Assessment of ventricular wall motion with focused echocardiography during cardiac arrest to predict survival.

Ozen C1, Salcin E1, Akoglu H1, Onur O1, Denizbasi A1.

Abstract

OBJECTIVES:

Our primary goal is to investigate the hypothesis that in patients with a detectable ventricular wall motion (VWM) in cardiac ultrasonography (US) during cardiopulmonary resuscitation (CPR), survival rate is significantly more than in patients without VWM in US.

MATERIAL AND METHODS:

In our prospective, single center study, 129 adult cardiac arrest (CA) patients were enrolled. Cardiac US according to Focus Assessed Transthoracic Echo (FATE) protocol was performed before CPR. Presence of VWM was recorded on forms along with demographic data, initial rhythm, CA location, presence of return of spontaneous circulation (ROSC) and time until ROSC was obtained.

RESULTS:

129 patients were included. ROSC was obtained in 56/77 (72.7%) patients with VWM and 3/52 (5.8%) patients without VWM which is statistically significant (p > 0.001). Presence of VWM is 95% (95% CI: 0.95-0.99) sensitive and 70% (95% CI: 0.58-0.80) specific for ROSC. 43/77 (55.8%) patients with VWM and 1 (1.9%) of 52 patients without VWM survived to hospital admission which was statistically significant (p < 0.001). Presence of VWM was 100% (95% CI: 0.87-1.00) sensitive and 54% (95% CI: 0.43-0.64) specific for survival to hospital admission.

CONCLUSION:

No patient without VWM in US survived to hospital discharge. Only 3 had ROSC in emergency department and only 1 survived to hospital admission. This data suggests no patient without VWM before the onset of CPR survived to hospital discharge and this may be an indication to end resuscitative efforts early in these patients.

DEA

Automated external defibrillator use for in-hospital emergency management.

Huschak G1, Dünnebier A2, Kaisers UX1, Huschens B3, Bercker S4.

Abstract

The in-hospital spread of automated external defibrillators (AEDs) is aimed to allow for a shock-delivery within three minutes. However, it has to be questioned if the implementation of AED alone really contributes to a 'heart-safe hospital'. We performed a cohort study of 1008 in-hospital emergency calls in a university tertiary care hospital, analysing cardiopulmonary resuscitation (CPR) cases with and without AED use. In total, 484 patients (48%) had cardiac arrest and received CPR. Response time of the emergency team was 4.3 ± 4.0 minutes. Only 8% percent of the CPR cases had a shockable rhythm. In three of 43 placements a shock was delivered by the AED. There were no differences in survival between patients with CPR only and CPR with AED use. Our data do not support the use of an AED for in-hospital CPR if a professional response team is rapidly available.

REGISTRES I REVISIONS

[**Prognostic factors for in-hospital cardiopulmonary arrests. A review of 760 cases**].

[Article in Spanish]

Fontanals J1, Magaldi M2, Caballero Á1, Fontanals M1; Comisión de atención a la parada cardiorrespiratoria intrahospitalaria del Hospital Clínic de Barcelona.
Abstract
BACKGROUND AND OBJECTIVE:
The aim of this study is to analyse in-hospital cardiopulmonary arrests (CA) that took place in conventional wards and evaluate their prognostic factors.
PATIENTS AND METHOD:
Retrospective review of in-hospital CA which occurred in our hospital over a 9-year period. CA that took place in intensive care areas, emergency rooms and operating theatres were excluded from the study. The following data were collected: demographic data, cause and initial rhythm of CA, internal control data, time, place, methods and results after cardiopulmonary resuscitation (CPR) (recovery of spontaneous circulation, [ROSC], and survival at discharge [SAD]) and neurologic performance at discharge. Results were analysed with SPSS® v. 20 predictive analytics software.
RESULTS:
Average age was 66.9±17.5 years; 63.5% male. CA team arrived in 1.75±0.74min on average, and the average length of CPR was 25.8±16.10min. First rhythm: a) shockable rhythms=22.1%; b) asystole=66.2%, and c) pulseless electrical activity=11.7%. ROSC=51% and SAD=24.8%. Factors associated with a better prognostic (P<.05): age, reason for hospital admission, patient's previous physical condition, principal cause of CA, number of defibrillations and average length of CPR.
CONCLUSIONS:
Despite having studied several variables as prognostic factors for CA and some of them being statistically significant, early prediction for survival for an in-hospital CA remains uncertain. Our study suggests that applying rational organisational measures, 25% of in-hospital CA could be discharged from hospital in good condition, and therefore, these organisational and educational measures should be extended to large hospitals.

Family Presence during Resuscitation: A Qualitative Analysis from a National Multicenter Randomized Clinical Trial.
De Stefano C1,2,3, Normand D2, Jabre P1,4,5, Azoulay E6, Kentish-Barnes N6, Lapostolle F1,7, Baubet T2,3, Reuter PG1,7, Javaud N1,7, Borron SW8, Vicaut E9, Adnet F1,7.
Abstract
BACKGROUND:
The themes of qualitative assessments that characterize the experience of family members offered the choice of observing cardiopulmonary resuscitation (CPR) of a loved one have not been formally identified.
METHODS AND FINDINGS:
In the context of a multicenter randomized clinical trial offering family members the choice of observing CPR of a patient with sudden cardiac arrest, a qualitative analysis, with a sequential explanatory design, was conducted. The aim of the study was to understand family members' experience during CPR. All participants were interviewed by phone at home three months after cardiac arrest. Saturation was reached after analysis of 30 interviews of a randomly selected sample of 75 family members included in the trial. Four themes were identified: 1- choosing to be actively involved in the resuscitation; 2- communication between the relative and the emergency care team; 3- perception of the reality of the death, promoting acceptance of the loss; 4- experience and reactions of the relatives who did or did not witness the CPR, describing their feelings. Twelve sub-themes further defining these four themes were identified. Transferability of our findings should take into account the country-specific medical system.

CONCLUSIONS:
Family presence can help to ameliorate the pain of the death, through the feeling of having helped to support the patient during the passage from life to death and of having participated in this important moment. Our results showed the central role of communication between the family and the emergency care team in facilitating the acceptance of the reality of death.

VENTILACIÓ

The association between timing of tracheal intubation and outcomes of adult in-hospital cardiac arrest: A retrospective cohort study.
Wang CH1, Chen WJ2, Chang WT3, Tsai MS3, Yu PH4, Wu YW5, Huang CH6.
Abstract
AIM:
Resuscitation guidelines indicate the ideal timing of tracheal intubation during in-hospital cardiac arrest (IHCA) has not been adequately studied.
METHODS:
A retrospective observational study in a single medical centre was conducted that evaluated patients with IHCA between 2006 and 2014. Multivariable logistic regression analysis was used to evaluate associations between independent variables and outcomes. Time to intubation was defined as elapsed time from the first chest compression to the time of completion of endotracheal intubation, tracheostomy, or cricothyroidotomy.
RESULTS:
A total of 702 patients were included. The mean time to intubation was 8.8min. Ninety-five (13.5%) patients survived to hospital discharge, and 44 (6.3%) patients displayed favourable neurological status at discharge. Time to intubation was shown to be inversely associated with favourable neurological outcome (odds ratio [OR]: 0.86, 95% confidence interval [CI]: 0.80-0.93; p-value <0.001). Delayed time to intubation was noted to be particularly unfavourable for survival outcome in patients with non-shockable rhythms (OR: 0.95, 95% CI: 0.91-0.98; p-value=0.005). Intubation within 8.8min of arrest was demonstrated to be positively associated with both favourable neurological outcome (OR: 7.28, 95% CI: 2.98-20.52; p-value <0.001) and survival to hospital discharge (OR: 2.09, 95% CI: 1.27-3.52; p-value=0.004).
CONCLUSION:
Earlier tracheal intubation during cardiopulmonary resuscitation might be beneficial for clinical outcomes following IHCA. Intubation within 8.8min appears favourable for both neurological and survival outcomes. Nevertheless, this goal should be attempted by clinicians who experienced in intubation to avoid potential complications and harm.

Effect of rescue breathing by lay rescuers for out-of-hospital cardiac arrest caused by respiratory disease: a nationwide, population-based, propensity score-matched study.
Fukuda T1, Ohashi-Fukuda N2, Kondo Y3, Sera T 4, Yahagi N2.
Abstract
The importance of respiratory care in cardiopulmonary resuscitation may vary depending on the cause of cardiac arrest. No previous study has investigated the effects of rescue breathing performed by a lay rescuer on the outcomes of patients with out-of-hospital cardiac arrest (OHCA) caused by intrinsic respiratory diseases. The aim of this study was to investigate whether rescue breathing performed by a lay rescuer is associated with outcomes after respiratory disease-related OHCA. In a nationwide, population-based, propensity score-matched study in Japan, among adult patients with OHCA caused by respiratory disease who

received bystander cardiopulmonary resuscitation from January 1, 2005 to December 31, 2010, we compared patients with rescue breathing to those without rescue breathing. The primary outcome was neurologically favorable survival 1 month after OHCA. Of the eligible 14,781 patients, 4970 received rescue breathing from a lay rescuer and 9811 did not receive rescue breathing. In a propensity score-matched cohort (4897 vs. 4897 patients), the neurologically favorable survival rate was similar between patients with and without rescue breathing from a lay rescuer [0.9 vs. 0.7 %; OR 1.23 (95 % CI 0.79-1.93)]. Additionally, in subgroup analyses, rescue breathing was not associated with neurological outcome regardless of the type of rescuer [family member: adjusted OR 0.83 (95 % CI 0.39-1.70); or non-family member: adjusted OR 1.91 (95 % CI 0.79-5.35)]. Even among patients with OHCA caused by respiratory disease, rescue breathing performed by a lay rescuer was not associated with neurological outcomes, regardless of the type of lay rescuer.

Scandinavian SSAI clinical practice guideline on pre-hospital airway management.
Rehn M1,2,3, Hyldmo PK1,4, Magnusson V5, Kurola J6, Kongstad P7, Rognås L8,9, Juvet LK10,11, Sandberg M12,13.
Abstract
BACKGROUND:
The Scandinavian society of anaesthesiology and intensive care medicine task force on pre-hospital airway management was asked to formulate recommendations following standards for trustworthy clinical practice guidelines.
METHODS:
The literature was systematically reviewed and the grading of recommendations assessment, development and evaluation (GRADE) system was applied to move from evidence to recommendations.
RESULTS:
We recommend that all emergency medical service (EMS) providers consider to: apply basic airway manoeuvres and airway adjuncts (good practice recommendation); turn unconscious non-trauma patients into the recovery position when advanced airway management is unavailable (good practice recommendation); turn unconscious trauma patients to the lateral trauma position while maintaining spinal alignment when advanced airway management is unavailable [strong recommendation, low quality of evidence (QoE)]. We suggest that intermediately trained providers use a supraglottic airway device (SAD) or basic airway manoeuvres on patients in cardiac arrest (weak recommendation, low QoE). We recommend that advanced trained providers consider using an SAD in selected indications or as a rescue device after failed endotracheal intubation (ETI) (good practice recommendation). We recommend that ETI should only be performed by advanced trained providers (strong recommendation, low QoE). We suggest that videolaryngoscopy is considered for ETI when direct laryngoscopy fails or is expected to be difficult (weak recommendation, low QoE). We suggest that advanced trained providers apply cricothyroidotomy in 'cannot intubate, cannot ventilate' situations (weak recommendation, low QoE).
CONCLUSION:
This guideline for pre-hospital airway management includes a combination of techniques applied in a stepwise fashion appropriate to patient clinical status and provider training.

CAUSES DE L'ACR

Predicting the outcomes for out-of-hospital cardiac arrest patients using multiple biomarkers and suspension microarray assays.

Huang CH1,2, Tsai MS1, Chien KL3, Chang WT1, Wang TD2, Chen SC1, Ma MH1, Hsu HY4, Chen WJ1,5.

Abstract

Predicting the prognosis for cardiac arrest is still challenging. Combining biomarkers from diverse pathophysiological pathways may provide reliable indicators for the severity of injury and predictors of long-term outcomes. We investigated the feasibility of using a multimarker strategy with key independent biomarkers to improve the prediction of outcomes in cardiac arrest. Adult out-of-hospital cardiac arrest patients with sustained return of spontaneous circulation were prospectively enrolled in this study. Blood samples were taken at 2 and 24 hours after cardiac arrest. Suspension microarray assays were used to test 21 different biomarkers. A total of 99 patients were enrolled, 45 of whom survived to hospital discharge. We identified 11 biomarkers that, when combined with clinical variables and factors of APACHE II score and history of arrhythmia, were independent determinants for outcome of in-hospital mortality (concordance = 0.9249, standard error = 0.0779). Three biomarkers combined with APACHE II and age were independent determinants for favorable neurological outcome at hospital discharge (area under the receiver-operator characteristic curve, 0.938; 95% confidence interval, 0.854 ~ 1.0). In conclusion, a systemic multiple biomarker approach using suspension microarray assays can identify independent predictors and model the outcomes of cardiac arrest patients during the post-cardiac arrest period

FEEDBACK

Using an inertial navigation algorithm and accelerometer to monitor chest compression depth during cardiopulmonary resuscitation.
Boussen S1, Ibouanga-Kipoutou H2, Fournier N3, Raboutet YG2, Llari M2, Bruder N4, Arnoux PJ2, Behr M2.

Abstract

We present an original method using a low cost accelerometer and a Kalman-filter based algorithm to monitor cardiopulmonary resuscitation chest compressions (CC) depth. A three-axis accelerometer connected to a computer was used during CC. A Kalman filter was used to retrieve speed and position from acceleration data. We first tested the algorithm for its accuracy and stability on surrogate data. The device was implemented for CC performed on a manikin. Different accelerometer locations were tested. We used a classical inertial navigation algorithm to reconstruct CPR depth and frequency. The device was found accurate enough to monitor CPR depth and its stability was checked for half an hour without any drift. Average error on displacement was ±0.5mm. We showed that depth measurement was dependent on the device location on the patient or the rescuer. The accuracy and stability of this small low-cost accelerometer coupled to a Kalman-filter based algorithm to reconstruct CC depth and frequency, was found well adapted and could be easily implemented.

CURES POST

Using the relationship between brain tissue regional saturation of oxygen and mean arterial pressure to determine the optimal mean arterial pressure in patients following cardiac arrest: A pilot proof-of-concept study.
Sekhon MS1, Smielewski P2, Bhate TD1, Brasher PM3, Foster D1, Menon DK2, Gupta AK2, Czosnyka M4, Henderson WR1, Gin K5, Wong G5, Griesdale DE6.

