

COMPRESSIONS TORÀCIQUES

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Rationale, Methodology, and Implementation of a Dispatcher-assisted Cardiopulmonary Resuscitation Trial in the Asia-Pacific (Pan-Asian Resuscitation Outcomes Study Phase 2).

Ong ME, Shin SD, Tanaka H, Ma MH, Nishiuchi T, Lee EJ, Ko PC, Edwin Doctor N, Khruengkarnchana P, Naroo GY, Wong KD, Nakagawa T, Ryoo HW, Lin CH, Goh ES, Khunkhlai N, Alsakaf OA, Hisamuddin NA, Bobrow BJ, McNally B, Assam PN, Chan ES.

Abstract

Abstract Background. Survival outcomes from out-of-hospital cardiac arrest (OHCA) in Asia are poor (2-11%). Bystander cardiopulmonary resuscitation (CPR) rates are relatively low in Asia. Dispatcher-assisted CPR (DA-CPR) has recently emerged as a potentially cost-effective intervention to increase bystander CPR and survival from OHCA. The Pan-Asian Resuscitation Outcomes Study (PAROS), an Asia-Pacific cardiac arrest registry, was set up in 2009, with the aim of understanding OHCA as a disease in Asia and improving OHCA survival. The network has adopted DA-CPR as part of its strategy to improve OHCA survival. **Objective.** This article aims to describe the conceptualization, study design, potential benefits, and difficulties for implementation of DA-CPR trial in the Asia-Pacific. **Methods.** Two levels of intervention, basic and comprehensive, will be offered to PAROS participating sites. The basic level consists of implementation of a DA-CPR protocol and training program, while the comprehensive level consists of implementation of the basic level, with the addition of a dispatch quality measurement tool, quality improvement program, and community education program. Sites that are not able to implement the package will contribute control data. The primary outcome of the study is survival to hospital discharge or survival to 30 days post cardiac arrest. DA-CPR and bystander CPR are secondary outcomes. **Conclusion.** Implementation of DA-CPR requires concerted efforts by EMS leaders and supervisors, dispatchers, hospital stakeholders, policy makers, and the general public. The DA-CPR trial implemented by the PAROS sites, if successful, can serve as a model for other countries considering such an intervention in their EMS systems.

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Official lay basic life support courses in Germany: is delivered content up to date with the guidelines? An observational study.

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Abstract

BACKGROUND AND OBJECTIVES: Educating the lay public in basic life support (BLS) is a cornerstone to improving bystander cardiopulmonary resuscitation (CPR) rates. In Germany, the official rescue organisations deliver accredited courses based on International Liaison Committee on Resuscitation (ILCOR) guidelines to up to 1 million participants every year. However, it is unknown how these courses are delivered in reality. We hypothesised that delivered content might not follow the proposed curriculum, and miss recent guideline updates.

METHODS: We analysed 20 official lay BLS courses of 240 min (which in Germany are always embedded into either a 1-day or a 2-day first aid course). One expert rated all courses as a participating observer, remaining incognito throughout the course. Teaching times for specific BLS elements were recorded on a standardised checklist. Quality of content was rated by 5-point Likert scales, ranging from -2 (not mentioned) to +2 (well explained).

RESULTS: Median total course time was 101 min (range 48-138) for BLS courses if part of a 1-day first aid course, and 123 min (53-244) if part of a 2-day course. Median teaching time for CPR was 51 min (range 20-70) and 60 min (16-138), respectively. Teaching times for recovery position were 44 min (range 24-66) and 55 min (24-114). Quality of content was rated worst for 'agonal gasping' (-1.35) and 'minimising chest compression interruptions' (-1.70).

CONCLUSIONS: Observed lay BLS courses lasted only half of the assigned curricular time. Substantial teaching time was spent on non-evidence-based interventions (eg, recovery position), and several important elements of BLS were not included. The findings call for curriculum revision, improved instructor training and systematic quality management.

DISPOSITIUS DE FEEDBACK

Resuscitation. 2014 Aug 19. pii: S0300-9572(14)00691-1. doi: 10.1016/j.resuscitation.2014.08.005. [Epub ahead of print]

Accurate Feedback of Chest Compression Depth on a Manikin on a Soft Surface with Correction for Total Body Displacement.

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Abstract

OBJECTIVE: TrueCPR is a new real-time compression depth feedback device that measures changes in magnetic field strength between a back pad and a chest pad. We determined its accuracy with a manikin on a test bench and on various surfaces.

METHODS: First, calibration and accuracy of the manikin and TrueCPR was verified on a drill press. Then, manual chest compressions were given, on a firm surface and on a foam or air mattress, with feedback of the TrueCPR or Q-CPR accelerometer, to achieve a depth of 50mm. Compression depth measurements by the devices and the manikin were compared.

RESULTS: On a hard surface TrueCPR showed a systematic underestimation of 2-3mm in the drill press. Manual tests on a hard surface showed a slightly larger underestimation of 4.5mm. When guided by TrueCPR on a foam or air mattress, the TrueCPR measured a mean(\pm SD) chest compression depth of 52.0(\pm 1.9)mm or 49.4(\pm 2.6)mm, respectively while the manikin measured 54.4(\pm 1.8)mm or 52.1(\pm 1.4)mm, respectively ($p < 0.001$). When guided by the Q-CPR accelerometer on a foam or air mattress, the accelerometer measured depth of 54.3(\pm 3.6)mm or 56.0(\pm 3.8)mm, respectively compared to the manikin 42.4(\pm 2.3)mm or 34.9(\pm 3.6)mm, respectively ($p < 0.001$).

CONCLUSION: TrueCPR measures depth precisely, independent of the stiffness of the surface upon which the CPR is being performed with a constant inaccuracy of < 4.5 mm. A sternum-only accelerometer substantially overestimates depth when performing CPR on a soft surface. Correction for body displacement on a soft surface is essential for accurate delivery of chest compressions within the recommended depth range.

CURAS POST-RCE

Am J Emerg Med. 2014 Jul;32(7):747-51. doi: 10.1016/j.ajem.2014.02.039. Epub 2014 Mar 5.

Application of cerebral oxygen saturation to prediction of the futility of resuscitation for out-of-hospital cardiopulmonary arrest patients: a single-center, prospective, observational study: can cerebral regional oxygen saturation predict the futility of CPR?

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Abstract

BACKGROUND: Cerebral regional oxygen saturation (rSO₂) can be measured immediately and noninvasively just after arrival at the hospital and may be useful for evaluating the futility of

resuscitation for a patient with out-of-hospital cardiopulmonary arrest (OHCA). We examined the best practices involving cerebral rSO₂ as an indicator of the futility of resuscitation.

