RCP / COMPRESSIONS TORÁCIQUES MECÀNIQUES

1. Pediatr Cardiol. 2019 Jun 19. doi: 10.1007/s00246-019-02135-x. [Epub ahead of

print]

Development and Evaluation of a New Chest Compression Technique for Cardiopulmonary Resuscitation in Infants.

Yang D(1), Kim KH(1), Oh JH(2), Son S(3), Cho J(3), Seo KM(3).

Abstract

We designed the newly developed flexed two-finger chest compression technique for cardiopulmonary resuscitation (CPR) in infants to increase the quality of chest compression by considering the advantages and disadvantages of the two-thumb encircling hand technique and conventional two-finger technique. The aim of the study is to compare the performance of the flexed two-finger technique and the currently used two-thumb technique or two-finger technique for infant CPR. A total of 42 doctors conducted 2-min single-rescuer CPR on a cardiac arrest infant model using the two-thumb technique followed, in a random order, by the two-finger technique and the flexed two-finger technique. Although the ratio of the adequate compression depth was highest in the two-thumb technique, followed by the flexed two-finger technique and two-finger technique (100% [98-100] vs. 99% [80-100] vs. 76% [42-95], respectively, P < 0.001), the hand-off time of the two-thumb technique was significantly longer than in the two-finger technique and flexed two-finger technique (31 s [28-35] vs. 29 s [27-32] vs. 29 s [26-32], respectively, P < 0.001). The number of total chest compressions of the two-thumb technique was significantly lower than in the two-finger technique and flexed two-finger technique (150 [148-159] vs. 159 [149-173] vs. 162 [150-172], respectively, P < 0.001). The newly developed chest compression technique could provide adequate compression depth without increasing the hand-off time during single-rescuer infant CPR.Trial registration: Clinical Research Information Service, KCT0002730.

2. Resuscitation. 2019 Jun 13. pii: S0300-9572(19)30218-7. doi: 10.1016/j.resuscitation.2019.06.005. [Epub ahead of print]

Association of bystander cardiopulmonary resuscitation and neurological outcome after out-of-hospital cardiac arrest due to drowning in Japan, 2013-2016.

Fukuda T(1), Ohashi-Fukuda N(2), Hayashida K(3), Kukita I(4).

Abstract

BACKGROUND: Early initiation of cardiopulmonary resuscitation (CPR) performed by bystanders is essential in patients with out-of-hospital cardiac arrest (OHCA) due to primary cardiac cause. However, evidence about the effect of bystander CPR on neurologically favorable survival after OHCA due to drowning is scarce and controversial. Methods: This nationwide population-based observational study using prospectively collected government-led registry data included patients with OHCA due to drowning who were transported to an emergency hospital between 2013 and 2016. The primary outcome was one-month neurologically favorable survival defined as Glasgow-Pittsburgh Cerebral Performance Category score of 1-2. The secondary outcomes were one-month survival and prehospital return of spontaneous circulation (ROSC). Results: The full cohort (n = 12,139) comprised 6291 (51.8%) male patients, and the mean age was 73.7 (standard deviation [SD], 18.8). Of these, 5157 (42.5%) received bystander CPR, and 6982 (57.5%) did not. 4345 patients receiving bystander CPR were propensity-matched with 4345 patients not receiving bystander CPR. In the propensity score-matched cohort, bystander CPR was associated with increased chance of one-month neurologically favorable survival (0.4% vs. 0.8%; risk ratio[RR], 2.19; 95%confidence interval[CI], 1.21-3.95; P = 0.0076), one-month survival (1.1% vs. 1.7%; RR, 1.55; 95%CI, 1.09-2.22; P = 0.0150), and prehospital ROSC (2.7% vs. 3.5%; RR, 1.30; 95%CI, 1.03-1.65; P = 0.0296). Similar association was observed across a variety of sensitivity

analyses. In subgroup analysis, statistically significant difference was not observed in pediatric OHCA due to drowning, although the sample size was too small (n = 218). CONCLUSIONS: Among patients with OHCA due to drowning, bystander CPR was associated with increased chance of neurologically favorable survival.

REGISTRES, REVISIONS I EDITORIALS

1. Am J Ther. 2019 Mar/Apr;26(2):e276-e283. doi: 10.1097/MJT.0000000000000927.

Cardiac Arrest in Special Circumstances-Recent Advances in Resuscitation.