Abstract

INTRODUCTION:
Prospectively assess cerebral autoregulation and optimal mean arterial pressure (MAPOPT) using the dynamic relationship between MAP and regional saturation of oxygen (rSO2) using near-infrared spectroscopy.
METHODS:
Feasibility study of twenty patients admitted to the intensive care unit following a cardiac arrest. All patients underwent continuous rSO2 monitoring using the INVOS® cerebral oximeter. ICM+® brain monitoring software calculates the cerebral oximetry index (COx) in real-time which is a moving Pearson correlation coefficient between 30 consecutive, 10-sec averaged values of MAP and correspond rSO2 signals. When rSO2 increases with increasing MAP (COx ≥0.3), cerebral autoregulation is dysfunctional. Conversely, when rSO2 remains constant or decreases with increasing MAP (COx <0.3), autoregulation is preserved. ICM+® fits a U-shaped curve through the COx values plotted versus MAP. The MAPOPT is nadir of this curve.
RESULTS:
The median age was 59 years (IQR 54 - 67) and 7 of 20 were female. The cardiac arrest was caused by myocardial infarction in 12 (60%) patients. Nineteen arrests were witnessed and return of spontaneous circulation occurred in a median of 15.5minutes (IQR 8-33). Patients underwent a median of 30hours (IQR 23-46) of monitoring. COx curves and MAPOPT were generated in all patients. The mean overall MAP and MAPOPT were 76mmHg (SD 10) and 76mmHg (SD 7), respectively. MAP was outside of 5mmHg from MAPOPT in 50% (SD 15) of the time. Out of the 7672 5-minute averaged COx measurements, 1182 (15%) were at 0.3 or above, indicating absence of autoregulation. Multivariable polynomial fractional regression demonstrated an increase in COx with increasing temperature (P=0.008).
CONCLUSIONS:
We demonstrated the feasibility to determine a MAPOPT using cerebral oximetry in patients after cardiac arrest.

High-mobility group box 1 is associated with neurological outcome in patients with post-cardiac arrest syndrome after out-of-hospital cardiac arrest.
Omura T1, Kushimoto S2, Yamanouchi S3, Kudo D2, Miyagawa N1.
Abstract
BACKGROUND:
Alarmins, including high-mobility group box 1 (HMGB-1), can be released from damaged tissues and activated cells as inflammatory mediators. We aimed to evaluate HMGB-1 and mitochondrial DNA dynamics and estimate the prognostic value for neurological outcome in patients with post-cardiac arrest syndrome after out-of-hospital cardiac arrest.
METHODS:
We evaluated the dynamics of HMGB-1, mitochondrial DNA, and other variables in patients with return of spontaneous circulation after out-of-hospital cardiac arrest. Patients were divided into two groups according to the cerebral performance category at 30 days: the favourable outcome group (cerebral performance categories 1 and 2) and unfavourable group (≥3).
RESULTS:
Twenty-one patients were included, and 11 demonstrated favourable outcomes. HMGB-1 levels and mitochondrial DNA on day 1 were significantly higher than on days 2, 3, 5, and 7. Plasma levels of HMGB-1 on day 1 correlated with prognostic parameters (estimated interval to return of spontaneous circulation, lactate, and NH3), tissue damage, systemic inflammation, and disease severity. HMGB-1 on day 1 in the unfavourable group was significantly higher than in the favourable group (median [interquartile range] 15.5 [6.65-18.7], 39.4 [17-69.5],

P = 0.009). These findings were not observed regarding mitochondrial DNA. Regarding HMGB-1 prediction accuracy for a good neurological outcome, the area under the receiver operating characteristic curve was 0.864 (95 % confidence interval 0.702, 1.000).

CONCLUSIONS:
HMGB-1 may be involved in acute-phase post-cardiac arrest syndrome pathophysiology, and an increase in plasma levels may be associated with a poor neurological outcome.

TTM

Targeted Temperature Management: Effects of Initial Protocol Implementation on Patient Outcomes.

Wyse J1, McNett M.

Abstract

BACKGROUND:
Targeted temperature management (TTM) is a strategy used by critical care nurses to mitigate negative effects of out-of-hospital cardiac arrest (OHCA); however, integration and compliance of TTM protocols into routine clinical practice can be challenging.
OBJECTIVES:
The aims of this study are to (1) investigate the effects of initial TTM protocol implementation on patient mortality, length of stay, and discharge disposition among patients who experience OHCA and (2) evaluate initial compliance and potential barriers to newly implemented TTM protocol.
METHODS:
A retrospective cohort design was used. Data were gathered on adult patients experiencing OHCA before and after immediate implementation of a TTM protocol within a large academic public hospital. Demographic and clinical data were abstracted from medical records of both TTM and non-TTM groups. Additional compliance data were gathered on the TTM group. Outcome variables included hospital mortality, length of stay, and discharge disposition.
RESULTS:
Total accrual was 259. Mortality decreased after protocol implementation (89.4%, 75%, P < .05), which was supported in the regression analyses (P = .05; odds ratio, 2.8). A higher proportion of subjects were discharged home after the TTM protocol (21.5% discharged home after protocol implementation vs 5.1% discharged home before protocol implementation; P < .05). Full protocol compliance was 30%. Protocol documentation was inconsistent across units and personnel.
CONCLUSIONS:
Findings suggest that even initial implementation of TTM protocols can result in positive patient outcomes. Full compliance with protocols remains difficult. Critical care nurses are integral to initiation of and adherence to therapeutic hypothermia protocols and are in a key position to develop strategies for improved compliance across departments.

Concordance of Brain and Core Temperature in Comatose Patients After Cardiac Arrest.

Coppler PJ1,2, Marill KA1, Okonkwo DO3, Shutter LA3,4,5, Dezfulian C5, Rittenberger JC1, Callaway CW1, Elmer J1,5.

Abstract

Comatose patients after cardiac arrest should receive active targeted temperature management (TTM), with a goal core temperature of 32-36°C for at least 24 hours. Small variations in brain temperature may confer or mitigate a substantial degree of neuroprotection, which may be lost at temperatures near 37°C. The purpose of this study was to define the relationship between brain and core temperature after cardiac arrest through

direct, simultaneous measurement of both. We placed intracranial monitors in a series of consecutive patients hospitalized for cardiac arrest at a single tertiary care facility within 12 hours of return of spontaneous circulation to guide postcardiac arrest care. We compared the absolute difference between brain and core (esophageal or rectal) temperature measurements every hour for the duration of intracranial monitoring and tested for a lag between brain and core temperature using the average square difference method. Overall, 11 patients underwent simultaneous brain and core temperature monitoring for a total of 906 hours of data (Median 95; IQR: 15-118 hours per subject). On average, brain temperature was 0.34C° (95% confidence interval [CI] 0.31-0.37) higher than core temperature. In 7% of observations, brain temperature exceeded the measured core temperature ≥1°C. Brain temperature lagged behind core temperature by 0.45 hours (95% CI = -0.27-1.27 hours). Brain temperature averages 0.34°C higher than core temperature after cardiac arrest, and is more than 1°C higher than core temperature 7% of the time. This phenomenon must be considered when carrying out TTM to a goal core temperature of <36°C.

3. Ann Emerg Med. 2016 May 27. pii: S0196-0644(16)30089-0. doi: 10.1016/j.annemergmed.2016.04.021. [Epub ahead of print]

Duration of Coma in Out-of-Hospital Cardiac Arrest Survivors Treated With Targeted Temperature Management.

Irisawa T1, Vadeboncoeur TF2, Karamooz M3, Mullins M4, Chikani V5, Spaite DW3, Bobrow BJ6.

Abstract

STUDY OBJECTIVE:
We evaluate the time to awakening after out-of-hospital cardiac arrest in patients treated with targeted temperature management and determine whether there was an association with any patient or event characteristics.
METHODS:
This was a prospective, observational cohort study of consecutive adult survivors of out-of-hospital cardiac arrest of presumed cardiac cause who were treated with targeted temperature management between January 1, 2008, and March 31, 2014. Data were obtained from hospitals and emergency medical services agencies responding to approximately 90% of Arizona's population as part of a state-sponsored out-of-hospital cardiac arrest quality improvement initiative.
RESULTS:
Among 573 out-of-hospital cardiac arrest patients who completed targeted temperature management, 316 became responsive, 60 (19.0%) of whom woke up at least 48 hours after rewarming. Eight patients (2.5%) became responsive more than 7 days after rewarming, 6 of whom were discharged with a good Cerebral Performance Category score (1 or 2). There were no differences in standard Utstein variables between the early and late awakeners. The early awakeners were more likely to be discharged with a good Cerebral Performance Category score (odds ratio 2.93; 95% confidence interval 1.09 to 7.93).
CONCLUSION:
We found that a substantial proportion of adult out-of-hospital cardiac arrest survivors treated with targeted temperature management became responsive greater than 48 hours after rewarming, with a resultant good neurologic outcome.

TRANSPORT

1. Turk J Emerg Med. 2015 Nov 17;15(3):122-5. doi: 10.1016/j.tjem.2015.11.005. eCollection 2015.

Assessment of prehospital medical care for the patients transported to emergency department by ambulance.

Akın Paker S1, Dagar S2, Gunay E3, Temizyurek Cebeci Z4, Aksay E5.

Abstract

OBJECTIVES:

In our study we aimed to investigate the quality and quantity of medical management inside ambulances for 14 and over 14 years old patients transported to a level three emergency department (ED).

MATERIAL AND METHODS:

Our study was conducted prospectively at a level three ED. 14 and over 14 years old patients who were transported to the ED by ambulance were included in the study consecutively. "Lack of vital rate" was described as missing of one or more of five vital rates during ambulance transportation. Both of two attending emergency physicians evaluated the medical procedures and management of patients at the ambulance simultaneously and this was recorded on the study forms.

RESULTS:

Four hundred and fifty six patients were included in the study. Missing vital signs were identified for 90.1% (n = 322) of the patients that were transported by physicians and 92.4% (n = 73) of the patients that were transported by paramedics. For five patients with cardiac arrest two (33.3%) had cardiopulmonary resuscitation (CPR), one (20%) was intubated, one (20%) received adrenaline. Out of 120 patients, needed spinal immobilization, 69 (57.5%) had spinal board. Cervical collar usage was 65.1% (n = 69) We have revealed that 316 (69.3%) patients did not receive at least one of the necessary medical intervention or treatment.

CONCLUSION:

During ambulance transportation, life-saving procedures like cardiopulmonary resuscitation, vital sign measurement, crucial treatment administration, endotracheal intubation, defibrillation, fracture immobilization were not performed adequately. Increasing the training on the deficient interventions and performing administrative inspections may improve quality of patient care.

PEDIATRIA

Ventricular Tachycardia: A Rare Commotio Cordis Presentation.
Jones LA1, Sullivan RW.

Abstract

Commotio cordis is a rare event caused by an unfortunately timed blunt anterior chest wall impact that most commonly presents in young male adolescents and is the second leading cause of death in young athletes. The most common initial presenting dysrhythmias are ventricular fibrillation and asystole, although other rare dysrhythmias have been reported- predominantly in animal models. To our knowledge, this is the first telemetry-confirmed case of commotio cordis with a presenting cardiac rhythm of ventricular tachycardia. While prompt recognition of commotio cordis and early cardiopulmonary resuscitation and defibrillation (if applicable) are still the treatment in these cases, our case offers potential insight into the underlying commotio cordis process.

Alterations in cognitive outcome between 3 and 12 months in survivors of out-of-hospital cardiac arrest.
Ørbo M1, Aslaksen PM2, Larsby K3, Schäfer C4, Tande PM3, Anke A5.

Abstract

OBJECTIVES:

To prospectively investigate cognitive recovery from 3 to 12 months after resuscitation from out-of-hospital cardiac arrest (OHCA) and the associations between cognitive performance at 3 months and health-related quality of life (HRQL), psychological distress and work status after 12 months.

METHODS:

At both assessments, neuropsychological tests were used to measure aspects of general mental ability, verbal and visual memory, psychomotor speed and executive function. The Short Form-36 (SF-36) was used to measure mental and physical HRQL, and the Hospital Anxiety and Depression Scale (HADS) to assess psychological distress.

RESULTS:

33 survivors completed both exams (31 males, mean age 58.6 years, SD=13). The OHCAs were witnessed and due to cardiac origins. Nine patients were awake at admission to the hospital. Longer coma duration was associated with poorer cognitive results. Memory impairments were the most common symptom. The mean changes and effect sizes indicated minor improvements in cognitive performance from 3-12 months (Hedges g<= .26). Reliable change indices for an individual's results further confirmed the stability of the group statistics. The HADS scores showed increased depressive symptoms, and mental HRQL was reduced from 3 to 12 months. Higher reports of psychological distress were related to worse HRQL. Work participation increased. Better cognitive results at 3 months were correlated with better HRQL and return to work at 12 months.

CONCLUSIONS:

The current data describe stability in results from 3-12 months. A worse cognitive performance at 3 months and higher reports of psychological distress were associated with lower HRQL

Which Fingers Should We Perform Two-Finger Chest Compression Technique with When Performing Cardiopulmonary Resuscitation on an Infant in Cardiac Arrest?

Kim YS1, Oh JH1, Kim CW1, Kim SE 1, Lee DH1, Hong JY1.

Abstract

This study compared the effectiveness two-finger chest compression technique (TFCC) performed using the right vs. left hand and the index-middle vs. middle-ring fingers. Four different finger/hand combinations were tested randomly in 30 healthcare providers performing TFCC (Test 1: the right index-middle fingers; Test 2: the left index-middle fingers; Test 3: the right middle-ring fingers; Test 4: the left middle-ring fingers) using two cross-over trials. The "patient" was a 3-month-old-infant-sized manikin. Each experiment consisted of cardiopulmonary resuscitation (CPR) consisting of 2 minutes of 30:2 compression: ventilation performed by one rescuer on a manikin lying on the floor as if in cardiac arrest. Ventilations were performed using the mouth-to-mouth method. Compression and ventilation data were collected during the tests. The mean compression depth (MCD) was significantly greater in TFCC performed with the index-middle fingers than with the middle-ring fingers regardless of the hand (95% confidence intervals; right hand: 37.8-40.2 vs. 35.2-38.6 mm, P = 0.002; left hand: 36.9-39.2 vs. 35.5-38.1 mm, P = 0.003). A deeper MCD was achieved with the index-middle fingers of the right versus the left hand (P = 0.004). The ratio of sufficiently deep compressions showed the same patterns. There were no significant differences in the other data. The best performance of TFCC in simulated 30:2 compression: ventilation CPR performed by one rescuer on an infant in cardiac arrest lying on the floor was obtained using the index-middle fingers of the right hand. Clinical Trial Registry at the Clinical Research Information Service (KCT0001515).

RECERCA EXPERIMENTAL

Preserved brain morphology after controlled automated reperfusion of the whole body following normothermic circulatory arrest time of up to 20 minutes.
Taunyane IC1, Benk C2, Beyersdorf F2, Foerster K2, Cristina Schmitz H2, Wittmann K2, Mader I3, Doostkam S4, Heilmann C5, Trummer G 2.
Abstract
OBJECTIVES:

Clinical outcomes following cardiac arrest (CA) and resuscitation remain a cause for concern. The use of Controlled Automated Reperfusion of the whoLe body (CARL) confers superior neurological outcome even after extended periods of CA. We aimed at investigating clinical outcome and brain morphology preservation when employing CARL following CA periods of 20 min.