METHODS: This study was a single-center, prospective, observational analysis of a cohort of consecutive adult OHCA patients who were transported to the University of Tokyo Hospital from October 1, 2012, to September 30, 2013, and whose cerebral rSO₂ values were measured.

RESULTS: During the study period, 69 adult OHCA patients were enrolled. Of the 54 patients with initial lower cerebral rSO₂ values of 26% or less, 47 patients failed to achieve return of spontaneous circulation (ROSC) in the receiver operating characteristic curve analysis (optimal cutoff, 26%; sensitivity, 88.7%; specificity, 56.3%; positive predictive value, 87.0%; negative predictive value, 60.0%; area under the curve [AUC], 0.714; P = .0033). The AUC for the initial lower cerebral rSO₂ value was greater than that for blood pH (AUC, 0.620; P = .1687) or lactate values (AUC, 0.627; P = .1081) measured upon arrival at the hospital as well as that for initial higher (AUC, 0.650; P = .1788) or average (AUC, 0.677; P = .0235) cerebral rSO₂ values. The adjusted odds ratio of the initial lower cerebral rSO₂ values of 26% or less for ROSC was 0.11 (95% confidence interval, 0.01-0.63; P = .0129).

CONCLUSIONS: Initial lower cerebral rSO₂ just after arrival at the hospital, as a static indicator, is associated with non-ROSC. However, an initially lower cerebral rSO₂ alone does not yield a diagnosis performance sufficient for evaluating the futility of resuscitation.

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Prognostic value of electroencephalography (EEG) after out-of-hospital cardiac arrest in successfully resuscitated patients used in daily clinical practice.

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Abstract

BACKGROUND: Out-of-hospital cardiac arrest (OHCA) is associated with a poor prognosis and predicting outcome is complex with neurophysiological testing and repeated clinical neurological examinations as key components of the assessment. In this study we examine the association between different electroencephalography (EEG) patterns and mortality in a clinical cohort of OHCA-patients.

METHODS: From 2002-2011 consecutive patients were admitted to an intensive-care-unit after resuscitation from OHCA. Utstein-criteria for pre-hospital data and review of individual patients' charts for post-resuscitation care were used. EEG reports were analysed according to the 2012 American Clinical Neurophysiology Society's guidelines.

RESULTS: A total of 1076 patients were included, and EEG was performed in 20% (n=219) with a median of 3(IQR 2-4) days after OHCA. Rhythmic Delta Activity (RDA) was found in 71 patients (36%) and Periodic Discharges (PD) in 100 patients (45%). Background EEG frequency of Alpha+ or Theta was noted in 107 patients (49%), and change in cerebral EEG activity to stimulation (reactivity) was found in 38 patients (17%). Suppression (all activity <10µV) was found in 26 (12%) and burst-suppression in 17 (8%) patients. A favourable EEG pattern (reactivity, favourable background frequency and RDA) was independently associated with reduced mortality with hazard ratio (HR) 0.43 (95%CI: 0.24-0.76), p=0.004 (false positive rate: 31%) and a non-favourable EEG pattern (no reactivity, unfavourable background frequency, and PD, suppressed voltage or burst-suppression) was associated with higher mortality (HR=1.62(1.09-2.41), p=0.02) after adjustment for known prognostic factors (false positive rate: 9%).

CONCLUSION: EEG may be useful in work-up in prognostication of patients with OHCA. Findings such as RDA (Rhythmic Delta Activity) seems to be associated with a better prognosis,

whereas suppressed voltage and burst-suppression patterns were associated with poor prognosis.

REGISTRES I REVISIONS

Resuscitation. 2014 Sep 6. pii: S0300-9572(14)00732-1. doi: 10.1016/j.resuscitation.2014.08.030. [Epub ahead of print]

Predictors of early care withdrawal following out-of-hospital cardiac arrest.

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Abstract

AIMS: To identify factors that associated with early care withdrawal in out-of-hospital cardiac arrest patients.

METHODS: Data was collected from 189 survivors to hospital admission. Patients were classified by survival status upon hospital discharge, and those who died were categorized into withdrawal vs. no withdrawal of care. Those who had care withdrawn were further subdivided into early care withdrawal i.e. ≤ 72 h vs. late withdrawal >72 h. Multivariable adjusted odds ratios were used to assess factors associated with early care withdrawal.

RESULTS: Of 189 patients with cardiac arrest, only 36 had advanced directives (19%) and 99 (52%) had care withdrawn. Most patients whose care was withdrawn died in hospital (94/99, 95%), and the remainder died in hospice. Care was withdrawn early ≤ 72 h in the majority of patients (59/94, 63%). Median time to early care withdrawal was 2 days IQR (1-3). Factors associated with early care withdrawal were age ≥ 75 years, poor initial neurologic exam, multiple co morbidities, multi-organ failure, lactic acid ≥ 10 mmolL⁻¹, Caucasian race and absence of bystander CPR. Advance directives did not appear to determine early care withdrawal.

CONCLUSIONS: Although most cardiac arrest patients do not have advance directives, care is often withdrawn in more than 50% and in many before the accepted time for neurological awakening (72h). The decision to withdraw care is influenced by older age, race, preexisting co morbidities, multi-organ failure, and a poor initial neurological exam. Further studies are needed to better understand this phenomenon and other sociological factors that guide such decisions

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Cardiac catheterization is associated with superior outcomes for survivors of out of hospital cardiac arrest: Review and meta-analysis.

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Abstract

AIMS: Survivors of out-of-hospital cardiac arrest (OHCA) have a high rate of morbidity and mortality. Invasive cardiac assessment with coronary angiography offers the potential for improving outcomes by facilitating early revascularization. The aim of the present study was to review the published data on early coronary angiography for survivors of OHCA, and its impact on survival and neurological outcomes.

METHODS: Medline, Embase and PubMed were searched with a structured search query. The primary outcome was in-hospital (or if not available, 30 day or 6 month) survival. Rates of survival with good neurological outcome were a secondary endpoint. The time period of the

search was from 1 January 1980 to 1 January 2014. Data was pooled with means and 95% CI interval calculated. Meta-analysis of the main outcomes was performed using a weighted random effects model.