Cimpoesu D(1), Corlade-Andrei M(1), Popa TO(1), Grigorasi G(1), Bouros C(1),

Rotaru L(2), Nedelea PL(1).

Abstract

BACKGROUND: Cardiopulmonary resuscitation (CPR) in special circumstances includes the emergency intervention for special causes, special environments, and special patients. Special causes cover the potential reversible causes of cardiac arrest that must be identified or excluded during any resuscitation act. The special environments section includes recommendations for the treatment of cardiac arrest occurring in specific locations: cardiac surgery, catheterization laboratory, dialysis unit, dental surgery, commercial airplanes or air ambulances, playing field, difficult environment (eg, drowning, high altitude, avalanche, and electrical injuries) or mass casualty incident. CPR for special patients gives guidance for the patients with severe comorbidities (asthma, heart failure with ventricular assist devices, neurological disease, and obesity) and pregnant women or older people. Areas of uncertainty: There are no generally worldwide accepted resuscitation guidelines for special circumstance, and there are still few studies investigating the safety and outcome of cardiac arrest in special circumstances. Applying standard advanced life support (ALS) guidelines in this situation is not enough to obtain better results from CPR, for example, cardiac arrest caused by electrolyte abnormalities require also the treatment of that electrolyte disturbance, not only standard CPR, or in the case of severe hypothermia, when standard ALS approach is not recommended until a temperature threshold is reached after warming measures. Data sources for this article are scientific articles describing retrospective studies conducted in CPR performed in special circumstances, experts' consensus, and related published opinion of experts in CPR. Therapeutic advances: The newest advance in therapeutics applied to resuscitation field for these particular situations is the use of extracorporeal life support/extracorporeal membrane oxygenation devices during CPR. CONCLUSIONS: In special circumstances, ALS guidelines require modification and special attention for causes, environment, and patient particularities, with specific therapeutic intervention concomitant with standard ALS.

2. Circulation. 2018 May 15;137(20):2125-2127. doi: 10.1161/CIRCULATIONAHA.118.033620.

Oxygen After Cardiac Arrest: Enough Is Enough?

McKenzie NF(1)(2), Dobb GJ(3)(4).

NO ABSTRACT AVAILABLE

3. Resuscitation. 2019 Jun 15. pii: S0300-9572(19)30220-5. doi:

10.1016/j.resuscitation.2019.06.007. [Epub ahead of print]

Lay first-responders alerted to out-of-hospital cardiac arrest by smartphone app - Not so novel any longer, and it's time to do more.

Smith CM(1).

NO ABSTRACT AVAILABLE

4. Emergencias. 2018 Jun;30(3):194-200.

Can sudden cardiac death in the young be predicted and prevented? Lessons from

autopsy for the emergency physician.

White JL(1), Chang AM(2), Cesar S(3), Sarquella-Brugada G(4).

Abstract

Sudden unexpected death in the young, though rare, is devastating for both the family and the community. Although only 1.3 to 8.5 cases of sudden cardiac death (SCD) occur per 100 000 young people, autopsy is often inconclusive. Many causes of SCD are related to autosomal dominant inherited risk, however; therefore, answers are important for survivors. Causes of autopsy-positive SCD in young patients include hypertrophic cardiomyopathy and arrhythmogenic right ventricular dysplasia. Autopsy-negative SCD has been related to inherited arrhythmogenic causes such as long QT syndrome, Brugada syndrome, catecholaminergic polymorphic ventricular tachycardia, Wolff-Parkinson-White syndrome, and idiopathic ventricular fibrillation. The important question for the emergency physician is how SCD can be predicted and prevented in the young so that there is no need for an autopsy.

[Article in English, Spanish]

ACR INTRAHOSPITALÀRIA

1. Am J Med Sci. 2019 May 21. pii: S0002-9629(19)30208-3. doi:10.1016/j.amjms.2019.05.003. [Epub ahead of print]

Association Between Time to Defibrillation and Neurologic Outcome in Patients

With In-Hospital Cardiac Arrest.

Kang JY(1), Kim YJ(1), Shin YJ(2), Huh JW(2), Hong SB(2), Kim WY(3).