METHODS:

Twenty-eight pigs were allocated to four extracorporeal circulation treatment strategies; seven others served as magnetic resonance imaging (MRI) controls. In prompt cardiopulmonary resuscitation (CPR; n = 6), induced circulatory arrest was followed immediately by open cardiac massage of 15 min, thereafter by CARL for 60 min. In delayed CPR (n = 6), induced CA was maintained for 15 min, after that open cardiac massage of 10 min duration was performed prior to extracorporeal CPR (ECPR) of 60 min. Induced CA times of 15 min in the ECPR 15' group (n = 6) and CA of 20 min in the CARL 20' group (n = 10) were followed by ECPR of 60 min and CARL of 60 min, respectively, without prior CPR. Daily neurological deficit scoring (NDS) up to the seventh day, markers of cellular injury [alanine transaminase (ALT), aspartate transaminase (AST) and neuron-specific enolase (NSE)] and brain MRI were performed.

RESULTS:

100% survival and normal NDSs were achieved in all animals in the prompt CPR and ECPR 15' groups. In CARL 20', nine animals survived. In contrast, only one animal in the delayed CPR group survived; three animals died within 24 h with a further two dying on Days 4 and 5, respectively. All markers of cellular injury were elevated in the delayed CPR group, ALT [38 (20.3) to 206 U/l (158.2); P = 0.0095], AST [26 (18.8) to 97 U/l (1965.8); P = 0.0095] and NSE [0.45 (0.25) to 7.95 µg/l (24.03); P = 0.0095]. In the ECPR 15' group, only NSE [0.45 (0.15) to 1.20 µg/l (2.40); P = 0.0065] remained elevated. In the CARL 20' group, differences in ALT [36 (10) to 53 U/l (20); P = 0.0005] and NSE [0.50 (0.40) to 1.5 µg/l (0.40); P < 0.0001] values were evident. T2-weighted MR images of the cerebellum [454 (28) to 495 mm2/s (55); U = 11; P = 0.0311], caudate nucleus [400 (59) to 467 mm2/s (42); U = 9; P = 0.0156], lentiform nucleus [377 (89) to 416 mm2/s (55); U = 11; P = 0.0311] and hippocampus [421 (109) to 511 mm2/s (58); U = 9; P = 0.0164] in the CARL 20' group showed higher signal intensities compared with controls. In delayed CPR, corresponding regions of interest on early apparent diffusion coefficient images showed a restricted diffusion.

CONCLUSIONS:

In our experimental animal model of CA, CARL results in satisfactory survival at CA periods of 20 min despite detected enzyme and morphological changes. These changes did not translate to clinical neurological deficits.

Activation of autophagy improved the neurologic outcome after cardiopulmonary resuscitation in rats.
Li X1, Liu YJ2, Xia JM3, Zeng XY2, Liao XX2, Wei HY2, Hu CL4, Jing XL2, Dai G5.
Abstract
OBJECTIVE:

Recent studies have shown the existence of autophagy in cerebral ischemia; however, there has been no research on the role of autophagy in cerebral injury after cardiopulmonary

resuscitation (CPR). This study was conducted to determine the role of autophagy in an animal model of ventricular fibrillation (VF)/CPR.

METHODS:

Experiment 1: A total of 48 adult Wistar rats were untreated for 7 minutes after induction of VF using an external transthoracic alternating current, and subsequent CPR was performed to observe the existence of autophagy after the return of spontaneous circulation (ROSC).

Experiment 2: A total of 72 rats were pretreated with intracerebroventricular injection of physiologic saline (control group), the autophagy inducer (rapamycin group), or the autophagy inhibitor 3-methyladenine (3-methyladenine group) before ROSC to evaluate the contribution of autophagy to neuronal injury after ROSC.

RESULTS:

The activation of autophagy was attenuated 2 to 4 hours after ROSC, which was related to the activity decrease of 5'-adenosine monophosphate-activated protein kinase after ROSC. Rapamycin treatment significantly increased the expressions of LC3-II and Beclin-1 after ROSC, attenuated the activation of caspase-3, promoted neuronal survival and decreased neuronal apoptosis, and improved the neurologic deficit score after CPR.

CONCLUSIONS:

The activation of autophagy after ROSC offered a remarkable tolerance to VF/CPR ischemic insult and improved the neurologic outcomes.

CASE REPORTS

Minimal invasive treatment of life-threatening bleeding caused by cardiopulmonary resuscitation-associated liver injury: a case report.
Næss PA1,2, Engeseth K3, Grøtta O4, Andersen GØ3, Gaarder C5.

Abstract

BACKGROUND:

Life-threatening bleeding caused by liver injury due to chest compressions is a rare complication in otherwise successful cardiopulmonary resuscitation. Surgical intervention has been suggested to achieve bleeding control; however, reported mortality is high. In this report, we present a brief literature review and a case report in which use of a less invasive strategy was followed by an uneventful recovery.

CASE PRESENTATION:

A 37-year-old white woman was admitted after out-of-hospital cardiac arrest. Bystander cardiopulmonary resuscitation was immediately performed, followed by advanced cardiopulmonary resuscitation that included tracheal intubation, mechanical chest compressions, and external defibrillation with return of spontaneous circulation. Upon hospital admission, the patient's blood pressure was 94/45 mmHg and her heart rate was 110 beats per minute. Her electrocardiogram showed no signs of ST-segment elevations or Q-wave development. Coronary angiography revealed a proximal thrombotic occlusion of the left anterior descending coronary artery. Successful recanalization, after thrombus aspiration and balloon dilation followed by stent implant, was verified with normalized anterograde flow. Immediately after the patient's arrival in the intensive cardiac care unit, a drop in her blood pressure to 60/30 mmHg and a hemoglobin concentration of 4.5 g/dl were noticed. Transfusion was started, and bedside abdominal ultrasound examination revealed free intraperitoneal fluid. Computed tomography of the abdomen revealed liver injury with active extravasation from the cranial surface of the right lobe and a massive hemoperitoneum. The patient was coagulopathic and acidotic with a body temperature of 33.5 °C. A minimally invasive treatment strategy, including angiography and selective trans-catheter arterial embolization, were performed in combination with percutaneous evacuation of 4.5 L of intraperitoneal blood. After completion of these procedures, the patient was hemodynamically

stable. She was weaned off mechanical ventilation 2 days later and made an uneventful recovery. She was discharged to a local hospital on day 13 without neurological disability.
CONCLUSIONS:
Although rare, bleeding caused by liver injury due to chest compressions can be life-threatening after successful cardiopulmonary resuscitation. Reported mortality is high after surgical intervention, and patients may benefit from less invasive treatment strategies such as those presented in this case report.

REGISTRES I REVISIONS

Sex differences in the prehospital management of out-of-hospital cardiac arrest.
Mumma BE1, Umarov T2.
Abstract
BACKGROUND:
Sex differences exist in the diagnosis and treatment of several cardiovascular diseases. Our objective was to determine whether sex differences exist in the use of guideline-recommended treatments in out-of-hospital cardiac arrest (OHCA).
METHODS:
We included adult patients with non-traumatic OHCA treated by emergency medical services (EMS) in the Resuscitation Outcomes Consortium Prehospital Resuscitation using an IMpedance valve and Early versus Delayed (ROC PRIMED) database during 2007-2009. Outcomes included prehospital treatment intervals, procedures, and medications. Data were analysed using multivariable linear and logistic regression models that adjusted for sex, age, witnessed arrest, public location, bystander cardiopulmonary resuscitation (CPR), and first known rhythm of ventricular tachycardia/fibrillation.
RESULTS:
We studied 15,584 patients; 64% were male and median age was 68 years (interquartile range 55-80). In multivariable analyses, intervals from EMS dispatch to first rhythm capture (p=0.001) and first EMS CPR (p=0.001) were longer in women than in men. Women were less likely to receive successful intravenous or intraosseous access (OR 0.78, 95% CI 0.71-0.86) but equally likely to receive a successful advanced airway (OR 0.94, 95% CI 0.86-1.02). Women were less likely to receive adrenaline (OR 0.81, 95% CI 0.74-0.88), atropine (OR 0.86, 95% CI 0.80-0.92), and lidocaine or amiodarone (OR 0.68, 95% CI 0.61-0.75).
CONCLUSION:
Women were less likely than men to receive guideline-recommended treatments for OHCA. The reasons for these differences require further exploration, and EMS provider education and training should specifically address these sex differences in the treatment of OHCA.

Body mass index and outcomes of in-hospital ventricular tachycardia and ventricular fibrillation arrest.
Ogunnaike BO1, Whitten CW2, Minhajuddin A2, Melikman E2, Joshi GP2, Moon TS2, Schneider PM3, Bradley SM3; American Heart Association's Get With The Guidelines(®)-Resuscitation Investigators.
Abstract
BACKGROUND:
Due to higher transthoracic impedance, obese patients may be less likely to be successfully defibrillated from ventricular tachycardia or ventricular fibrillation (VT/VF) arrest. However,

the association between patient body mass index (BMI), defibrillation success, and survival outcomes of VT/VF arrest are poorly understood.

METHODS:
We evaluated 7110 patients with in-hospital VT/VF arrest at 286 hospitals within the Get With The Guidelines®-Resuscitation (GWTG-R) Multicenter Observational Registry between 2006 and 2012. Patients were categorized as underweight (BMI<18.5kg/m2), normal weight (BMI 18.5-24.9kg/m2), over-weight (BMI 25.0-29.9kg/m2), obese (BMI 30.0-34.9kg/m2), and extremely obese (BMI≥35.0kg/m2). Using generalized linear mixed regression, we determined the risk-adjusted relationship between BMI and patient outcomes while accounting for clustering by hospitals. The primary outcome was successful first shock defibrillation (a post-shock rhythm other than VT/VF) with secondary outcomes of return of spontaneous circulation, survival to 24h, and survival to discharge.
RESULTS:
Among adult patients suffering VT/VF arrest, 304 (4.3%) were underweight, 2061 (29.0%) were normal weight, 2139 (30.1%) were overweight, and 2606 (36.6%) were obese or extremely obese. In a risk-adjusted analysis, we observed no interaction between BMI and energy level for the successful termination of VT/VF with first shock. Furthermore, the risk-adjusted likelihood of successful first shock termination of VT/VF did not differ significantly across BMI categories. Finally, when compared to overweight patients, obese patients had similar risk-adjusted likelihood of survival to hospital discharge (odds ratio 0.786, 95% confidence interval 0.593-1.043).
CONCLUSIONS:
There was no significant difference in the likelihood of successful defibrillation with the first shock attempt among different BMI categories

Factors associated with out-of-hospital cardiac arrest with pulseless electric activity: A population-based study.
Ko DT1, Qiu F2, Koh M2, Dorian P3, Cheskes S4, Austin PC2, Scales DC5, Wijeysundera HC6, Verbeek PR7, Drennan I8, Ng T2, Tu JV6, Morrison LJ8.
Abstract
BACKGROUND:
Many patients with out-of-hospital cardiac arrest present with pulseless electric activity (PEA) rather than shockable rhythm. Despite improvements in resuscitation care, survival of PEA patients remains dismal. Our main objective was to characterize out-of-hospital cardiac arrest patients by initial presenting rhythm and to evaluate independent determinants of PEA.
METHODS:
A population-based study was conducted using the Toronto Rescu Epistry database with linkage to administrative data in Ontario, Canada. We included patients older than 20 years who had nontraumatic cardiac arrests from 2005 to 2010. Multivariable logistic regression models were constructed to determine factors predicting the occurrence of PEA vs shockable rhythm vs asystole.
RESULTS:
Of the 9,882 included patients who received treatment, 24.5% had PEA, 26.3% had shockable rhythm, and 49.2% had asystole. Patients with PEA had a mean age of 72 years, 41.2% were female and had multiple comorbidities, and 53.4% were hospitalized in the past year. As compared with shockable rhythm, PEA patients were older, were more likely to be women, and had more comorbidities. As compared with asystole, PEA patients had similar baseline and clinical characteristics, but were substantially more likely to have an arrest witnessed by emergency medical services (odds ratio 13) or by bystander (odds ratio 3.24). Mortality at 30

days was 95.5%, 77.9%, and 98.9% for patients with PEA, shockable rhythm, asystole, respectively.

CONCLUSIONS:

Patient characteristics differed substantially in those presenting with PEA and shockable rhythm. In contrast, the main distinguishing factor between PEA and asystole cardiac arrest related mainly to factors at the time of the cardiac arrest.

Can we identify termination of resuscitation criteria in cardiac arrest due to drowning: results from the French national out-of-hospital cardiac arrest registry.

Hubert H1, Escutnaire J1, Michelet P2, Babykina E1, El Khoury C3, Tazarourte K4, Vilhelm C1, El Hiki L5, Guinhouya B1, Gueugniaud PY4; on behalf GR-RéAC.

Abstract

RATIONALE, AIMS AND OBJECTIVES:

The aim of this study was to describe the cohort of persons having experiences fatal and non-fatal drowning events, registered in the French cardiac arrest registry and to identify termination of resuscitation criteria.

METHODS:

We performed a prospective multicenter study based on data from French cardiac arrest registry database. All patients with cardiac arrest after drowning (CAD) recorded between July 2011 and November 2014 were included. The population description was carried out by medians [interquartile ranges (IQR)] or frequencies. The characteristics were compared in terms of the primary endpoint (alive vs dead at hospital admission) using chi-square or Fisher's exact and the Mann-Whitney U test. The predictive model was carried out using the multivariate logistic regression.

RESULTS:

The analysis included 234 CAD. The majority of patients were adults (83.6%) and males (64.5%). Most of the submersions occurred out of home (75.6%). We recorded 66.7% of incidents in fresh water. About a third of CAD was witnessed of which 33.8% had an immediate basic life support. Most of CAD patients received an advanced cardiac life support (87.2%). The median Mobile Medical Team response time was 22 [15-30] minutes. At hospital, 40.6% of patients were alive. Twenty one patients (9.0%) were discharged alive. Among them, 17 had a good neurological outcome. Faster interventions generally resulted in higher survival chances (Mobile Medical Team response time OR: 0.960[0.925; 0.996]; P = 0.0.031; no flow duration OR: 0.535[0.313; 0.913]; P = 0.022) if associated with ventilation (OR: 6.742[2.043; 22.250]; P = 0.002). Age (OR: 0.971[0.955; 0.988]; P = 0.001) and location outside (OR: 0.203[0.064; 0.625]; P = 0.007) are the other criteria of our model.

CONCLUSIONS:

The model is helpful to highlight explanative variables concerning CAD patients' outcome. The next step is the validation of these five factors by a larger study. Prevention and public training to lifesaving behaviours must be considered as priorities in French public health programmes.

ENTRENAMENT

Comparison of effectiveness of class lecture versus workshop-based teaching of basic life support on acquiring practice skills among the health care providers.

Karim HM1, Yunus M2, Bhattacharyya P1, Ahmed G3.

Abstract

BACKGROUND:

Basic life support (BLS) is an integral part of emergency medical care. Studies have shown poor knowledge of it among health care providers who are usually taught BLS by lecture-based teachings in classes.
OBJECTIVES:
This study is designed to assess the effectiveness of class lecture versus workshop-based teaching of BLS on acquiring the practice skills on mannequin.
METHODS:
After ethical approval and informed consent from the participants, the present study was conducted among the health care providers. Participants were grouped in lecture-based class teaching and workshop-based teaching. They were then asked to practice BLS on mannequin (Resusci Anne with QCPR) and evaluated as per performance parameters based on American Heart Association BLS. Statistical analyses are done by Fisher's exact t-test using GraphPad INSTAT software and $P < 0.05$ is taken as significant.
RESULTS:
There were 55 participants in lecture-based teaching and 50 in workshop-based teaching group. There is no statistical difference in recognition of arrest, checking pulse, and starting chest compression ($P > 0.05$). Though more than 83% of lecture-based teaching group has started chest compression as compared 96% of workshop group; only 49% of the participants of lecture-based group performed quality chest compression as compared to 82% of other group ($P = 0.0005$). The workshop group also performed better bag mask ventilation and defibrillation ($P < 0.0001$).
CONCLUSION:
Workshop-based BLS teaching is more effective and lecture-based class teaching better is replaced in medical education curriculum.