RESULTS: Following review of all identified records, 105 relevant full text articles were retrieved. Fifty had adequate outcome information stratified by the use of coronary angiography for analysis. In studies where a control group was available for comparison, the overall survival in the acute angiography group was 58.8% versus 30.9% in the control group (Odds ratio 2.77, 95% CI 2.06-3.72). Survival with good neurological outcome (as per the Utstein framework) in the early angiography group was 58% versus 35.8% in the control group (Odds ratio 2.20, 95% CI 1.46-3.32).

CONCLUSIONS: Early coronary angiography in patients following OHCA is associated with improved outcome and better survival.

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Cardiopulmonary resuscitation (CPR) plus delayed defibrillation versus immediate defibrillation for out-of-hospital cardiac arrest.

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Abstract

BACKGROUND: Sudden cardiac arrest (SCA) is a common health problem associated with high levels of mortality. Cardiac arrest is caused by three groups of dysrhythmias: ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT), pulseless electric activity (PEA) and asystole. The most common dysrhythmia found in out-of-hospital cardiac arrest (OHCA) is VF. During VF or VT, cardiopulmonary resuscitation (CPR) provides perfusion and oxygenation to the tissues, whilst defibrillation restores a viable cardiac rhythm. Early successful defibrillation is known to improve outcomes in VF/VT. However, it has been hypothesized that a period of CPR before defibrillation creates a more conducive physiological environment, increasing the likelihood of successful defibrillation. The order of priority of CPR versus defibrillation therefore remains in contention. As previous studies have remained inconclusive, we conducted a systematic review of available evidence in an attempt to draw conclusions on whether CPR plus delayed defibrillation or immediate defibrillation resulted in better outcomes in OHCA.

OBJECTIVES: To examine whether an initial one and one-half to three minutes of CPR administered by paramedics before defibrillation versus immediate defibrillation on arrival influenced survival rates, neurological outcomes or rates of return of spontaneous circulation (ROSC) in OHCA.

SEARCH METHODS: We searched the following databases: the Cochrane Central Register of Controlled trials (CENTRAL) (2013, Issue 6); MEDLINE (Ovid) (1948 to May 2013); EMBASE (1980 to May 2013); the Institute for Scientific Information (ISI) Web of Science (1980 to May 2013) and the China Academic Journal Network Publishing Database (China National Knowledge Infrastructure (CNKI), 1980 to May 2013). We included studies published in all languages. We also searched the Current Controlled Trials and Clinical Trials databases for ongoing trials. We screened the references lists of studies included in our review against the reference lists of relevant International Liaison Committee on Resuscitation (ILCOR) evidence worksheets.

SELECTION CRITERIA: Our participant group consisted of adults over 18 years of age presenting with OHCA who were in VF or pulseless VT at the time of emergency medical service (EMS) paramedic arrival. We included randomized controlled trials (RCTs) and quasi-randomized controlled trials that evaluated the effects of one and one-half to three minutes of CPR versus defibrillation as initial therapy on survival and neurological outcomes of these participants. We excluded observational and cross-over design studies.

DATA COLLECTION AND ANALYSIS: Two review authors independently extracted the data. We contacted study authors to ask for additional data when required. The risk ratio (RR) for each

outcome was calculated and summarized in the meta-analysis after heterogeneity was considered. We used Review Manager software for all analyses.

MAIN RESULTS: We included four RCTs with a total of 3090 enrolled participants (one study used a cluster-randomized design). Three trials were considered to have a relatively low risk of bias, and one trial was considered to have a relatively high risk. When survival to hospital discharge was compared, 38 of 320 (11.88%) participants survived to discharge in the initial CPR plus delayed defibrillation group compared with 39 of 338 participants (11.54%) in the immediate defibrillation group (RR 1.09, 95% CI 0.54 to 2.20, $\text{Chi}^2 = 10.78$, degrees of freedom (df) = 5, P value 0.06, $I^2 = 54\%$, low-quality evidence). When we compared the neurological outcome at hospital discharge (RR 1.12, 95% CI 0.65 to 1.93, low-quality evidence), the rate of return of spontaneous circulation (ROSC) (RR 0.94, 95% CI 0.77 to 1.15, low-quality evidence) and survival at one year (RR 0.77, 95% CI 0.24 to 2.49, low-quality evidence), we could not rule out the superiority of either treatment. Adverse effects were not associated with either treatment.

AUTHORS' CONCLUSIONS: Owing to the low quality of available evidence, we have been unable to determine conclusively whether immediate defibrillation and one and one-half to three minutes of CPR as initial therapy before defibrillation have similar effects on rates of return of spontaneous circulation, survival to discharge or neurological insult. We have also been unable to conclude whether either treatment approach provides a degree of superiority in OHCA. We propose that this is an area that needs further rigorous research through additional high-quality RCTs, including larger sample sizes and proper subgroup analysis.

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Improved outcome in Sweden after out-of-hospital cardiac arrest and possible association with improvements in every link in the chain of survival.

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Abstract

AIMS: To describe out-of-hospital cardiac arrest (OHCA) in Sweden from a long-term perspective in terms of changes in outcome and circumstances at resuscitation.

METHODS AND RESULTS: All cases of OHCA (n = 59 926) reported to the Swedish Cardiac Arrest Register from 1992 to 2011 were included. The number of cases reported (n/100 000 person-years) increased from 27 (1992) to 52 (2011). Crew-witnessed cases, cardiopulmonary resuscitation prior to the arrival of the emergency medical service (EMS), and EMS response time increased (P < 0.0001). There was a decrease in the delay from collapse to calling for the EMS in all patients and from collapse to defibrillation among patients found in ventricular fibrillation (P < 0.0001). The proportion of patients found in ventricular fibrillation decreased from 35 to 25% (P < 0.0001). Thirty-day survival increased from 4.8 (1992) to 10.7% (2011) (P < 0.0001), particularly among patients found in a shockable rhythm and patients with return of spontaneous circulation (ROSC) at hospital admission. Among patients hospitalized with ROSC in 2008-2011, 41% underwent therapeutic hypothermia and 28% underwent percutaneous coronary intervention. Among 30-day survivors in 2008-2011, 94% had a cerebral performance category score of 1 or 2 at discharge from hospital and the results were even better if patients were found in a shockable rhythm.

CONCLUSION: From a long-term perspective, 30-day survival after OHCA in Sweden more than doubled. The increase in survival was most marked among patients found in a shockable rhythm and those hospitalized with ROSC. There were improvements in all four links in the chain of survival, which might explain the improved outcome.

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Glucocorticoids as an Emerging Pharmacologic Agent for Cardiopulmonary Resuscitation.