Abstract

BACKGROUND: The influence of time to defibrillation in patients with shockable in-hospital cardiac arrest (IHCA) has not been fully assessed. This study investigated the association between time to defibrillation and neurologic outcome in shockable IHCA survivors. Materials and methods: A 7-year retrospective cohort study was conducted using a prospectively collected registry of adult IHCA patients. Patients whose first documented rhythm was pulseless ventricular tachycardia or ventricular fibrillation and who received defibrillation within 5 minutes were included. Results: Among 1,683 IHCA patients, 261 patients were included. At 28 days, a good neurologic outcome (Cerebral Performance Category score 1 or 2) according to time to defibrillation was seen in 49.0%, 21.1%, 13.4% and 16.5% of patients treated at <2 minutes (n = 128), 2-3 minutes (n = 55), 3-4 minutes (n = 35) and 4-5 minutes (n = 43) after IHCA, respectively. After adjusting for clinical characteristics, a graded inverse association was found after 3 minutes. CONCLUSIONS: A graded inverse association between time to defibrillation and neurologic outcome was observed beyond 3 minutes following cardiac arrest. A target time to defibrillation of <3 minutes may be a practical target goal in resource-limited hospitals.

CAUSA DE L'ACR

1. Am J Emerg Med. 2018 Aug;36(8):1350-1355. doi: 10.1016/j.ajem.2017.12.040. Epub 2017 Dec 20.

Cardiac arrest while exercising on mountains in national or provincial parks: A national observational study from 2012 to 2015.

Jung E(1), Park JH(2), Kong SY(3), Hong KJ(4), Ro YS(3), Song KJ(2), Ryu HH(5), Shin SD(2).

Abstract

BACKGROUND: Previous studies on cardiac arrest in mountainous areas were focused on environmental features such as altitude and temperature. However, those are limited to factors affecting the prognosis of patients after cardiac arrest. We analyzed the cardiac arrests in national or provincial parks located in the mountains and determined the factors affecting the prognosis of patients after cardiac arrest. Methods: This study included all emergency medical service (EMS) treated patients over the age of 40 experiencing out-of-hospital cardiac arrests (OHCAs) of presumed cardiac etiology during exercise, between January 2012 and December 2015. The main focus of interest was the location of cardiac arrest occurrence (national mountain parks and provincial parks vs. other sites). The main outcome was survival to discharge and multivariable logistic regression was performed to adjust for possible confounding effects. Results: A total 1835 patients who suffered a cardiac arrest while exercising were included. From these, 68 patients experienced cardiac arrest in national or provincial parks, and 1767 occurred in other locations. The unadjusted and adjusted ORs (95% CI) for a good cerebral performance scale (CPC) were 0.09 (0.01-0.63) and 0.08(0.01-0.56), survival discharges were 0.13(0.03-0.53) and 0.11 (0.03-0.48). CONCLUSIONS: Cardiac arrests occurring while exercising in the mountainous areas have worse prognosis compared to alternative locations.

2. Crit Care Med. 2019 Jun 14. doi: 10.1097/CCM.0000000000003869. [Epub ahead of print]

Causes of Death in Status Epilepticus.

Hawkes MA(1), English SW(2), Mandrekar JN(3), Rabinstein AA(1), Hocker S(1).

Abstract

OBJECTIVES: To determine the causes of death in patients with status epilepticus. To analyze the relative contributions of seizure etiology, seizure refractoriness, use of mechanical ventilation, anesthetic drugs for seizure control, and medical complications to in-hospital and 90-day mortality, hospital length of stay, and discharge disposition. DESIGN: Retrospective cohort. Setting: Single-center neuroscience ICU. Participants: Patients with status epilepticus were identified by retrospective search of electronic database from January 1, 2011, to December 31, 2016. Interventions: Review of electronic medical records. Measurements and main results: Demographics, clinical characteristics, treatments, and outcomes were collected. Univariable and multivariable logistic regression analysis were used to determine whether the use of anesthetic drugs, mechanical ventilation, Status Epilepticus Severity Score, refractoriness of seizures, etiology of seizures, or medical complications were associated with in-hospital, 90-day mortality or discharge disposition. Among 244 patients with status epilepticus (mean age was 64 yr [interquartile range, 42-76], 55% male, median Status Epilepticus Severity Score 3 [interquartile range, 2-4]), 24 received anesthetic drug infusions for seizure control. In-hospital and 90-day mortality rates were 9.2% and 19.2%, respectively. Death was preceded by withdrawal of life-sustaining treatment in 19 patients (86.3%) and cardiac arrest in three (13.7%). Only Status Epilepticus Severity Score was associated with in-hospital and 90-day mortality, whereas the use of anesthetic drugs for seizure control, mechanical ventilation, medical complications, etiology, and refractoriness of seizures were not. Hospital length of stay was longer in patients with medical complications (p = 0.0091), refractory seizures (p = 0.0077), and in those who required anesthetic drugs for seizure control (p = 0.0035). Patients who had refractory seizures were less likely to be discharged home (odds ratio, 0.295; CI, 0.143-0.608; p = 0.0009). CONCLUSIONS: In this cohort, death primarily resulted from the underlying neurologic disease and withdrawal of life-sustaining

treatment and not from our treatment choices. Use of anesthetic drugs, medical complications, and mechanical ventilation were not associated with in-hospital and 90-day mortality.