ECOGRAFIA

Pre-hospital assessment with ultrasound in emergencies: implementation in the field.
Rooney KP1, Lahham S2, Lahham S2, Anderson CL2, Bledsoe B3, Sloane B2, Joseph L2, Osborn MB2, Fox JC2.
Abstract
BACKGROUND:
Point-of-care ultrasound (US) is a proven diagnostic imaging tool in the emergency department (ED). Modern US devices are now more compact, affordable and portable, which has led to increased usage in austere environments. However, studies supporting the use of US in the prehospital setting are limited. The primary outcome of this pilot study was to determine if paramedics could perform cardiac ultrasound in the field and obtain images that were adequate for interpretation. A secondary outcome was whether paramedics could correctly identify cardiac activity or the lack thereof in cardiac arrest patients.
METHODS:
We performed a prospective educational study using a convenience sample of professional paramedics without ultrasound experience. Eligible paramedics participated in a 3-hour session on point-of-care US. The paramedics then used US during emergency calls and saved the scans for possible cardiac complaints including: chest pain, dyspnea, loss of consciousness, trauma, or cardiac arrest.
RESULTS:
Four paramedics from two distinct fire stations enrolled a total of 19 unique patients, of whom 17 were deemed adequate for clinical decision making (89%, 95%CI 67%-99%). Paramedics accurately recorded 17 cases of cardiac activity (100%, 95%CI 84%-100%) and 2 cases of cardiac standstill (100%, 95%CI 22%-100%).
CONCLUSION:

Our pilot study suggests that with minimal training, paramedics can use US to obtain cardiac images that are adequate for interpretation and diagnose cardiac standstill. Further large-scale clinical trials are needed to determine if prehospital US can be used to guide care for patients with cardiac complaints.

PEDIATRIA

Results of Extracorporeal Cardiopulmonary Resuscitation in Children.
Shin HJ1, Song S2, Park HK2, Park YH2.
Abstract
BACKGROUND:
Survival of children experiencing cardiac arrest refractory to conventional cardiopulmonary resuscitation (CPR) is very poor. We sought to examine current era outcomes of extracorporeal CPR (ECPR) support for refractory arrest.
METHODS:
Patients who were <18 years and underwent ECPR between November 2013 and January 2016 were including in this study. We retrospectively investigated patient medical records.
RESULTS:
Twelve children, median age 6.6 months (range, 1 day to 11.7 years), required ECPR. patients' diseases spanned several categories: congenital heart disease (n=5), myocarditis (n=2), respiratory failure (n=2), septic shock (n=1), trauma (n=1), and post-cardiotomy arrest (n=1). Cannulation sites included the neck (n=8), chest (n=3), and neck to chest conversion (n=1). Median duration of extracorporeal membrane oxygenation was five days (range, 0 to 14 days). Extracorporeal membrane oxygenation was successfully discontinued in 10 (83.3%) patients. Nine patients (75%) survived more than seven days after support discontinuation and four patients (33.3%) survived and were discharged. Causes of death included ischemic brain injury (n=4), sepsis (n=3), and gastrointestinal bleeding (n=1).
CONCLUSION:
ECPR plays a valuable role in children experiencing refractory cardiac arrest. The weaning rate is acceptable; however, survival is related to other organ dysfunction and the severity of ischemic brain injury. ECPR prior to the emergence of end-organ injury and prevention of neurologic injury might enhance survival.

The Success Rate of Pediatric In-Hospital Cardiopulmonary Resuscitation in Ahvaz Training Hospitals.
Assar S1, Husseinzadeh M2, Nikravesh AH3, Davoodzadeh H4.
Abstract
Research Objective. This study determined the outcome of cardiopulmonary resuscitation (CPR) after in-hospital cardiac arrest and factors influencing it in two training hospitals in Ahvaz. Method. Patients hospitalized in the pediatric wards and exposed to CPR during hospital stay were included in the study (September 2013 to May 2014). The primary outcome of CPR was assumed to be the return of spontaneous circulation (ROSC) and the secondary outcome was assumed to be survival to discharge. The neurological outcome of survivors was assessed using the Pediatric Cerebral Performance Category (PCPC) method. Results. Of the 279 study participants, 138 patients (49.4%) showed ROSC, 81 patients (29%) survived for 24 hours after the CPR, and 33 patients (11.8%) survived to discharge. Of the surviving patients, 16 (48.5%) had favorable neurological outcome. The resuscitation during holidays resulted in fewer ROSC. Multivariate analysis showed that longer CPR duration, CPR by junior residents, growth deficiency, and prearrest vasoactive drug infusion were associated with decreased

survival to discharge (p < 0.05). Infants and patients with respiratory disease had higher survival rates. Conclusion. The rate of successful CPR in our study was lower than rates reported by developed countries. However, factors influencing the outcome of CPR were similar. These results reflect the necessity of paying more attention to pediatric CPR training, postresuscitation conditions, and expansion of intensive care facilities.

ECMO

1. Catheter Cardiovasc Interv. 2016 Jun 17. doi: 10.1002/ccd.26616. [Epub ahead of print]
"Shock and Go?" extracorporeal cardio-pulmonary resuscitation in the golden-hour of ROSC.

Spangenberg T1, Meincke F1, Brooks S1, Frerker C1, Kreidel F1, Thielsen T1, Schmidt T1, Kuck KH1, Ghanem A2.

Abstract

OBJECTIVES:
The feasibility and outcomes of 35 consecutive patients subjected to eCPR in the tertiary cardiology center were investigated.
BACKGROUND:
While conventional cardiopulmonary-resuscitation (cCPR) often times achieves only mediocre outcomes extracorporeal cardiopulmonary-resuscitation (eCPR) increasingly shifts into the focus of interest. However, the scientific evidence for eCPR is sparse, particularly in the cardiological setting.
METHODS:
Retrospective chart analysis of 35 patients treated with eCPR between 01/2014 and 10/2015.
RESULTS:
The duration of cCPR until initiation of eCPR was 73.8 ± 37.6 min and resulted in an initial pH of 6.9 ± 0.2 and serum lactate level of 14.5 ± 4.8 mmol/L. About 62% (n = 22) of the patients suffered from out of hospital cardiac arrest (OHCA), 85% (n = 30) of the overall events were witnessed and bystander-CPR performed in 77% (n = 27) of cases. Cause of arrest was dominated by acute myocardial infarction (AMI, 71%), initial rhythm to a lesser degree by ventricular fibrillation/tachycardia (VF/VT, 57%). Almost all patients (n = 33, 94%) experienced return of spontaneous circulation (ROSC) after establishing extracorporeal life support (ECLS). In all 57% patients were successfully weaned from ECLS. Survival to discharge was 31% with predominantly good cerebral performance category (CPC 1-2). Survivors were more likely to receive bystander-CPR (P = 0.03) and the duration of cCPR until initiation of eCPR was significantly shorter (P = 0.004).
CONCLUSIONS:
Our data proves the exceptional level of efficiency of eCPR particularly when Bystander-CPR has been initiated and there is a short duration of cCPR.

2. J Intensive Care Med. 2016 Jun 14. pii: 0885066616654451. [Epub ahead of print]
Temporary Venoarterial Extracorporeal Membrane Oxygenation: Ten-Year Experience at a Cardiac Transplant Center.

Tran BG1, De La Cruz K2, Grant S2, Meltzer J3, Benharash P2, Dave R4, Ardehali A2, Shemin R2, Depasquale E4, Nsair A5.

Abstract

OBJECTIVE:
Advances in extracorporeal membrane oxygenation (ECMO) have enabled rapid deployment in a wide range of clinical settings. We report our experience with venoarterial (VA) ECMO in adult patients over 10 years and aim to identify predictors of mortality.
DESIGN:

This is a retrospective analysis of all adult patients undergoing VA ECMO at a tertiary care center from January 1, 2004, to December 31, 2013.

RESULTS:

A total of 224 consecutive cases were reviewed. Eighty (35.7%) patients survived to discharge and 144 (64.3%) patients died. Patients requiring ECMO for heart transplant graft failure had lower mortality (51.6%) compared to all other etiologies (69.1%; P = .02). Forty-two percent (94 of the 224) of the patients required cardiopulmonary resuscitation (CPR) preceding ECMO and had higher rate of in-hospital mortality (74.5%) compared with patients without cardiac arrest (56.9%; P = .01). Patients with less than 30 minutes of CPR had a mortality rate of 40.0% compared to 91.4% for CPR > 30 minutes (P = .001). In all, 24.1% of patients (54 of the 224) experienced ECMO-associated complications without significant increase in mortality, and 22.3% (50 of the 224) of the patients were transitioned to ventricular assist devices (VADs) or transplant. Patients bridged to a VAD including left ventricular assist devices and biventricular assist devices had a mortality rate of 56.1% versus 22.2% when bridged directly to transplant (P = .01). Paradoxically, patients with an ejection fraction (EF) > 35% had a higher mortality compared to patients with an EF < 35% (75.3% vs 49.4%, respectively, P = .001).

CONCLUSION:

Extracorporeal membrane oxygenation in patients with heart transplant graft failure had the best outcome. In patients who had cardiac arrest, prolonged CPR > 30 minutes was associated with very high mortality. Paradoxically, patients with EF > 35% had a higher mortality than patients with EF < 35%, likely reflecting patients with diastolic heart failure or noncardiac causes necessitating ECMO. For transplant candidates, direct bridge from ECMO to transplant could achieve a very good outcome.

CURES POST

Impact of acute kidney injury on patient outcome in out-of-hospital cardiac arrest: a prospective observational study.
Beitland S1,2, Nakstad ER3, Staer-Jensen H2, Draegni T4, Andersen GØ5, Jacobsen D1,3,6, Brunborg C7, Waldum-Grevbo B1,8, Sunde K1,2.

Abstract

BACKGROUND:

Kidney disease after out-of-hospital cardiac arrest (OHCA) is incompletely described. We examined the occurrence of acute kidney injury (AKI) in OHCA patients and impact of AKI, with or without renal replacement therapy (RRT), on 6-month mortality and neurological outcome.

METHODS:

Prospective study at Oslo University Hospital, Oslo, Norway. Adult resuscitated comatose OHCA patients treated with targeted temperature management at 33°C for 24 h were included. AKI and chronic kidney disease (CKD) were classified according to the Kidney Disease Improving Global Outcomes (KDIGO) guidelines. Main outcomes were 6-month mortality and good neurological outcome defined as Cerebral Performance Category 1-2.

RESULTS:

Among 245 included patients (84% males, mean age 61 years), 11 (4%) had previously known CKD and 112 (46%) developed AKI. Overall 6-month outcome revealed that 112 (46%) died and 123 (50%) had good neurological outcome. Compared with no kidney disease, the presence of AKI was significantly associated with 6-month mortality (odds ratio (OR) 3.17, 95% confidence interval (CI) 1.95-5.43, P < 0.001) and good neurological outcome (OR 0.28, 95% CI 0.16-0.48, P < 0.001). Six-month mortality (50 vs. 61%, P = 0.401) and frequency of good neurological outcome (44 vs. 35%, P = 0.417) were not statistically different in AKI patients with or without RRT, also after excluding patients where RRT was withheld due to futility.

CONCLUSIONS:

Kidney disease occurred in about half of patients successfully resuscitated from OHCA. Presence of AKI, but not RRT, was associated with unfavourable 6-month outcome.

2. AJNR Am J Neuroradiol. 2016 Jun 16. [Epub ahead of print]

Discordant Observation of Brain Injury by MRI and Malignant Electroencephalography Patterns in Comatose Survivors of Cardiac Arrest following Therapeutic Hypothermia.

Mettenburg JM1, Agarwal V2, Baldwin M2, Rittenberger JC2.

Abstract

BACKGROUND AND PURPOSE:

Malignant electroencephalography patterns are considered predictive of poor outcome in comatose survivors of cardiac arrest. We hypothesized that malignant patterns on electroencephalography are associated with evidence of more severe brain injury on MR imaging.

MATERIALS AND METHODS:

Retrospective review of clinical, imaging, and electroencephalography data of 33 adult comatose survivors of cardiac arrest following therapeutic hypothermia was performed. Outcomes measured included discharge destination and survival. Imaging studies were visually scored for severity of brain injury. Mean whole-brain apparent diffusion coefficient and percentage of severely injured brain (ADC < 700 × 10-6 mm2/s) were calculated. Continuous electroencephalographic interpretation was characterized as malignant or nonmalignant. Nonparametric tests were performed to assess the relationship of patient outcome, MR imaging, and electroencephalography patterns.

RESULTS:

Subjects with anatomic evidence of diffuse brain injury were less likely to have malignant electroencephalography patterns. Subjects with malignant electroencephalography patterns, invariably associated with bad outcomes, were observed to have whole-brain apparent diffusion coefficient measures similar to those in subjects with nonmalignant electroencephalography patterns and good outcome and different from those in subjects with nonmalignant electroencephalography patterns and bad outcomes. Regional hippocampal or basal ganglia injury was associated with a bad outcome regardless of electroencephalography findings.

CONCLUSIONS:

We found discordant evidence of brain injury by MR imaging and electroencephalography, refuting our initial hypothesis. Malignant electroencephalography patterns were generally more frequent in subjects with less severe brain injury by MR imaging. These findings suggest a complementary role of MR imaging and electroencephalography and support the aggressive treatment of malignant electroencephalography patterns in this population.

TRAUMA

1. Med Sci Monit. 2016 Jun 13;22:2013-20.

Early-Onset Pneumonia in Non-Traumatic Out-of-Hospital Cardiac Arrest Patients with Special Focus on Prehospital Airway Management.

Christ M1, von Auenmueller KI1, Amirie S1, Sasko BM1, Brand M1, Trappe HJ1.

Abstract

BACKGROUND More than half of all non-traumatic out-of-hospital cardiac arrest (OHCA) patients die in the hospital. Early-onset pneumonia (EOP) has been described as one of the most common complications after successful cardiopulmonary resuscitation. However, the expanded use of alternative airway devices (AAD) might influence the incidence of EOP following OHCA. MATERIAL AND METHODS We analyzed data from all OHCA patients admitted to our hospital between 1 January 2008 and 31 December 2014. EOP was defined as proof of the presence of a pathogenic microorganism in samples of respiratory secretions within the

first 5 days after hospital admission. RESULTS There were 252 patients admitted: 155 men (61.5%) and 97 women (38.5%), with a mean age of 69.1±13.8 years. Of these, 164 patients (77.6%) were admitted with an endotracheal tube (ET) and 62 (27.4%) with an AAD. We found that 36 out of a total of 80 respiratory secretion samples (45.0%) contained pathogenic microorganisms, with Staphylococcus aureus as the most common bacteria. Neither bacterial detection (p=0.765) nor survival rates (p=0.538) differed between patients admitted with ET and those with AAD. CONCLUSIONS Irrespective of increasing use of AAD, the incidence of EOP remains high.