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Abstract

Although cardiac arrest (CA) constitutes a major health problem with dismal prognosis, no specific drug therapy has been shown to improve survival to hospital discharge. CA causes adrenal insufficiency which is associated with poor outcome and increased mortality. Adrenal insufficiency may manifest as an inability to increase cortisol secretion during and after cardiopulmonary resuscitation (CPR). Several studies suggest that glucocorticoids during and after CPR seem to confer benefits with respect to return of spontaneous circulation (ROSC) rates and long term survival. They have beneficial hemodynamic effects that may favor their use during CPR and in the early post-resuscitation period. Moreover, they have anti-inflammatory and anti-apoptotic properties that improve organ function by reducing ischemia/reperfusion (I/R) injury. However, glucocorticoid supplementation has shown conflicting results with regard to survival to hospital discharge and neurological outcome. The purpose of this article is to review the pathophysiology of hypothalamic-pituitary-adrenal (HPA) axis during CPR. Furthermore, this article reviews the effects of glucocorticoids use during CRP and the post-resuscitation phase.

Int J Cardiol. 2014 Aug 17. pii: S0167-5273(14)01583-6. doi: 10.1016/j.ijcard.2014.08.057. [Epub ahead of print]

Predictors of favorable and poor prognosis in unwitnessed out-of-hospital cardiac arrest with a non-shockable initial rhythm.

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Abstract

BACKGROUND: Unwitnessed OHCA patients with non-shockable initial rhythms account for nearly half of all OHCA patients, and their prognosis is extremely poor. To date, no studies have focused on these patients. This study aimed to investigating the predictors of favorable and poor prognosis in these patients.

METHODS: We conducted a nationwide, population-based, observational study of data from the All Japan Utstein Registry, which included 121,081 adult OHCA patients subjected to resuscitation attempts from January 1, 2010 to December 31, 2010. The primary endpoint was favorable neurological outcome one month after OHCA.

RESULTS: Of the eligible 120,721 patients, 68,024 (56.3%) were unwitnessed OHCA patients with non-shockable initial rhythms. A younger age (18-64years: as a reference; 65-84years: OR 0.68, 95% CI 0.54-0.87, $p=0.0019$; ≥ 85 years: OR 0.46, 95% CI 0.33-0.63, $p<0.0001$), conversion to shockable rhythm (OR 2.14, 95% CI 1.43-3.13, $p=0.0003$), and pre-hospital ROSC (OR 94.85, 95% CI 75.71-119.35, $p<0.0001$) were independently associated with a favorable neurological outcome. Favorable neurological outcome rate was 28.8% in unwitnessed OHCA patients with non-shockable initial rhythms with all three favorable predictors, and 0.18% in patients without any of the three predictors (OR 230.34, 95% CI 127.37-402.96, $P<0.0001$).

CONCLUSIONS: It may be worthwhile to provide maximum lifesaving medical resources for patients with all of the favorable predictors (<65 years, conversion to shockable rhythm, and

pre-hospital ROSC); however, continued resuscitation efforts for patients without these predictors should likely be restrained.

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Association of Neighborhood Characteristics with Incidence of Out-of-Hospital Cardiac Arrest and Rates of Bystander-Initiated CPR: Implications for Community-Based Education Intervention.

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Abstract

OBJECTIVE: A 10-fold regional variation in survival after out-of-hospital cardiac arrest (OHCA) has been reported in the United States, which partly relates to variability in bystander cardiopulmonary resuscitation (CPR) rates. In order for resources to be focused on areas of greatest need, we conducted a geospatial analysis of variation of CPR rates.

METHODS: Using 2010-2011 data from Durham, Mecklenburg, and Wake counties in North Carolina participating in the Cardiac Arrest Registry to Enhance Survival (CARES) program, we included all patients with OHCA for whom resuscitation was attempted. Geocoded data and logistic regression modeling were used to assess incidence of OHCA and patterns of bystander CPR according to census tracts and factors associated herewith.

RESULTS: In total, 1466 patients were included (median age, 65 years [interquartile range 25]; 63.4% men). Bystander CPR by a layperson was initiated in 37.9% of these patients. High-incidence OHCA areas were characterized partly by higher population densities and higher percentages of black race as well as lower levels of education and income. Low rates of bystander CPR were associated with population composition (percent black: OR, 3.73; 95% CI, 2.00-6.97 per 1% increment in black patients; percent elderly: 3.25; 1.41-7.48 per 1% increment in elderly patients; percent living in poverty: 1.77, 1.16-2.71 per 1% increase in patients living in poverty).

CONCLUSIONS: In 3 counties in North Carolina, areas with low rates of bystander CPR can be identified using geospatial data, and education efforts can be targeted to improve recognition of cardiac arrest and to augment bystander CPR rates.

HYPOTERMIA

Resuscitation. 2014 Aug 30. pii: S0300-9572(14)00716-3. doi: 10.1016/j.resuscitation.2014.08.014. [Epub ahead of print]

Lack of improved outcomes with increased use of targeted temperature management following out-of-hospital cardiac arrest: A multicenter retrospective cohort study.

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Abstract

STUDY AIMS: To assess whether increased use of targeted temperature management (TTM) within an integrated healthcare delivery system resulted in improved rates of good neurologic outcome at hospital discharge (Cerebral Performance Category score of 1 or 2).

METHODS: Retrospective cohort study of patients with OHCA admitted to 21 medical centers between January 2007 and December 2012. A standardized TTM protocol and educational program were introduced throughout the system in early 2009. Comatose patients eligible for treatment with TTM were included. Adjusted odds of good neurologic outcome at hospital discharge and survival to hospital discharge were assessed using multivariate logistic regression.

RESULTS: A total of 1119 patients were admitted post-OHCA with coma, 59.1% (661 of 1119) of which were eligible for TTM. The percentage of patients treated with TTM markedly increased during the study period: 10.5% in the years preceding (2007-2008) vs. 85.1% in the years following (2011-2012) implementation of the practice improvement initiative. However, unadjusted in-hospital survival (37.3% vs. 39.0%, $p=0.77$) and good neurologic outcome at hospital discharge (26.3% vs. 26.6%, $p=1.0$) did not change. The adjusted odds of survival to hospital discharge (AOR 1.0, 95% CI 0.85-1.17) or a good neurologic outcome (AOR 0.94, 95% CI 0.79-1.11) were likewise non-significant.

INTERPRETATION: Despite a marked increase in TTM rates across hospitals in an integrated delivery system, there was no appreciable change in the crude or adjusted odds of in-hospital survival or good neurologic outcomes at hospital discharge among eligible post-arrest patients.