RECERCA EXPERIMENTAL

Return of spontaneous Circulation Is Not Affected by Different Chest Compression Rates Superimposed with Sustained Inflations during Cardiopulmonary Resuscitation in Newborn Piglets.
Li ES1,2, Cheung PY2,3, Lee TF2,3, Lu M2,3, O'Reilly M2,3, Schmölzer GM2,3.
Abstract
OBJECTIVE:
Recently, sustained inflations (SI) during chest compression (CC) have been suggested as an alternative to the current approach during neonatal resuscitation. However, the optimal rate of CC during SI has not yet been established. Our aim was to determine whether different CC rates during SI reduce time to return of spontaneous circulation (ROSC) and improve hemodynamic recovery in newborn piglets with asphyxia-induced bradycardia.
INTERVENTION AND MEASUREMENTS:
Term newborn piglets were anesthetized, intubated, instrumented and exposed to 45-min normocapnic hypoxia followed by asphyxia. Resuscitation was initiated when heart rate decreased to 25% of baseline. Piglets were randomized into three groups: CC superimposed by SI at a rate of 90 CC per minute (SI+CC 90, n = 8), CC superimposed by SI at a rate of 120 CC per minute (SI+CC 120, n = 8), or a sham group (n = 6). Cardiac function, carotid blood flow, cerebral oxygenation and respiratory parameters were continuously recorded throughout the experiment.
MAIN RESULTS:
Both treatment groups had similar time of ROSC, survival rates, hemodynamic and respiratory parameters during cardiopulmonary resuscitation. The hemodynamic recovery in the subsequent 4h was similar in both groups and was only slightly lower than sham-operated piglets at the end of experiment.
CONCLUSION:
Newborn piglets resuscitated by SI+CC 120 did not show a significant advantage in ROSC, survival, and hemodynamic recovery as compared to those piglets resuscitated by SI+CC 90.

CASE REPORT

The need to immobilise the cervical spine during cardiopulmonary resuscitation and electric shock administration in out-of-hospital cardiac arrest.
Desroziers M1, Mole S1, Jost D2, Tourtier JP1.
Abstract
In cases of out-of hospital cardiac arrest (OHCA), falling to the ground can cause brain and neck trauma to the patient. We present a case of a man in his mid-60s who suffered from an OHCA resulting in a violent collapse. The patient received immediate cardiopulmonary resuscitation, but his spine was immobilised only after a large frontal haematoma was found. The

resuscitation efforts resulted in return of spontaneous circulation and discharge from hospital. After this, doctors performed angioplasty, followed by a cardiopulmonary bypass. Later, CT scan examination reported a displaced and unstable fracture of the 6th vertebra without bone marrow involvement. The patient underwent a second operation. 40 days later, he was able to return home without sequela. This case shows the importance of analysing the circumstances of a fall, considering the possibility of two concomitant diagnoses and prioritising investigations and treatment

Use of an Intravascular Heat Exchange Catheter and Intravenous Lipid Emulsion for Hypothermic Cardiac Arrest After Cyclobenzaprine Overdose.
Westrol MS1, Awad NI2, Bridgeman PJ2, Page E3, McCoy JV4, Jeges J4.
Abstract
In this case report, a 22-year-old male developed severe hypothermia after an accidental overdose of cyclobenzaprine. During transport, the patient developed cardiac arrest. He received active rewarming measures, including pleural lavage, gastric lavage, an intravascular heat exchange catheter, and cardiopulmonary bypass. Intravenous lipid emulsion (ILE) was also administered. A discussion of cyclobenzaprine toxicity, hypothermia, ILE, and accidental hypothermic cardiac arrest follows.

RCP MECÀNICA

Quality between mechanical compression on reducible stretcher versus manual compression on standard stretcher in small elevator.
Kim TH1, Hong KJ2, Sang Do S3, Kim CH4, Song SW5, Song KJ6, Ro YS7, Ahn KO8, Jang DB9.
Abstract
OBJECTIVES:
Manual cardiopulmonary resuscitation (CPR) during vertical transport in small elevators using standard stretcher for out-of-hospital cardiac arrest can raise concerns with diminishing quality. Mechanical CPR on a reducible stretcher (RS-CPR) that can be shortened in the length was tested to compare the CPR quality with manual CPR on a standard stretcher (SS-CPR).
METHODS:
A randomized crossover manikin simulation was designed. Three teams of emergency medical technicians were recruited to perform serial CPR simulations using two different protocols (RS-CPR and SS-CPR) according to a randomization; the first 6 minutes of manual CPR at the scene was identical for both scenarios and two different protocols during vertical transport in a small elevator followed on a basis of cross-over assignment. The LUCAS-2 Chest Compression System (Jolife AB, Lund, Sweden) was used for RS-CPR. CPR quality was measured using a resuscitation manikin (Resusci Anne QCPR, Laerdal Medical, Stavanger, Norway) in terms of no flow fraction, compression depth, and rate (median and IQR).
RESULTS:
A total of 42 simulations were analyzed. CPR quality did not differ significantly at the scene. No flow fraction (%) was significantly lower when the stretcher was moving in RS-CPR then SS-CPR (36.0 (33.8-38.7) vs 44.0 (36.8-54.4), P< .01). RS-CPR showed significantly better quality than SS-CPR; 93.2 (50.6-95.6) vs 14.8 (0-20.8) for adequate depth (P< 0.01), and 97.5 (96.6-98.2) vs 68.9(43.4-78.5) for adequate rate (P< .01).
CONCLUSION:

Mechanical CPR on a reducible stretcher during vertical transport showed significant improvement in CPR quality in terms of no-flow fraction, compression depth, and rate compared with manual CPR on a standard stretcher.

DEA

Minimizing pre- and post-shock pauses during the use of an automatic external defibrillator by two different voice prompt protocols. A randomized controlled trial of a bundle of measures.
Beesems SG1, Berdowski J2, Hulleman M2, Blom MT2, Tijssen JG2, Koster RW2.
Abstract
BACKGROUND:
Previous large retrospective analyses have found an association between duration of peri-shock pauses in cardiopulmonary resuscitation (CPR) and survival. In a randomized trial, we tested whether shortening these pauses improves survival after out-of-hospital cardiac arrest (OHCA).
METHODS:
Patients with OHCA between May 2006 and January 2014 with shockable initial rhythm, treated by first responders, were randomized to two automated external defibrillator (AED) treatment protocols. In the control protocol AEDs performed post-shock analysis and prompted rescuers to a pulse check (Guidelines 2000). In the experimental protocol a 15s period of CPR during and after charging of the AED was added to the voice prompts and CPR was resumed immediately after defibrillation (modification of the Guidelines 2005). Survival was assessed at hospital admission and discharge.
RESULTS:
Of 1174 OHCA patients, 456 met the inclusion criteria: 227 were randomly assigned to the experimental protocol and 229 to the control protocol. The experimental group experienced shorter pre-shock pauses (6 [5-11]s vs. 20 [18-23]s; P<0.001), and shorter post-shock pauses (7 [6-9]s vs. 27 [16-34]s; P<0.001). Similar proportions of patients survived to hospital admission (experimental: 62% vs.
CONTROL:
65%; RR [95%CI] 0.96 [0.83-1.10], P=0.51), and hospital discharge (experimental: 42% vs.
CONTROL:
38%; RR [95%CI] 1.09 [0.87-1.37], P=0.46).
CONCLUSION:
In patients with OHCA and shockable initial rhythms, treatment with AEDs with the experimental protocol shortened pre-shock and post-shock CPR pauses, and increased overall CPR time, but did not improve survival to hospital admission or discharge.

REGISTRES I REVISIONS

Improving Survival From Cardiac Arrest: A Review of Contemporary Practice and Challenges.
Jentzer JC1, Clements CM2, Wright RS3, White RD4, Jaffe AS5.
Abstract
Cardiac arrest is a common and lethal condition frequently encountered by emergency medicine providers. Resuscitation of persons after cardiac arrest remains challenging, and outcomes remain poor overall. Successful resuscitation hinges on timely, high-quality cardiopulmonary resuscitation. The optimal method of providing chest compressions and

ventilator support during cardiac arrest remains uncertain. Prompt and effective defibrillation of ventricular arrhythmias is one of the few effective therapies available for treatment of cardiac arrest. Despite numerous studies during several decades, no specific drug delivered during cardiac arrest has been shown to improve neurologically intact survival after cardiac arrest. Extracorporeal circulation can rescue a minority of highly selected patients with refractory cardiac arrest. Current management of pulseless electrical activity is associated with poor outcomes, but it is hoped that a more targeted diagnostic approach based on electrocardiography and bedside cardiac ultrasonography may improve survival. The evolution of postresuscitation care appears to have improved cardiac arrest outcomes in patients who are successfully resuscitated. The initial approach to early stabilization includes standard measures, such as support of pulmonary function, hemodynamic stabilization, and rapid diagnostic assessment. Coronary angiography is often indicated because of the high frequency of unstable coronary artery disease in comatose survivors of cardiac arrest and should be performed early after resuscitation. Optimizing and standardizing our current approach to cardiac arrest resuscitation and postresuscitation care will be essential for developing strategies for improving survival after cardiac arrest.

A text message alert system for trained volunteers improves out-of-hospital cardiac arrest survival.

Pijls RW1, Nelemans PJ2, Rahel BM3, Gorgels AP 4.

Abstract

AIMS:
The survival rate of sudden out-of-hospital cardiac arrests (OHCAs) increases by early notification of Emergency Medical Systems (EMS) and early application of basic life support (BLS) techniques and defibrillation. A Text Message (TM) alert system for trained volunteers in the community was implemented in the Netherlands to reduce response times. The aim of this study was to assess if this system improves survival after OHCA.
METHODS AND RESULTS:
From April 2012 to April 2014 data on all 1546 emergency calls for OHCA in the Dutch province of Limburg were collected according to the Utstein template. On site resuscitation attempts for presumed cardiac arrest were made in 833 cases, of which the TM-alert system was activated in 422 cases. Two cardiopulmonary resuscitation (CPR) scenarios were compared: 1. TM-alert system was activated but no responders attended (n=131), and 2. TM-alert system was activated with attendance of ≥1 responder(s) (n=291). Survival to hospital discharge was 16.0% in scenario 1 and 27.1% in scenario 2 corresponding with OR=1.95 (95% CI 1.15-3.33; P=.014). After adjustment for potential confounders the odds ratio increased (OR=2.82; 95% CI 1.52-5.24; P=.001). Of the 100 survivors, 92% were discharged from the hospital to their home with no or limited neurological sequelae.
CONCLUSION:
The TM-alert system is effective in increasing survival to hospital discharge in OHCA victims and the degree of disability or dependence after survival is low.

Aquests s'han fumat alguna cosa…

Outcome of patients receiving cardiopulmonary resuscitation in the ED of an urban academic hospital.

Chokengarmwong N1, Ortiz LA2, Raja A3, Goldstein JN 3, Huang F4, Yeh DD5.

Abstract

BACKGROUND:

The success of Closed Chest Cardiopulmonary Resuscitation (CC-CPR) degrades with prolonged times. Open Chest CPR (OC-CPR) is an alternative that may lead to superior coronary and cerebral perfusion. It is critical to determine when continued CC-CPR is unlikely to be successful to justify initiating OC-CPR as rescue therapy. The purpose of this study is to review CC-CPR outcomes to define a time threshold for attempting OC-CPR.

METHODS:

We identified all adult non-trauma patients diagnosed with cardiac arrest, ventricular fibrillation, ventricular tachycardia and asystole from 1/1/10-12/31/14. We collected demographics, cardiac rhythm, resuscitation duration, survival to hospital discharge and neurological outcome. Using time to ROSC after ED arrival and good neurological outcome, we explored various times as triggers for attempting OC-CPR.

RESULTS:

Among 242 cases of CPR, 205 cases were out-of-hospital cardiac arrest (OHCA). Mean age was 63.7 (±16.9),woman comprised 29.8% (72/242), and median prehospital CPR time was 30 min (20-44). Patients suffering ED arrest had improved ROSC (54.1% vs. 12.7%, p<0.001) and survival to hospital discharge rates (37.8% vs. 2.9%, p<0.001) compared to OHCA. Patients achieving ROSC had median total CPR duration of 18 minutes (10 minutes of pre-hospital CPR) compared with patients without ROSC who had 45 minutes (30 pre-hospital) respectively. No patient receiving > 10 minutes of CPR in the ED survived to hospital discharge.

CONCLUSION:

In patients suffering OHCA and requiring CC-CPR in the ED, overall survival rate to good neurologic function is low. OC-CPR could potentially be attempted after 10 minutes of CC-CPR in the ED.

EuReCa ONE-27 Nations, ONE Europe, ONE Registry: A prospective one month analysis of out-of-hospital cardiac arrest outcomes in 27 countries in Europe.

Gräsner JT1, Lefering R2, Koster RW3, Masterson S4, Böttiger BW5, Herlitz J6, Wnent J7, Tjelmeland IB8, Ortiz FR9, Maurer H10, Baubin M11, Mols P12, Hadžibegović I13, Ioannides M14, Škulec R15, Wissenberg M16, Salo A17, Hubert H18, Nikolaou NI19, Lóczi G20, Svavarsdóttir H21, Semeraro F22, Wright PJ23, Clarens C24, Pijls R25, Cebula G26, Correia VG27, Cimpoesu D28, Raffay V29, Trenkler S30, Markota A31, Strömsöe A32, Burkart R33, Perkins GD34, Bossaert LL35; EuReCa ONE Collaborators.

Abstract

INTRODUCTION:

The aim of the EuReCa ONE study was to determine the incidence, process, and outcome for out of hospital cardiac arrest (OHCA) throughout Europe.

METHODS:

This was an international, prospective, multi-centre one-month study. Patients who suffered an OHCA during October 2014 who were attended and/or treated by an Emergency Medical Service (EMS) were eligible for inclusion in the study. Data were extracted from national, regional or local registries.

RESULTS:

Data on 10,682 confirmed OHCAs from 248 regions in 27 countries, covering an estimated population of 174 million. In 7146 (66%) cases, CPR was started by a bystander or by the EMS. The incidence of CPR attempts ranged from 19.0 to 104.0 per 100,000 population per year. 1735 had ROSC on arrival at hospital (25.2%), Overall, 662/6414 (10.3%) in all cases with CPR attempted survived for at least 30 days or to hospital discharge.

CONCLUSION:

The results of EuReCa ONE highlight that OHCA is still a major public health problem accounting for a substantial number of deaths in Europe. EuReCa ONE very clearly demonstrates marked differences in the processes for data collection and reported outcomes following OHCA all over Europe. Using these data and analyses, different countries, regions, systems, and concepts can benchmark themselves and may learn from each other to further improve survival following one of our major health care events.

Sex-Based Disparities in Incidence, Treatment, and Outcomes of Cardiac Arrest in the United States, 2003-2012.
Kim LK1, Looser P2, Swaminathan RV2, Horowitz J2, Friedman O3, Shin JH2, Minutello RM2, Bergman G2, Singh H2, Wong SC2, Feldman DN2.
Abstract
BACKGROUND:
Recent studies have shown improving survival after cardiac arrest. However, data regarding sex-based disparities in treatment and outcomes after cardiac arrest are limited.
METHODS AND RESULTS:
We performed a retrospective analysis of all patients suffering cardiac arrest between 2003 and 2012 using the Nationwide Inpatient Sample database. Annual rates of cardiac arrest, rates of utilization of coronary angiography/percutaneous coronary interventions/targeted temperature management, and sex-based outcomes after cardiac arrest were examined. Among a total of 1 436 052 discharge records analyzed for cardiac arrest patients, 45.4% (n=651 745) were females. Women were less likely to present with ventricular tachycardia/ventricular fibrillation arrests compared with men throughout the study period. The annual rates of cardiac arrests have increased from 2003 to 2012 by 14.0% (Ptrend<0.001) and ventricular tachycardia/ventricular fibrillation arrests have increased by 25.9% (Ptrend<0.001). Women were less likely to undergo coronary angiography, percutaneous coronary interventions, or targeted temperature management in both ventricular tachycardia/ventricular fibrillation and pulseless electrical activity/asystole arrests. Over a 10-year study period, there was a significant decrease in in-hospital mortality in women (from 69.1% to 60.9%, Ptrend<0.001) and men (from 67.2% to 58.6%, Ptrend<0.001) after cardiac arrest. In-hospital mortality was significantly higher in women compared with men (64.0% versus 61.4%; adjusted odds ratio 1.02, P<0.001), particularly in the ventricular tachycardia/ventricular fibrillation arrest cohort (49.4% versus 45.6%; adjusted odds ratio 1.11, P<0.001).
CONCLUSIONS:
Women presenting with cardiac arrests are less likely to undergo therapeutic procedures, including coronary angiography, percutaneous coronary interventions, and targeted temperature management. Despite trends in improving survival after cardiac arrest over 10 years, women continue to have higher in-hospital mortality when compared with men.

CENTRAL DE COORDINACIÓ

Effect of introduction of a standardized protocol in dispatcher-assisted cardiopulmonary resuscitation.
Plodr M1, Truhlar A2, Krencikova J3, Praunova M3, Svaba V3, Masek J3, Bejrova D3, Paral J4.
Abstract
BACKGROUND:
The two most commonly used dispatch tools are medical priority dispatch (MPD) and criteria based dispatch (CBD), but there are countries still using non-standardized emergency call

processing. We compared selected characteristics of DA-CPR before and after implementation of a standardized protocol in a non-MPD and non-CBD system.

METHODS:

Observational study of DA-CPR recordings during 4-month periods before (PER1) and after (PER2) the standardized protocol had been implemented. Selected performance characteristics included times to event verification, identification of cardiac arrest, DA-CPR instructions, and first chest compression between PER1 and PER2 were compared. The secondary goal was to compare survival to hospital discharge.

RESULTS:

A total of 152 call recordings with DA-CPR were evaluated in PER1 and 174 in PER2. Median times to cardiac arrest recognition were 46s in PER1 and 37s in PER2 (p=0.002), to first compression 2min 35s in PER1 and 2min 25s in PER2 (p=0.549). Admission to hospital with return of spontaneous circulation (ROSC) was achieved in 39 patients (31.9%) in PER1 and 57 (45.6%) in PER2 (p<0.05), discharge from hospital (CPC 1-2) in 9.1% and 14.4% patients in PER1 and PER2, respectively. If ventricular fibrillation was the initial rhythm, survival rate (CPC 1-2) was 32.3% in PER1 and 38.7% in PER2 (p=0.523).

CONCLUSION:

Implementation of a standardized DA-CPR protocol resulted in faster identification of cardiac arrest, response team dispatching and arrival at scene. These factors were associated with a trend to better survival.

MONITORATGE DE LA RCP

Arterial Blood Gases during and their Dynamic Changes after Cardiopulmonary Resuscitation: A Prospective Clinical Study.

Spindelboeck W1, Gemes G2, Strasser C3, Toescher K3, Kores B3, Metnitz P4, Haas J5, Prause G4.

Abstract

PURPOSE:

An arterial blood gas analysis (ABG) yields important diagnostic information in the management of cardiac arrest. This study evaluated ABG samples obtained during out-of-hospital cardiopulmonary resuscitation (OHCPR) in the setting of a prospective multicenter trial. We aimed to clarify prospectively the ABG characteristics during OHCPR, potential prognostic parameters and the ABG dynamics after return of spontaneous circulation (ROSC).

METHODS:

ABG samples were collected and instantly processed either under ongoing OHCPR performed according to current advanced life support guidelines or immediately after ROSC and data ware entered into a case report form along with standard CPR parameters.

RESULTS:

During a 22-month observation period, 115 patients had an ABG analysis during OHCPR. In samples obtained under ongoing CPR, an acidosis was present in 98% of all cases, but was mostly of mixed hypercapnic and metabolic origin. Hypocapnia was present in only 6% of cases. There was a trend toward higher paO2 values in patients who reached sustained ROSC, and a multivariate regression analysis revealed age, initial rhythm, time from collapse to CPR initiation and the arterio-alveolar CO2 difference (AaDCO2) to be associated with sustained ROSC. ABG samples drawn immediately after ROSC demonstrated higher paO2 and unaltered pH and base excess levels compared with samples collected during ongoing CPR.

CONCLUSIONS:

Our findings suggest that adequate ventilation and oxygenation deserve more research and clinical attention in the management of cardiac arrest and that oxygen uptake improves within

minutes after ROSC. Hyperventilation resulting in arterial hypocapnia is not a major problem during OHCPR.

DESFIBRIL·LADORS IMPLANTABLES

Frequency and Implications of Ischemia Prior to Ventricular Tachyarrhythmia in Patients Treated With a Wearable Cardioverter Defibrillator Following Myocardial Infarction.
Kandzari DE1, Perumal R2, Bhatt DL3.
Abstract
BACKGROUND:
Autopsy studies imply that recurrent myocardial infarction (MI) accounts for the majority of sudden death early after acute MI, rather than primary arrhythmia. However, diagnosis of recurrent MI by autopsy is challenging and excludes electrocardiographic data to adjudicate arrhythmic causes. We examined the frequency of ischemia prior to treated ventricular tachycardia/fibrillation (VT/VF) and outcomes in patients using the wearable cardioverter defibrillator (WCD) following acute MI.
HYPOTHESIS:
Primary arrhythmia, rather than ischemia, is a frequent contributor to sudden death following MI.
METHODS:
All patients treated for VT/VF over a 6-year period while wearing a WCD following acute MI with advanced left ventricular dysfunction (ejection fraction ≤35%) were included. Patients with ST-segment changes ≥0.1 mV before VT/VF were classified ischemic. Demographics and clinical outcomes were compared between those with ischemia-mediated vs primary arrhythmia.
RESULTS:
Among 273 patients fulfilling study criteria, 15.4% had ischemia prior to VT/VF. Clinical and WCD use characteristics did not significantly differ between ischemic and primary VT/VF groups. Termination of VT/VF by WCD treatment approximated 96% in both groups. Survival 24 hours post-treatment was 88% and 84% (P = 0.54) for patients with and without ischemic VT/VF, respectively. Furthermore, 30-day cumulative survival for those with and without ischemic VT/VF was 77% and 70%, respectively (P = 0.57).
CONCLUSIONS:
Ischemia is an infrequent cause of VT/VF following MI, contradicting previous study conclusions that recurrent MI is responsible for most post-MI sudden death. Etiology of VT/VF, however, did not influence defibrillation success or survival, which was high for both groups.

RCP A LES ESCOLES (AL JAPÓ)

Cardiopulmonary Resuscitation Training in Schools: A Comparison of Trainee Satisfaction among Different Age Groups.
Hori S1, Suzuki M, Yamazaki M, Aikawa N, Yamazaki H.
Abstract
Cardiopulmonary resuscitation (CPR) has recently been added to the school curriculum worldwide and is currently taught to students between the ages of 10 and 16 years. The effect of the age of trainees on their satisfaction with CPR training has yet been elucidated. The aim of this study was to compare the satisfaction of trainees of different ages who participated in CPR training in schools in Japan. In total, 392 primary school students (10-11 years old), 1798

junior high school students (12-13 years old), and 4162 high schools students (15-16 years old) underwent the same 3-h course of CPR training, according to the guidelines of 2000 for Emergency Cardiovascular Care and CPR. The course was evaluated by a questionnaire completed by the participants. Primary school students responded most positively to all questions, including those reflecting enjoyment and the confidence of participants to apply CPR (Jonckheere-Terpstra test: P < 0.01). Exploratory factor analysis defined three latent variables (reaction, concentration, and naïveté) based on the seven variables addressed in the questionnaire. In the causal relationships analyzed by structural equation modeling (SEM), naïveté (which is related to age) directly affected the other latent variables. The current model suggested that the students' satisfaction with CPR training was strongly related to their age. Primary school students enjoyed CPR training more and were more confident in their ability to perform CPR than junior high and high school students were. Therefore, children aged 10-11 years may be the most appropriate candidates for the introduction of CPR training in schools.

PEDIATRIA

The epidemiology and outcomes of pediatric in-hospital cardiopulmonary arrest in the United States during 1997 to 2012.
Martinez PA1, Totapally BR2.
Abstract
OBJECTIVE:
Evaluate the trends in the incidence of in-hospital cardiopulmonary arrest (IHCA) and the associated mortality rate in children during 1997 to 2012.
DESIGN:
Retrospective cohort study using the Kids' Inpatient Database (KID).
METHODS:
Demographic and outcome data on children under 18 years of age with and without IHCA were extracted from the KID 1997 through 2012. ICD-9 procedure codes 99.60 or 99.63 were used to define IHCA. Chi-square, Chi-square for trend, and independent Student's t-test were used to analyze the data.
RESULTS:
A total of 29,577 discharges with IHCA were identified. The overall incidence of pediatric IHCA was 0.78/1000 discharges with a mortality rate of 46%. The incidence of pediatric IHCA increased significantly from 0.57 in 1997 to 1.01 in 2012 (p<0.05). The mortality rate after IHCA decreased significantly from 51% in 1997 to 40% in 2012 (p<0.05). The incidence of IHCA was significantly higher for males, infants, black children, children from metropolitan regions and children from lower median household income regions (p<0.05). The mortality rate was significantly higher for teenagers, black children, Hispanic children and children from metropolitan regions (p<0.05).
CONCLUSION:
The incidence of pediatric IHCA in the United States has increased from 1997 to 2012 while the mortality has decreased. The incidence of IHCA is higher among males, infants, black children, children from metropolitan regions and children from lower household income regions. The mortality after IHCA is higher among teenagers, black children, Hispanic children and children from metropolitan regions.

ECMO

In-Hospital Neurologic Complications in Adult Patients Undergoing Venoarterial Extracorporeal Membrane Oxygenation: Results From the Extracorporeal Life Support Organization Registry.

Lorusso R1, Barili F, Mauro MD, Gelsomino S, Parise O, Rycus PT, Maessen J, Mueller T, Muellenbach R, Belohlavek J, Peek G, Combes A, Frenckner B, Pesenti A, Thiagarajan RR.

Abstract

OBJECTIVES:

To elucidate the epidemiology, complication profiles, hospital outcome, and predisposing factors of CNS complications occurring during venoarterial extracorporeal membrane oxygenation in adults.

DESIGN:

Retrospective analysis of the Extracorporeal Life Support Organization registry.

SETTING:

Data reported to Extracorporeal Life Support Organization by 230 extracorporeal membrane oxygenation centers from 1992 to 2013.

PATIENTS:

Patients more than 16 years old supported with a single-run of venoarterial extracorporeal membrane oxygenation.

INTERVENTIONS:

None.

MEASUREMENTS AND MAIN RESULTS:

We examined 4,522 adult patients supported with venoarterial extracorporeal membrane oxygenation and included in the Extracorporeal Life Support Organization registry. Venoarterial extracorporeal membrane oxygenation was used for cardiac dysfunction in 3,005 patients (66.5%), cardiopulmonary resuscitation in 877 patients (19.4%), and respiratory failure in 640 patients (14.1%), respectively. Multivariate logistic regression was performed to identify factors independently associated with CNS injury. Neurologic complications occurred in 682 patients (15.1%), and included brain death in 358 patients (7.9%), cerebral infarction in 161 patients (3.6%), seizures in 83 patients (1.8%), and cerebral hemorrhage in 80 patients (1.8%). Multiple CNS complications in the same patient occurred in 70 cases. Hospital mortality in patients with CNS complications was 89%, compared with 57% in patients without (p < 0.001). In a multivariable model, age, pre-extracorporeal membrane oxygenation cardiac arrest, the use of inotropes on extracorporeal membrane oxygenation, and post-extracorporeal membrane oxygenation hypoglycemia were shown to be associated with CNS complications.

CONCLUSIONS:

Neurologic complications in adult patients on venoarterial extracorporeal membrane oxygenation support are common and associated with poor survival. Further research should focus on better understanding and management of brain/extracorporeal membrane oxygenation interaction to avoid such catastrophic complications.

Emergency physician-performed transesophageal echocardiography for extracorporeal life support vascular cannula placement.

Fair J1, Tonna J1, Galovic B1, Youngquist S1, McKellar SH1, Mallin M1.

Abstract

INTRODUCTION:

There is growing interest and application of extracorporeal membrane oxygenation (ECMO) as a life-saving procedure for out-of-hospital cardiac arrest (OHCA), also called extracorporeal life support (ECLS). Extracorporeal membrane oxygenation cannulation with ongoing chest

compressions is challenging, and transesophageal echocardiography (TEE) is an invaluable tool with which to guide ECMO wire guidance and cannula positioning.

METHODS:

We describe our protocol for TEE guidance by emergency physicians in our hospital.

RESULTS:

Of our first 12 cases of ECLS, 10 have had TEE guidance by an emergency physician with successful placement and without complication or need for repositioning. Emergency physician-performed TEE for ECLS vascular cannula placement has been both feasible and useful in our experience and warrants further study.

CASE REPORT

Salbutamol Abuse is Associated with Ventricular Fibrillation.
Uysal E1, Solak S1, Carus M1, Uzun N1, Cevik E2.
Abstract
Salbutamol-induced cardiac complications are well-established. Herein, we describe a case of a 24-year female who was admitted to the emergency department because of a suicide attempt with salbutamol (76 mg). Salbutamol abuse induced the development of supraventricular tachycardia and ventricular fibrillation. Regular sinus rhythm was restored with defibrillation. The hypokalemic patient who stayed in the intensive care unit was discharged after 48 hours of hospitalization.

RCP MECÀNICA

Does the use of a chest compression system in children improve the effectiveness of chest compressions? A randomized crossover simulation pilot study.
Szarpak Ł1, Truszewski Z, Smereka J, Czyżewski Ł.
Abstract
BACKGROUND:

Providing high-quality chest compressions is a key element affecting the effectiveness of cardiopulmonary resuscitation (CPR).

AIM:

To evaluate the effectiveness of standard (manual) chest compressions (Standard BLS, standard basic life support) and those performed with the use of the Lifeline ARM chest compression system (ARM; Defibtech).