Acta Anaesthesiol Scand. 2014 Sep 1. doi: 10.1111/aas.12386. [Epub ahead of print]

Hypothermia after cardiac arrest does not affect serum levels of neuron-specific enolase and protein S-100b.

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Abstract

BACKGROUND: We investigated the brain-derived proteins neuron-specific enolase (NSE) and protein S-100b (S-100b) in survivors of cardiac arrest who had either received therapeutic hypothermia (TH) or had not.

METHODS: In a retrospective cohort study, we analysed serum levels of these two proteins over 5 days in 201 adult cardiac arrest survivors admitted to our intensive care unit between 2003 and 2010. These were all survivors that remained comatose and survived at least 48 h. Of these, 140 received therapeutic hypothermia (hypothermia group). The remainder received only standard therapy without hypothermia (normothermia group).

RESULTS: There was no difference in survival between the hypothermia and normothermia groups. At 4 weeks after arrest, 61 (43.6%) patients of the hypothermia group and 26 (42.6%) patients of the normothermia group were still alive with favourable to moderate neurological outcome (Cerebral Performance Category Scale 1-3). We observed no change in the mean serum levels of either protein between the two groups. Within each group, we found significantly higher serum levels of NSE and S-100b in patients with unfavourable neurological outcome (Cerebral Performance Category Scale 4 and 5) than in those with moderate to favourable outcome. Cut-off levels 3 days after cardiac arrest predicting an unfavourable outcome were > 40 ng/ml for NSE [specificity 95.2%, Sensitivity 74.1%, areas under the curve (AUC):0.889], false positive rate 4 [confidence interval (CI): 0.0131-0.1175] and > 1.03 $\mu\text{g/l}$ for S-100b (specificity 95.6%, Sensitivity 57.8%, AUC: 0.875) false positive rate 3 (CI: 0.0091-0.1218).

CONCLUSIONS: Additional application of TH was not associated with significant changes in serum levels of NSE and S-100b in comatose survivors of cardiac arrest, compared to those treated without TH.

Crit Care Med. 2014 Sep 3. [Epub ahead of print]

Targeted Temperature Management Processes and Outcomes After Out-of-Hospital Cardiac Arrest: An Observational Cohort Study.

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Abstract

OBJECTIVES: Targeted temperature management has been shown to improve survival with good neurological outcome in patients after out-of-hospital cardiac arrest. The optimal approach to inducing and maintaining targeted temperature management, however, remains uncertain. The objective of this study was to evaluate these processes of care with survival and neurological function in patients after out-of-hospital cardiac arrest.

DESIGN: An observational cohort study evaluating the association of targeted temperature management processes with survival and neurological function using bivariate and generalized estimating equation analyses.

SETTING: Thirty-two tertiary and community hospitals in eight urban and rural regions of southern Ontario, Canada.

PATIENTS:: Consecutive adult (≥ 18 yr) patients admitted between November 1, 2007, and January 31, 2012, and who were treated with targeted temperature management following nontraumatic out-of-hospital cardiac arrest.

INTERVENTIONS: Evaluate the association of targeted temperature management processes with survival and neurologic function using bivariate and generalized estimating equation analyses.

MEASUREMENTS AND MAIN RESULTS: There were 5,770 consecutive out-of-hospital cardiac arrest patients, of whom 747 (12.9%) were eligible and received targeted temperature management. Among patients with available outcome data, 365 of 738 (49.5%) survived to hospital discharge and 241 of 675 (35.7%) had good neurological outcomes. After adjusting for the Utstein variables, a higher temperature prior to initiation of targeted temperature management was associated with improved neurological outcomes (odds ratio, 1.27 per °C; 95% CI, 1.08-1.50; $p = 0.004$) and survival (odds ratio, 1.26 per °C; 95% CI, 1.09-1.46; $p = 0.002$). A slower rate of cooling was associated with improved neurological outcomes (odds ratio, 0.74 per °C/hr; 95% CI, 0.57-0.97; $p = 0.03$) and survival (odds ratio, 0.73 per °C/hr; 95% CI, 0.54-1.00; $p = 0.049$).

CONCLUSIONS: A higher baseline temperature prior to initiation of targeted temperature management and a slower rate of cooling were associated with improved survival and neurological outcomes. This may reflect a complex relationship between the approach to targeted temperature management and the extent of underlying brain injury causing impaired thermoregulation in out-of-hospital cardiac arrest patients.

Enferm Clin. 2014 Sep 4. pii: S1130-8621(14)00108-9. doi: 10.1016/j.enfcli.2014.07.004. [Epub ahead of print]

[Evaluation of nurse workload in patients undergoing therapeutic hypothermia.]

[Article in Spanish]

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Abstract

OBJECTIVE: Therapeutic hypothermia (TH) is recommended to minimize neurological damage in patients surviving sudden cardiac arrest (SCA). There is scarcity of data evaluating the

nursing workload in these patients. The objective of the study is to assess the workload of nurses whilst treating patients undergoing TH after SCA.

METHOD: A 43-month prospective-retrospective comparative cohort study was designed. Patients admitted to intensive care unit, for recovered SCA and persistent coma, were included. A comparison was made using the baseline characteristics, medical management, in-hospital mortality, and nursing workload during the first 96 hours using the Therapeutic Intervention Scoring System-28 (TISS-28); Nursing Activities Score (NAS); and Nine Equivalents of Nursing Manpower Use Score (NEMS) scales among patients who received TH and those who did not.

RESULTS: A total 46 patients were included: 26 in the TH group and 20 in the Non-TH group. Regarding baseline characteristics and management, the TH group presented higher prevalence of smoking habit (69 vs. 25%, $p=0.012$), out-of-hospital SCA (96 vs. 55%, $p<0.001$), and the performance of coronary angiography (96 vs. 65%, $p=0.014$) compared with the non-TH group. No differences were observed in the nursing workload, assessed by TISS 28, NAS or NEMS scales, or in-hospital mortality.

CONCLUSIONS: In this study performance of TH in SCA survivors is not associated with an increase in nursing workload. The installation of a TH program does not require the use of more nursing resources in terms of workload.

Curr Atheroscler Rep. 2014 Nov;16(11):451. doi: 10.1007/s11883-014-0451-z.

Enhancing approaches to therapeutic hypothermia in patients with sudden circulatory arrest.