METHODS:

The study was designed as a randomized crossover study. In total, 37 nurses participated in the study. They performed a randomized 2-minute asynchronous resuscitation using the Standard BLS method or the ARM system. The following parameters were measured: the total number of chest compressions, the frequency of compressions (min-1), compression depth (mm), and the percentage of correctly performed chest compressions and total chest decompressions. The authors also analysed the participants' preferences concerning the use of particular CPR techniques in the clinical setting.

RESULTS:

The results obtained during the simulation study with the application of the ARM system were statistically significantly better than those with the Standard BLS method (p < 0.05) in the case of all analysed parameters.
CONCLUSIONS:
During the simulated child resuscitation performed by the nurses, the application of the Lifeline ARM chest compression system significantly improved the effectiveness of chest compressions.

REGISTRES, REVISIONS I EDITORIALS

Relation of Obesity to Survival After In-Hospital Cardiac Arrest.
Gupta T1, Kolte D2, Mohananey D3, Khera S1, Goel K4, Mondal P1, Aronow WS5, Jain D1, Cooper HA1, Iwai S1, Frishman WH1, Bhatt DL6, Fonarow GC7, Panza JA1.
Abstract
Previous studies have shown that obesity is paradoxically associated with improved outcomes in many cardiovascular (CV) disease states; however, whether obesity affects survival after in-hospital cardiac arrest (IHCA) has not been well examined. We queried the 2003 to 2011 Nationwide Inpatient Sample databases to identify all patients aged ≥18 years who underwent cardiopulmonary resuscitation for IHCA. Obese patients were identified using the co-morbidity variable for obesity, as defined in Nationwide Inpatient Sample databases. Survival to hospital discharge was compared between obese and nonobese patients using multivariate regression models. Of 836,289 patients with IHCA, 67,216 (8.0%) were obese. Obese patients were younger and more likely to be women compared with nonobese patients. Despite being younger, obese patients had significantly higher prevalence of most CV co-morbidities such as dyslipidemia, coronary artery disease, previous myocardial infarction, heart failure, diabetes mellitus, hypertension, peripheral vascular disease, and chronic renal failure (p <0.001 for all). Obese patients were more likely to have ventricular tachycardia or ventricular fibrillation as the initial cardiac arrest rhythm (22.3% vs 20.9%; p <0.001). After multivariate risk adjustment, obese patients had improved survival to hospital discharge compared with nonobese patients (31.4% vs 24.1%; unadjusted odds ratio 1.44, 95% CI 1.42 to 1.47, p <0.001; adjusted odds ratio 1.15, 95% CI 1.13 to 1.17, p <0.001). Similar results were seen in patients with CV or non-CV conditions as the primary diagnosis and in those with ventricular tachycardia/ventricular fibrillation or pulseless electrical activity/asystole as the cardiac arrest rhythm. In conclusion, this large retrospective analysis of a nationwide cohort of patients with IHCA demonstrated higher risk-adjusted odds of survival in obese patients, consistent with an "obesity paradox."

Increasing survival after admission to UK critical care units following cardiopulmonary resuscitation.
Nolan JP1,2, Ferrando P3, Soar J4, Benger J5, Thomas M6, Harrison DA3, Perkins GD7,8.
Abstract
BACKGROUND:
In recent years there have been many developments in post-resuscitation care. We have investigated trends in patient characteristics and outcome following admission to UK critical care units following cardiopulmonary resuscitation (CPR) for the period 2004-2014. Our hypothesis is that there has been a reduction in risk-adjusted mortality during this period.
METHODS:
We undertook a prospectively defined, retrospective analysis of the Intensive Care National Audit & Research Centre (ICNARC) Case Mix Programme Database (CMPD) for the period 1 January 2004 to 31 December 2014. Admissions, mechanically ventilated in the first 24 hours

in the critical care unit and admitted following CPR, defined as the delivery of chest compressions in the 24 hours before admission, were identified. Case mix, withdrawal, outcome and activity were described annually for all admissions identified as post-cardiac arrest admissions, and separately for out-of-hospital cardiac arrest and in-hospital cardiac arrest. To assess whether in-hospital mortality had improved over time, hierarchical multivariate logistic regression models were constructed, with in-hospital mortality as the dependent variable, year of admission as the main exposure variable and intensive care unit (ICU) as a random effect. All analyses were repeated using only the data from those ICUs contributing data throughout the study period.

RESULTS:

During the period 2004-2014 survivors of cardiac arrest accounted for an increasing proportion of mechanically ventilated admissions to ICUs in the ICNARC CMPD (9.0 % in 2004 increasing to 12.2 % in 2014). Risk-adjusted hospital mortality following admission to ICU after cardiac arrest has decreased significantly during this period (OR 0.96 per year). Over this time, the ICU length of stay and time to treatment withdrawal has increased significantly. Re-analysis including only those 116 ICUs contributing data throughout the study period confirmed all the results of the primary analysis.

CONCLUSIONS:

Risk-adjusted hospital mortality following admission to ICU after cardiac arrest has decreased significantly during the period 2004-2014. Over the same period the ICU length of stay and time to treatment withdrawal has increased significantly.

Disparities in Survival with Bystander CPR following Cardiopulmonary Arrest Based on Neighborhood Characteristics.

Rivera NT1, Kumar SL2, Bhandari RK3, Kumar SD4.

Abstract

The American Heart Association reports the annual incidence of out-of-hospital cardiopulmonary arrests (OHCA) is greater than 300,000 with a survival rate of 9.5%. Bystander cardiopulmonary resuscitation (CPR) saves one life for every 30, with a 10% decrease in survival associated with every minute of delay in CPR initiation. Bystander CPR and training vary widely by region. We conducted a retrospective study of 320 persons who suffered OHCA in South Florida over 25 months. Increased survival, overall and with bystander CPR, was seen with increasing income (p = 0.05), with a stronger disparity between low- and high-income neighborhoods (p = 0.01 and p = 0.03, resp.). Survival with bystander CPR was statistically greater in white- versus black-predominant neighborhoods (p = 0.04). Increased survival, overall and with bystander CPR, was seen with high- versus low-education neighborhoods (p = 0.03). Neighborhoods with more high school age persons displayed the lowest survival. We discovered a significant disparity in OHCA survival within neighborhoods of low-income, black-predominance, and low-education. Reduced survival was seen in neighborhoods with larger populations of high school students. This group is a potential target for training, and instruction can conceivably change survival outcomes in these neighborhoods, closing the gap, thus improving survival for all.

Impact of Hospital Teaching Status on Mortality, Length of Stay and Cost Among Patients With Cardiac Arrest in the United States.

Dolmatova EV1, Moazzami K1, Klapholz M2, Kothari N1, Feurdean M1, Waller AH3.

Abstract

Limited data exist regarding the in-hospital outcomes in patients with cardiac arrest (CA) in teaching versus nonteaching hospital settings. Using the Nationwide (National) Inpatient

Sample (2008 to 2012), 731,107 cases of CA were identified using International Classification of Diseases, Ninth Edition codes. Among these patients, 348,368 (47.6%) were managed in teaching hospitals and 376,035 (51.4%) in nonteaching hospitals. Patients in teaching hospitals with CA were younger (62.42 vs 68.08 years old), had less co-morbidities (p <0.001), were less likely to be white (54.6% vs 65.5%) and more likely to be uninsured (9.1% vs 7.6%). Mortality in patients with CA was significantly lower in teaching hospitals than in nonteaching hospitals (55.3% vs 58.8%; all p <0.001). The mortality remained significantly lower after adjusting for baseline patient and hospital characteristics (odds ratio 0.917, CI 0.899 to 0.937, p <0.001). However, the survival benefit was no longer present after adjusting for in-hospital procedures (OR 0.997, CI 0.974 to 1.02, p = 0.779). In conclusion, teaching status of the hospital was associated with decreased in-hospital mortality in patients with CA. The differences in mortality disappeared after adjusting for in-hospital procedures, indicating that routine application of novel therapeutic methods in patients with CA in teaching hospitals could translate into improved survival outcomes.

Cardiovascular emergencies and cardiac arrest in a pregnant woman.
Ducloy-Bouthors AS1, Gonzalez-Estevez M2, Constans B2, Turbelin A2, Barre-Drouard C2.
Abstract
Points essentiels Any dyspnoea, chest pain, syncope or collapsus must alert women health care providers to engage rapidly the diagnosis process and emergent treatment of the cardio-circulatory failure. The larger competence of the obstetric anaesthetists to perform echographic diagnosis at the parturient bedside helps to a more rapid management than previously. Symptomatic and etiologic treatments must be applied without delay induced by the pregnant status and obstetrical manoeuvres. Haemodynamic management must be guided by a strict continuous monitoring. Non-invasive cardiac output monitoring is now available to allow this follow-up. Cardiac arrest (CA) management in a pregnant woman is based on: Oxygenation, intubation, ventilation, cardiac massage accompanied by left uterus displacement to increase right ventricular preload, intravenous epinephrine and electrical cardioversion changing palette axis to avoid the foetus, Caesarean section within 4minutes if CA persists. Cardiac arrest is a good indication for Extracorporeal Cardiac Life Support, especially in amniotic fluid embolism. ECLS is also indicated in severe failures if symptomatic and aetiologic treatments are inefficient: peripartum cardiomyopathy, acute respiratory distress syndrome, valvular decompensation. Massive pulmonary embolism needs urgent thrombolytic treatment, which timing to delivery must be considered. Type A aortic dissection and valvular ruptures are surgical emergencies. Hypertensive emergencies require an immediate intravenous treatment. Multidisciplinary management should be the rule for any cardiovascular emergency in a pregnant woman or immediate post-partum. Because of the rarity of this event, team training including simulation should be performed in each obstetric unit.

FV I DESFIBRIL·LACIÓ

The Effects of Shock from Defibrillation Threshold Testing on Cardiac Systolic and Diastolic Function.
Kodani T1, Mine T1, Kishima H1, Masuyama T1.
Abstract
INTRODUCTION:

Inappropriate implantable cardioveter-defibrillator (ICD) shocks are associated with increased overall mortality. However, it remains unclear whether shocks from defibrillation threshold (DFT) testing directly impair cardiac function.

METHODS:

DFT testing was performed in 34 patients who underwent ICD/cardiac resynchronization therapy with a defibrillator (CRT-D) implantation/generator exchange. Heart rate and cardiac function, including left ventricular systolic pressure (LVSP), LV end-diastolic pressure (LVEDP), peak positive and negative dp/dt (+dp/dt and -dp/dt, respectively) of LV pressure and the tau index, were assessed with a Mikro-Cath™ diagnostic pressure catheter. These parameters were measured before and 1, 3, 5, 10, and 15 minutes after DFT testing.

RESULTS:

Peak positive dp/dt increased over baseline at each interval (976 ± 229 vs. 1039 ± 258, 1049 ± 245, 1042 ± 247, 1037 ± 259, and 1034 ± 254 mmHg/s, respectively; $P < 0.01$). Furthermore, peak negative dp/dt (-1140 ± 397 vs. -1185 ± 447, 1193 ± 435, -1195 ± 434, -1189 ± 449, and -1186 ± 459 mmHg/s, respectively; $P < 0.01$) and the tau index (65.1 ± 18.5 vs. 62.5 ± 16.8* , 62.4 ± 15.9§ , 63.0 ± 16.8* , 62.8 ± 18.7* , respectively; * $P < 0.05$, § $P < 0.01$) decreased compared to those at baseline at each interval.

CONCLUSION:

Shock after defibrillation threshold testing improved left ventricular systolic and diastolic function immediately, especially in patients with preserved left ventricular ejection fraction.

Expanding the first link in the chain of survival-Experiences from dispatcher referral of callers to AED locations.

Fredman D1, Svensson L2, Ban Y3, Jonsson M2, Hollenberg J2, Nordberg P2, Ringh M2, Rosenqvist M4, Lundén M5, Claesson A2 .

Abstract

INTRODUCTION:

Early use of automated external defibrillators (AED) increases survival in cases of out-of-hospital cardiac arrest (OHCA). Dispatchers play important roles in identifying OHCA, dispatching ambulances and providing callers with telephone-assisted cardiopulmonary resuscitation. Guidelines recommend that AED registries be linked to dispatch centres as tools to refer callers to nearby AED.

AIM:

The aim of this study was to investigate to what extent dispatchers, when provided with a tool to display AED locations and accessibility, referred callers to nearby AED.

METHODS:

An application providing real-time visualization of AED locations and accessibility was implemented at four dispatch centres in Sweden. Dispatchers were instructed to refer callers to nearby AED when OHCA was suspected. Such cases were prospectively collected, and geographic information systems were used to identify those located ≤100m from an AED. Audio recordings of emergency calls were assessed to evaluate the AED referral rate.

RESULTS:

Between February and August 2014, 3,009 suspected OHCA calls were received. In 6.6% of those calls (200/3009), an AED was ≤100m from the suspected OHCA. The AED was accessible and the caller was not alone on scene in 24% (47/200) of these cases. In two of those 47 cases (4.3%), the dispatcher referred the caller to the AED.

CONCLUSION:

Despite a tool for dispatchers to refer callers to a nearby AED, referral was rare. Only a minority of the suspected OHCA cases occurred ≤100m from an AED. We identified AED accessibility and callers being alone on scene as obstacles for AED referral.

Public-access AED pad application and outcomes for out-of-hospital cardiac arrests in Osaka, Japan.
Kiyohara K1, Kitamura T2, Sakai T3, Nishiyama C 4, Nishiuchi T5, Hayashi Y6, Sakamoto T7, Marukawa S8, Iwami T9.

Abstract
BACKGROUND:
Actual application of public-access automated external defibrillator (AED) pads to patients with an out-of-hospital cardiac arrest (OHCA) by the public has been poorly investigated.
METHODS:
AED applications, prehospital characteristics, and one-month outcomes of OHCAs occurring in Osaka Prefecture from 2011 to 2012 were obtained from the Utstein Osaka Project registry. Patients with a non-traumatic OHCA occurring before emergency medical service attendance were enrolled. The proportion of AED pads that were applied to the patients' chests by the public and one-month outcomes were analysed according to the location of OHCA.
RESULTS:
In total, public-access AED pads were applied to 3.5% of OHCA patients (351/9978) during the study period. In the multivariate analyses, OHCAs that occurred in public places and received bystander-initiated cardiopulmonary resuscitation were associated with significantly higher application of public-access AEDs. Among the patients for whom public-access AED pads were applied, 29.6% (104/351) received public-access defibrillation. One-month survival with a favourable neurological outcome was significantly higher among patients who had an AED applied compared to those who did not (19.4% vs. 3.0%; OR: 2.76 [95% CI: 1.92-3.97]).
CONCLUSION:
The application of public-access AEDs leads to favourable outcomes after an OHCA, but utilisation of available equipment remains insufficient, and varies considerably according to the location of the OHCA event. Alongside disseminating public-access AEDs, further strategic approaches for the deployment of AEDs at the scene, as well as basic life support training for the public are required to improve survival rates after OHCAs.

TRAUMA

Resuscitative endovascular balloon occlusion of the aorta (REBOA) in the pre-hospital setting: An additional resuscitation option for uncontrolled catastrophic haemorrhage.
Sadek S1, Lockey DJ2, Lendrum R2, Perkins Z2, Price J2, Davies GE2.