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Abstract

Cardiac arrest is common and causes substantial morbidity and mortality. Despite advances in prevention and resuscitation, most patients remain unconscious and survival remains poor. Therapeutic hypothermia (32-34 °C) has emerged as a potent neuroprotective modality following resuscitation. In early clinical trials, application of therapeutic hypothermia improved survival in patients with ventricular fibrillation (VF), which led to the recommended use of therapeutic hypothermia for patients resuscitated from VF. However, two recent clinical trials have challenged some assumptions. First, the use of paramedic-initiated rapid infusion of cold crystalloids as a mean to achieve faster cooling rates after resuscitation in patients with and without VF arrest did not improve survival. Second, once patients were admitted to the hospital, targeting their temperature to 33 versus 36 °C for 36 h (in addition to active hyperthermia prevention) after out-of-hospital cardiac arrest did not to change clinical outcomes, suggesting that 36 °C may represent the target temperature instead of temperatures of less than 34 °C.

CJEM. 2014 Aug 1;16(0):26-33.

Effect of prehospital initiation of therapeutic hypothermia in adults with cardiac arrest on time-to-target temperature.

Schenfeld EM, Studnek J, Heffner AC, Nussbaum M, Kraft K, Pearson DA.

Abstract

Objective: Despite growing adoption, the impact of prehospital initiation of therapeutic hypothermia on outcomes of cardiac arrest patients is unknown. The objective of this study was to determine if prehospital administration of cold intravenous fluids improved the time-to-target temperature.

METHODS: All patients enrolled in an institutional post-cardiac arrest treatment pathway were prospectively registered into a quality assurance database. Patients undergoing cooling induction on hospital arrival were compared to those receiving a new treatment protocol initiated during the study period involving prehospital cooling with 4°C (39.2°F) normal saline. The primary outcome was the time-to-target temperature. Secondary outcomes included emergency medicine system transport time metrics, mortality, and neurologic status at discharge and 1 year.

RESULTS: One hundred thirty-two patients were enrolled during the study period. The initial rhythm was ventricular fibrillation/tachycardia in 63% and asystole/pulseless electrical activity in 36%. Eighty patients received prehospital cooling and 52 patients did not and comprised the historical control group. Time-to-target temperatures were not significantly different between prehospital and hospital cooled groups (256 v. 271 minutes, respectively, $p = 0.64$), nor was there any improvement in hospital survival (54% v. 50%, $p = 0.67$), good neurologic outcome (49% v. 44%, $p = 0.61$), or 1-year survival (49% v. 42%, $p = 0.46$) between the two groups. Transport times were longer in the prehospital cooled group.

CONCLUSIONS: Out-of-hospital cardiac arrest patients treated with prehospital cooling before arrival at our urban hospital did not have faster time-to-target temperature or improvement in outcomes compared to patients cooled immediately on emergency department arrival. Further research is needed to determine if any benefits exist from prehospital cooling prior to its widespread adoption.

J Electrocardiol. 2014 Jan-Feb;47(1):84-92. doi: 10.1016/j.jelectrocard.2013.05.139. Epub 2013 Jun 27.

The pattern of Tpeak-Tend and QT interval, and J wave during therapeutic hypothermia.

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Abstract

BACKGROUND AND PURPOSE: The electrocardiogram manifestations of hypothermia include J waves and prolongation of QT intervals. This study described changes in repolarization patterns during therapeutic hypothermia (TH).

METHODS: We measured the QTc and the interval from the peak to the end of the T wave (TpTe) from the V4 and V6 leads in 20 patients with TH. The TpTe was also expressed as a ratio to the duration of QT ($[TpTe/QT] \times 100\%$), and to the corrected value for heart rate ($TpTe/VRR$).

RESULTS: The QTc became prolonged in all patients during TH. While the $TpTe/VRR$ did not change, the $[TpTe/QT] \times 100\%$ decreased significantly during TH. The J wave developed during TH in seven patients. With one patient, ventricular fibrillation occurred preceded by an abnormal J wave and prolonged TpTe during TH.

CONCLUSIONS: QTc prolongation without TpTe increase or abnormal J wave may not be arrhythmogenic during TH.

ORGANITZACIÓ

Resuscitation. 2014 Aug 22. pii: S0300-9572(14)00695-9. doi: 10.1016/j.resuscitation.2014.07.021. [Epub ahead of print]

A simple solution for improving reliability of cardiac arrest equipment provision in hospital.

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Abstract

INTRODUCTION: Effective and safe cardiac arrest care in the hospital setting is reliant on the immediate availability of emergency equipment. The patient safety literature highlights

deficiencies in current approaches to resuscitation equipment provision, highlighting the need for innovative solutions to this problem.

METHODS: We conducted a before-after study at a large NHS trust to evaluate the effect of a sealed tray system and database on resuscitation equipment provision. The system was evaluated by a series of unannounced inspections to assess resuscitation trolley compliance with local policy prior to and following system implementation. The time taken to check trolleys was assessed by timing clinicians checking both types of trolley in a simulation setting.

RESULTS: The sealed tray system was implemented in 2010, and led to a significant increase in the number of resuscitation trolleys without missing, surplus, or expired items (2009: n=1 (4.76%) vs 2011: n=37 (100%), p<0.001). It also significantly reduced the time required to check each resuscitation trolley in the simulation setting (12.86 (95% CI: 10.02-15.71) vs 3.15 (95% CI: 1.19-4.51)min, p<0.001), but had no effect on the number of resuscitation trolleys checked every day over the previous month (2009: n=8 (38.10%) vs 2011: n=11 (29.73%), p=0.514).

CONCLUSION: The implementation of a sealed tray system led to a significant and sustained improvement in resuscitation equipment provision, but had no effect on resuscitation trolley checking frequency.

Resuscitation. 2014 Aug 20. pii: S0300-9572(14)00690-X. doi: 10.1016/j.resuscitation.2014.08.004. [Epub ahead of print]

Factors relating to the perceived management of emergency situations: A survey of former Advanced Life Support course participants' clinical experiences.

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Abstract

BACKGROUND: This study explored individual, team, and setting factors associated with the quality of management of in-hospital emergency situations experienced by former Advanced Life Support (ALS) course participants.

METHODS: This study was a survey of former ALS course participants' long-term experience of management of in-hospital, emergency situations. The survey was carried out in 2012 in Denmark and Norway.

RESULTS: A questionnaire was sent to 526 potential responders and (281/479×100) 58.7% responded. The results demonstrated that 75% of the emergency situations were perceived as "managed well". In general, the responders' confidence in being ALS providers was high, mean 4.3 (SD 0.8), scale 1-5. Significant differences between the perceived "well" and "not well" managed situations were found for all questions, p<0.001. The largest differences related to perception of co-workers' ability to apply ALS principles, the team atmosphere and communication. Responders' ratings of quality of management of emergency situations increased with intensity of setting. However, the 'clinical setting' was rated significantly lower as attributor to ability to apply ALS principles compared to 'co-workers familiarity with ALS principles', 'own confidence as ALS-provider' and 'own social/inter-personal skills'.

CONCLUSION: The results of this survey emphasise that ALS providers' perceived ability to apply ALS skills were substantially affected by teamwork skills and co-workers' skills. Team

related factors associated with successful outcome were related to clear role distribution, clear inter-personal communication and attentive listening, as well as respectful behaviour and positive team atmosphere. Although intensity of setting was attributed to ability to apply ALS principles, this did not affect management of emergency situations to the same extent as individual and team factors.

FV I DESFIBRIL·LACIÓ

J Electrocardiol. 2014 Aug 2. pii: S0022-0736(14)00295-7. doi: 10.1016/j.jelectrocard.2014.07.021. [Epub ahead of print]

Analyzing cardiac rhythm in the presence of chest compression artifact for automated shock advisory.

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Abstract

Defibrillation is often required to terminate a ventricular fibrillation or fast ventricular tachycardia rhythm and resume a perfusing rhythm in sudden cardiac arrest patients. Automated external defibrillators rely on automatic ECG analysis algorithms to detect the presence of shockable rhythms before advising the rescuer to deliver a shock. For a reliable rhythm analysis, chest compression must be interrupted to prevent corruption of the ECG waveform due to the artifact induced by the mechanical activity of compressions. However, these hands-off intervals adversely affect the success of treatment. To minimize the hands-off intervals and increase the chance of successful resuscitation, we developed a method which asks for interrupting the compressions only if the underlying ECG rhythm cannot be accurately determined during chest compressions. Using this method only a small percentage of cases need compressions interruption, hence a significant reduction in hands-off time is achieved. Our algorithm comprises a novel filtering technique for the ECG and thoracic impedance waveforms, and an innovative method to combine analysis from both filtered and unfiltered data. Requiring compression interruption for only 14% of cases, our algorithm achieved a sensitivity of 92% and specificity of 99%.

Am J Emerg Med. 2014 Aug 27. pii: S0735-6757(14)00600-7. doi: 10.1016/j.ajem.2014.08.046. [Epub ahead of print]

Defibrillation in rural areas.

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Abstract

AIM OF THE STUDY: Automated external defibrillation (AED) and public access defibrillation (PAD) have become cornerstones in the chain of survival in modern cardiopulmonary resuscitation. Most studies of AED and PAD have been performed in urban areas, and evidence is scarce for sparsely populated rural areas. The aim of this review was to review the literature and discuss treatment strategies for out-of-hospital cardiac arrest in rural areas.

METHODS: A Medline search was performed with the keywords automated external defibrillation (617 hits), public access defibrillation (256), and automated external defibrillator public (542). Of these 1415 abstracts and additional articles found by manually searching references, 92 articles were included in this nonsystematic review.

RESULTS: Early defibrillation is crucial for survival with good neurological outcome after cardiac arrest. Rapid defibrillation can be a challenge in sparsely populated and remote areas, where the incidence of cardiac arrest is low and rescuer response times can be long. The few studies performed in rural areas showed that the introduction of AED programs based on a 2-tier emergency medical system, consisting of Basic Life Support and Advanced Life Support teams, resulted in a decrease in collapse-to-defibrillation times and better survival of patients with out-of-hospital cardiac arrest.

CONCLUSIONS: In rural areas, introducing AED programs and a 2-tier emergency medical system may increase survival of out-of-hospital cardiac arrest patients. More studies on AED and PAD in rural areas are required.

TRAINING

J Clin Diagn Res. 2014 Jul;8(7):MC08-11. doi: 10.7860/JCDR/2014/8541.4567. Epub 2014 Jul 20.

Clinical Awareness of Do's and Don'ts of Cardiopulmonary Resuscitation (CPR) Among University Medical Students-A Questionnaire Study.

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Abstract

BACKGROUND: Medical students today are tomorrow's future doctors. One of the key skills that students should develop during their graduation training is to be prepared for emergency life saving measures like cardiopulmonary resuscitation (CPR) anytime, anywhere. The students play integral role in learning, mastering and inculcating the most pragmatic clinical skill of CPR.

OBJECTIVES: a) To evaluate the CPR awareness among undergraduate medical students. b) To screen the knowledge regarding accurate, effective CPR procedural techniques and various barriers of CPR failure in clinical practice from student perspective. c) To ascertain interest in CPR training programs and also inculcating CPR as an active part of clinical practice in future.

MATERIALS AND METHODS: The questionnaire comprised of three parts, first one dealing with general questions to know the importance of CPR in clinical practice, second one comprised of the main goal and accuracy of CPR intervention and the last segment consisted of questions targeting the indications, methods and effectiveness of CPR.

STATISTICAL ANALYSIS: Descriptive statistics and multiple response analyses were done by using SPSS 17.

RESULTS: The students had good knowledge about the importance of CPR in clinical practice and stand average in knowing its indications and effectiveness. Whereas, only 1.2% of them were completely aware about the universal compression ventilation ratio, and 20.4% were aware of the current order of CPR being compression, airway and breathing.

CONCLUSION: Though, CPR awareness is good among the students but skills of CPR have to be mastered by proper certified training programs at regular intervals and knowledge has to be updated with the changing trends in CPR.

Clin Teach. 2014 Oct;11(6):444-8. doi: 10.1111/tct.12175.

Round-the-table teaching: a novel approach to resuscitation education.

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Abstract

BACKGROUND: Effective cardiopulmonary resuscitation saves lives. Health professionals who care for acutely unwell children need to be prepared to care for a child in arrest. Hospitals must ensure that their staff have the knowledge, confidence and ability to respond to a child in cardiac arrest. RESUS4KIDS is a programme designed to teach paediatric resuscitation to health care professionals who care for acutely unwell children. The programme is delivered in two components: an e-learning component for pre-learning, followed by a short, practical, face-to-face course that is taught using the round-the-table teaching approach.

CONTEXT: Round-the-table teaching is a novel, evidence-based small group teaching approach designed to teach paediatric resuscitation skills and knowledge. Round-the-table teaching uses a structured approach to managing a collapsed child, and ensures that each participant has the opportunity to practise the essential resuscitation skills of airway manoeuvres, bag mask ventilation and cardiac compressions.