Abstract
This report describes the first use of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) in the pre-hospital setting to control catastrophic haemorrhage. The patient, who had fallen 15 meters, suffered catastrophic internal haemorrhage associated with a pelvic fracture. He was treated by London's Air Ambulance's Physician-Paramedic team. This included insertion of a REBOA balloon catheter at the scene to control likely fatal exsanguination. The patient survived transfer to hospital, emergency angio-embolisation and subsequent surgery. He was discharged neurologically normal after 52 days and went on to make a full recovery. The poor prognosis in catastrophic torso haemorrhage and novel endovascular methods of haemorrhage control are discussed. Also the challenges of Pre-Hospital REBOA are discussed together with the training and governance required for a safe system.

TARGET TEMEPERATURE MANAGEMENT

Predictors of death among cardiac arrest patients after therapeutic hypothermia: A non-tertiary care center's initial experience.

[Article in English, Portuguese]

Ruivo C1, Jesus C2, Morais J3, Viana P2.

Abstract

INTRODUCTION AND OBJECTIVES:

Therapeutic hypothermia (TH) is recommended for patients with return of spontaneous circulation (ROSC) after cardiac arrest (CA). There is still uncertainty about management, target temperature and duration of TH. In the present study we aim to describe the initial experience of a non-tertiary care center with TH after CA and to determine predictors of mortality.

METHODS:

During the period 2011-2014, out of 2279 patients hospitalized in the intensive care unit, 82 had a diagnosis of CA with ROSC. We determined predictors of mortality and neurological outcome in comatose patients with ROSC after CA treated by TH.

RESULTS:

A total of 15 patients were included, mean age 47.3±14 years, 10 (67.0%) male. CA occurred out-of-hospital (n=11; 73.3%) or in-hospital (n=4; 26.7%), in initial shockable (n=10; 66.7%) or non-shockable (n=5, 33.3%) rhythm. The mean time from CA to ROSC (CA-ROSC) was 44.7±36.5 min. All patients met the 24-hour TH target temperature of 33°C. The mean neuron-specific enolase (NSE) level was 93.7±109.0 µg/l. Seven patients (46.7%) were discharged with good cerebral performance and eight (53.3%) died. Patients who survived had lower median age (p=0.032), shorter CA-ROSC (p=0.048), lower NSE levels (p=0.020) and initial ventricular fibrillation rhythm (p=NS).

CONCLUSIONS:

The effectiveness of TH appears to be related to younger age, shockable initial rhythm and shorter CA-ROSC time. This results indicates some lines of inquiry that should be developed in appropriate prospective studies. The role of biomarkers as predictors of prognosis is an open question, with NSE potentially playing an important role.

Comorbidity burden is not associated with higher mortality after out-of-hospital cardiac arrest.

Winther-Jensen M1, Kjaergaard J1, Nielsen N2, Kuiper M3, Friberg H4, Søholm H1, Hartvig Thomsen J1, Frydland M1, Hassager C1.

Abstract

OBJECTIVES:

We investigated whether comorbidity burden of comatose survivors of out-of-hospital cardiac arrest (OHCA) affects outcome and if comorbidity modifies the effect of target temperature management (TTM) on final outcome.

DESIGN:

The TTM trial randomized 939 patients to 24 hours of TTM at either 33°C or 36°C with no difference regarding mortality and neurological outcome. This post-hoc study of the TTM-trial formed a modified Comorbidity Index (mCI), based on available comorbidities from the Charlson Comorbidity index.

RESULTS:

Bystander CPR decreased with higher comorbidity group, p = 0.01. Comorbidity groups were univariately associated with higher mortality compared to mCI0 (HRmCI1:1.55, CI: 1.25-1.93, p < 0.001, HRmCI2:2.01, CI:1.55-2.62, p < 0.001, HRmCI≥32.16, CI:1.57-2.97, p < 0.001). When

adjusting for confounders there was a consistent, nonsignificant association between level of comorbidity and mortality (HRmC11:1.17, CI: 0.92-1.48, p = 0.21, HRmCI2: 1.28, CI:0.96-1.71, p = 0.10, HRmCI≥31.37, CI:0.97-1.95, p = 0.08). There was no interaction between comorbidity burden and level of TTM on outcome, p = 0.61.
CONCLUSION:
Comorbidity burden was associated with higher mortality following OHCA, but when adjusting for confounders, the influence was no longer significant. The association between mCI and mortality was not modified by TTM. Comorbidity burden is associated with lower rates of bystander cardiopulmonary resuscitation after out-of-hospital cardiac arrest.

CURES POST-RCP

The Association Between Arterial Oxygen Tension and Neurological Outcome After Cardiac Arrest.
Johnson NJ1, Dodampahala K2, Rosselot B2,3, Perman SM4, Mikkelsen ME5, Goyal M6, Gaieski DF7, Grossestreuer AV8.

Abstract
A number of observational studies have evaluated the association between arterial oxygen tensions and outcome after cardiac arrest with variable results. The objective of this study is to determine the association between arterial oxygen tension and neurological outcome after cardiac arrest. A retrospective cohort analysis was performed using the Penn Alliance for Therapeutic Hypothermia registry. Adult patients who experienced return of spontaneous circulation after in-hospital or out-of-hospital cardiac arrest (OHCA) and had a partial pressure of arterial oxygen (PaO2) recorded within 48 hours were included. Our primary exposure of interest was PaO2. Hyperoxemia was defined as PaO2 > 300 mmHg, hypoxemia as PaO2 < 60 mmHg, and optimal oxygenation as PaO2 60-300 mmHg. The primary outcome was neurological function at hospital discharge among survivors, as described by the cerebral performance category (CPC) score, dichotomized into "favorable" (CPCs 1-2) and "unfavorable" (CPCs 3-5). Secondary outcomes included in-hospital mortality. A total of 544 patients from 13 institutions were included. Average age was 61 years, 56% were male, and 51% were white. A total of 64% experienced OHCA, 81% of arrests were witnessed, and pulseless electrical activity was the most common initial rhythm (40%). More than 72% of the patients had cardiac etiology for their arrests, and 55% underwent targeted temperature management. A total of 38% of patients survived to hospital discharge. There was no significant association between PaO2 at any time interval and neurological outcome at hospital discharge. Hyperoxemia at 12 hours after cardiac arrest was associated with decreased odds of survival (OR 0.17 [0.03-0.89], p = 0.032). There was no significant association between arterial oxygen tension measured within the first 48 hours after cardiac arrest and neurological outcome.

PEDIATRIA

Atrial Thrombus in a Premature Newborn Following Cardio-Pulmonary Resuscitation.
Ali SR1, Ahmed S1, Aslam N1, Lohana H1.

Abstract
Critically ill newborns, whether term or preterm, are at great risk for developing symptomatic thromboembolic disease. Comorbidities like inflammation, DIC, fluctuations in cardiac output, congenital heart disease, as well as central venous or arterial catheters, are the predisposing risk factors. Clinically symptomatic or asymptomatic cases are usually picked up by echocardiography, usually done for other indications. Management usually comprises of observation, heparin therapy, thrombo-embolectomy, and catheter directed revascularization.

We present a case of premature neonate who developed thrombus at inter-atrial septum as a possible consequence of cardiopulmonary resuscitation, detected by echocardiography. Conversely, there is always a possibility of paradoxical emboli in neonates with patent foramen ovale (PFO). Subsequent clinical course remained asymptomatic and baby was discharged home after 6 weeks with cardiac follow-up. Atrial septal findings of organized clot/thrombus in asymptomatic newborns need to be correlated with the details of neonatal care. Long-term follow-up is dependent on underlying pathology.

Evaluating the influence of ventilation and ventilation-compression synchronization on chest compression force and depth during simulated neonatal resuscitation.
Dellimore KH1, Scheffer C1, Smith J2, Van Den Heever DJ1, Lloyd DL1.
Abstract

OBJECTIVES:
To investigate the influence of ventilation and ventilation-compression synchronization on compression force and sternal displacement during simulated neonatal cardiopulmonary resuscitation (NCPR) on an infant manikin.
METHODS:
Five Neonatal Resuscitation Program trained clinicians were recruited to perform simulated NCPR on an infant manikin using Two-Finger (TF) and Two-Thumb (TT) compression, with synchronous and asynchronous ventilation, as well as without ventilation. The sternal displacement and force were recorded and analyzed.
RESULTS:
Synchronous ventilation and compression yielded sternal displacements and forces in the range of 22.8-32.4 mm and 15.0-29.8 N, respectively, while asynchronous ventilation and compression produced depths and forces in the range of 21.2-32.4 mm and 14.0-28.8 N, respectively.
CONCLUSIONS:
Ventilation exerts a significant influence on sternal displacement and force during simulated NCPR, regardless of the compression method used. Ventilation-compression synchronization, however, is only significant during TF compression with lower compression forces measured during synchronous ventilation than in asynchronous ventilation. This occurs for two reasons: i) the strong influence of ventilation forces on the lower magnitude compression forces produced during TF compression relative to TT compression, and (ii) in asynchronous ventilation, compression and ventilation may occur simultaneously, with inflation and deflation providing an opposing force to the applied compression force.

ENSENYAMENT

The effect of peer-group size on the delivery of feedback in basic life support refresher training: a cluster randomized controlled trial.
Cho Y1, Je S2, Yoon YS3, Roh HR4, Chang C5,6, Kang H7, Lim T7.
Abstract

BACKGROUND:
Students are largely providing feedback to one another when instructor facilitates peer feedback rather than teaching in group training. The number of students in a group affect the learning of students in the group training. We aimed to investigate whether a larger group size increases students' test scores on a post-training test with peer feedback facilitated by instructor after video-guided basic life support (BLS) refresher training. Students' one-rescuer adult BLS skills were assessed by a 2-min checklist-based test 1 year after the initial training.
METHODS:

A cluster randomized controlled trial was conducted to evaluate the effect of student number in a group on BLS refresher training. Participants included 115 final-year medical students undergoing their emergency medicine clerkship. The median number of students was 8 in the large groups and 4 in the standard group. The primary outcome was to examine group differences in post-training test scores after video-guided BLS training. Secondary outcomes included the feedback time, number of feedback topics, and results of end-of-training evaluation questionnaires.

RESULTS:

Scores on the post-training test increased over three consecutive tests with instructor-led peer feedback, but not differ between large and standard groups. The feedback time was longer and number of feedback topics generated by students were higher in standard groups compared to large groups on the first and second tests. The end-of-training questionnaire revealed that the students in large groups preferred the smaller group size compared to their actual group size.

CONCLUSIONS:

In this BLS refresher training, the instructor-led group feedback increased the test score after tutorial video-guided BLS learning, irrespective of the group size. A smaller group size allowed more participations in peer feedback.

EXPERIMENTAL

Reduction of Serious Adverse Events Demanding Study Exclusion in Model Development: Extracorporeal Life Support Resuscitation of Ventricular Fibrillation Cardiac Arrest in Rats.
Warenits AM1, Sterz F, Schober A, Ettl F, Magnet IA, Högler S, Teubenbacher U, Grassmann D, Wagner M, Janata A, Weihs W.

Abstract

Extracorporeal life support is a promising concept for selected patients in refractory cardiogenic shock and for advanced life support of persistent ventricular fibrillation cardiac arrest. Animal models of ventricular fibrillation cardiac arrest could help to investigate new treatment strategies for successful resuscitation. Associated procedural pitfalls in establishing a rat model of extracorporeal life support resuscitation need to be replaced, refined, reduced and reported.Anesthetized male Sprague-Dawley rats (350-600 g), (n = 126), underwent cardiac arrest induced with a pacing catheter placed into the right ventricle via a jugular cannula. Rats were resuscitated with extracorporeal life support, mechanical ventilation, defibrillation and medication. Catheter and cannula explantation was performed if restoration of spontaneous circulation was achieved. All observed serious adverse events (SAEs) occurring in each of the experimental phases were analyzed.Restoration of spontaneous circulation could be achieved in 68/126 rats (54%); SAEs were observed in 76 (60%) experiments. Experimental procedures related SAEs were 62 (82%) and avoidable human errors were 14 (18%). The most common serious adverse events were caused by insertion or explantation of the venous bypass cannula and resulted in lethal bleeding, cannula dislocation or air embolism. Establishing an extracorporeal life support model in rats has confronted us with technical challenges. Even advancements in small animal critical care management over the years delivered by an experienced team and technical modifications were not able to totally avoid such serious adverse events. Replacement, refinement and reduction reports of serious adverse events demanding study exclusions to avoid animal resources are missing and are presented hereby.

Cardiopulmonary responses during the cooling and the extracorporeal life support rewarming phases in a porcine model of accidental deep hypothermic cardiac arrest.

Debaty G1,2, Maignan M3, Perrin B4, Brouta A 4, Guergour D5, Trocme C5, Bach V6, Tanguy S4, Briot R3,4.

Abstract

BACKGROUND:

This study aimed to assess cardiac and pulmonary pathophysiological responses during cooling and extracorporeal life support (ECLS) rewarming in a porcine model of deep hypothermic cardiac arrest (DHCA). In addition, we evaluated whether providing a lower flow rate of ECLS during the rewarming phase might attenuate cardiopulmonary injuries.

METHODS:

Twenty pigs were cannulated for ECLS, cooled until DHCA occurred and subjected to 30 min of cardiac arrest. In order to assess the physiological impact of ECLS on cardiac output we measured flow in the pulmonary artery using Doppler echocardiography as well as a modified thermodilution technique using the Swan-Ganz catheter (injection site in the right ventricle). The animals were randomized into two groups during rewarming: a group with a low blood flow rate of 1.5 L/min (LF group) and a group with a normal flow rate of 3.0 L/min (NF group). The ECLS temperature was adjusted to 5 °C above the central core. Cardiac output, hemodynamics and pulmonary function parameters were evaluated.

RESULTS:

During the cooling phase, cardiac output, heart rhythm and blood pressure decreased continuously. Pulmonary artery pressure tended to increase at 32 °C compared to the initial value (20.2 ± 1.7 mmHg vs. 29.1 ± 5.6 mmHg, $p = 0.09$). During rewarming, arterial blood pressure was higher in the NF than in the LF group at 20° and 25 °C ($p = 0.003$ and 0.05, respectively). After rewarming to 35 °C, cardiac output was 3.9 ± 0.5 L/min in the NF group vs. 2.7 ± 0.5 L/min in LF group ($p = 0.06$). At the end of rewarming under ECLS cardiac output was inversely proportional to the ECLS flow rate. Moreover, the ECLS flow rate did not significantly change pulmonary vascular resistance.

DISCUSSION:

Using a newly developed experimental model of DHCA treated by ECLS, we assessed the cardiac and pulmonary pathophysiological response during the cooling phase and the ECLS rewarming phase. Despite lower metabolic need during hypothermia, a low ECLS blood flow rate during rewarming did not improved cardiopulmonary injuries after rewarming.

CONCLUSION:

A low ECLS flow rate during the rewarming phase did not attenuate pulmonary lesions, increased blood lactate level and tended to decrease cardiac output after rewarming. A normal ECLS flow rate did not increase pulmonary vascular resistance compared to a low flow rate. This experimental model on pigs contributes a number of pathophysiological findings relevant to the rewarming strategy for patients who have undergone accidental DHCA.