INNOVATION: Round-the-table teaching is an engaging, non-threatening approach to delivering interdisciplinary paediatric resuscitation education. The methodology ensures that all participants have the opportunity to practise each of the different essential skills associated with the Danger, Response, Send for help, Airway, Breathing, Circulation, Defibrillation or rhythm recognition (DRSABCD) approach to the collapsed child.

IMPLICATIONS: Round-the-table teaching is based on evidence-based small group teaching methods. The methodology of round-the-table teaching can be applied to any topic where participants must demonstrate an understanding of a sequential approach to a clinical skill. Round-the-table teaching uses a structured approach to managing a collapsed child.

ECMO

Resuscitation. 2014 Sep 5. pii: S0300-9572(14)00730-8. doi: 10.1016/j.resuscitation.2014.08.028. [Epub ahead of print]

Extracorporeal life support as rescue strategy for out-of-hospital and Emergency Department cardiac arrest.

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Abstract

BACKGROUND: Extracorporeal life support (ECLS) has been trialed as a rescue strategy for patients with cardiac arrest unresponsive to conventional cardiopulmonary resuscitation.

OBJECTIVE: We sought to describe our institution's experience with implementation of ECLS for out-of-hospital and Emergency Department (ED) cardiac arrests. Our primary outcome was survival to hospital discharge.

METHODS: Consecutive patients placed on ECLS in the ED or within one hour of admission after out-of-hospital or ED cardiac arrest were enrolled at two urban academic medical centers in the United States from July 2007-April 2014.

RESULTS: During the study period, 26 patients were included. Average age was 40±15 years, 54% were male, and 42% were white. Initial cardiac rhythms were ventricular fibrillation or pulseless ventricular tachycardia in 42%. The average time from initial cardiac arrest to initiation of ECLS was 77±51minutes (range 12-180minutes). ECLS cannulation was unsuccessful in two patients. Eighteen (69%) had complications related to ECLS, most commonly bleeding and ischemic events. Four patients (15%) survived to discharge, three of whom were neurologically intact at 6 months.

CONCLUSION: ECLS shows promise as a rescue strategy for refractory out-of-hospital or ED cardiac arrest but is not without challenges. Further investigations are necessary to refine the technique, patient selection, and ancillary therapeutics.

CASE REPORT

World J Emerg Med. 2014;5(2):154-6. doi: 10.5847/wjem.j.1920-8642.2014.02.015.

Survival from cardiac arrest due to sushi suffocation.

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Abstract

BACKGROUND: Sushi suffocation is relatively uncommon, and it is an unignorable cause of sudden death; however, no reports on sushi suffocation have been published.

METHODS: A 60-year-old man was referred to our hospital for post resuscitative intensive care. He had choked on sushi and collapsed in the dining room of a mental hospital. A nursing assistant summoned a physician who attempted to extract the sushi. External cardiac massage was initiated after 7 minutes had elapsed and followed by endotracheal intubation. Return of spontaneous circulation was achieved after 7 minutes of resuscitation. A bronchoscopy demonstrated a large amount of shari in the trachea and right bronchus, which was removed with alligator forceps and a wire basket.

RESULTS: Neurological recovery was evident on day 2 of admission. He was transferred back to the mental hospital with no neurological complications.

CONCLUSION: Emergency physicians should consider sushi suffocation, including its clinical features and management.

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Full Neurologic Recovery and Return of Spontaneous Circulation Following Prolonged Cardiac Arrest Facilitated by Percutaneous Left Ventricular Assist Device.

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Abstract

Sudden cardiac arrest is associated with high early mortality, which is largely related to postcardiac arrest syndrome characterized by an acute but often transient decrease in left ventricular (LV) function. The stunned LV provides poor cardiac output, which compounds the initial global insult from hypoperfusion. If employed early, an LV assist device (LVAD) may improve survival and neurologic outcome; however, traditional methods of augmenting LV function have significant drawbacks, limiting their usefulness in the periarrest period. Full cardiac support with cardiopulmonary bypass is not always readily available but is increasingly being studied as a tool to intensify resuscitation. There have been no controlled trials studying the early use of percutaneous LVADs (pLVADs) in pericardiac arrest patients or intra-arrest as a

bridge to return of spontaneous circulation. This article presents a case study and discussion of a patient who arrested while undergoing an elective coronary angioplasty and suffered prolonged cardiopulmonary resuscitation. During resuscitation, treatment included placement of a pLVAD and initiation of therapeutic hypothermia. The patient made a rapid and full recovery.

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Successful alteplase bolus administration for a presumed massive pulmonary embolism during cardiopulmonary resuscitation.

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Abstract

OBJECTIVE: To describe the case of a patient successfully resuscitated with bolus alteplase for a presumed massive pulmonary embolism (PE) with associated cardiac arrest.

CASE SUMMARY: A 54-year-old man presented to the emergency department for evaluation of syncope following recent open reduction and internal fixation of his ankle. On arrival, his condition rapidly deteriorated and progressed to cardiopulmonary arrest. Because of noncompliance with postoperative thromboprophylaxis, there was high suspicion for PE. Following 40 minutes of advanced cardiac life support, empirical alteplase 50 mg was administered intravenously over 2 minutes with return of spontaneous circulation (ROSC) observed 6 minutes later. The diagnosis of PE using computed tomographic angiography was confirmed after fibrinolytic therapy. Although his hospital course was complicated by a gastrointestinal bleed requiring transfusion, he was discharged neurologically intact.

DISCUSSION: Clinical guidelines recommend fibrinolytic therapy for patients with PE and cardiac arrest. Data from retrospective analyses, case series, and case reports suggest that various fibrinolytic regimens may facilitate ROSC and improve neurologically intact survival without an increased risk of fatal hemorrhage.

CONCLUSION: The choice of fibrinolytic therapy should be based on hospital availability, with prompt initiation of treatment and incorporation of an intravenous bolus. A reasonable treatment regimen is alteplase 0.6 mg/kg (maximum of 50 mg) or fixed dose of alteplase 50 mg given over 2 to 15 minutes. Resuscitation should be continued for at least 30 minutes, or until ROSC, after fibrinolytic initiation to allow time for the medication to work

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

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Abstract

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

MATERIALS AND METHODS: In total, 80 doctors and nurses who attended three EPLS provider courses, from May 2012 to December 2012, were asked to participate in the study and only 50 responded positively. Demographic data (age, sex, occupation) of the participants were

collected. The European Resuscitation Council-approved EPLS written test was used to assess theoretical knowledge right after the course and after 4 months. The retention of certain skills (airway opening, bag-mask ventilation, chest compressions) was also examined.

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

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