3. Cardiol Rev. 2019 May/Jun;27(3):160-166. doi: 10.1097/CRD.0000000000000226.

Impact of Implantable Cardioverter-Defibrillator Interventions on All-Cause Mortality in Heart Failure Patients: A Meta-Analysis.

Bazoukis G(1), Tse G(2), Korantzopoulos P(3), Liu T(4), Letsas KP(1), Stavrakis

S(5), Naka KK(6).

Abstract

Implantable cardioverter-defibrillators (ICDs) have a unique role in the primary and secondary prevention of sudden cardiac death. However, appropriate and inappropriate ICD interventions [antitachycardia pacing (ATP) or shocks] can result in deleterious effects. The aim of our study was to systematically review the existing data about the impact of ICD interventions on all-cause mortality in heart failure patients with reduced ejection fraction (HFrEF). We systematically searched MEDLINE (by using PubMed Web-based search engine) without any limits until September 30, 2017. After screening 17,752 records, a total of 17 studies met our inclusion criteria and were included in our meta-analysis. Our data showed that in patients with HFrEF, appropriate [hazard ratio (HR), 2.00; 95% confidence interval (CI), 1.52-2.63; P < 0.01; I 88%] and inappropriate [HR, 1.30; 95% CI, 1.07-1.58; P < 0.01; I 26%] ICD interventions were significantly associated with increased all-cause mortality. However, neither appropriate ATP [HR, 1.27; 95% CI, 0.80-2.02; P = 0.30; I 62%] nor inappropriate ATP [HR, 1.01; 95% CI, 0.49-2.07; P = 0.98; I 46%] were significantly associated with all-cause mortality in this patient population. In conclusion, ICD shocks are associated with a worse prognosis in HFrEF.

4. QJM. 2019 May 1;112(5):343-350. doi: 10.1093/qjmed/hcz028.

Gender difference in clinical and genetic characteristics of Brugada syndrome: SADS-TW BrS registry.

Chen CJ(1), Juang JJ(1), Lin LY(1), Liu YB(1), Ho LT(1), Yu CC(1), Huang HC(1), Lin TT(2), Liao MC(2), Chen JJ(3), Hwang JJ(1), Chen WJ(1), Yeh SS(4), YangDH(5), Chiang FT(6), Lin JL(7), Lai LP(1), Horie M(8); (SADS-TW BrS Registry).

Abstract

BACKGROUND: Brugada syndrome (BrS) is a heritable sudden cardiac death (SCD) disease with male predominance. Information on gender difference of BrS remains scarce. AIM: To investigate the gender difference of BrS in Han Chinese. Design: We consecutively enrolled 169 BrS patients (153 males and 16 females) from Han Chinese in Taiwan from 1998 to 2017. Methods: Clinical characteristics, electrocardiographic parameters and SCN5A mutation status were compared between genders. Results: The percentage of family history of SCD in females was slightly higher (31.3% vs. 15%, P = 0.15). Females exhibited longer QTc (457.8 ± 33.0 vs. 429.5 ± 42.1 ms, P < 0.01). Regarding cumulative event occurrence by age, Mantel-Cox test showed females had earlier age of onset of first cardiac events (SCD or syncope) than males (P = 0.049), which was mainly attributed to syncope (P < 0.01). Males with SCD exhibited longer QRS duration (114.2 ± 26.8 vs. 104.8 ± 15.3 ms, P = 0.02) and QTc (442.5 ± 57.4 vs. 422.9 ± 28.8 ms, P = 0.02). Males with syncope exhibited longer PR interval (181.2 ± 33.7 vs. 165.7 ± 27.1 ms, P = 0.01), whereas females with SCD or syncope had a trend towards slower heart rates (69.1 ± 9.6 vs. 82.2 ± 16.3 bpm, P = 0.10) than female with no or mild symptoms. There was no difference in the percentage of SCN5A mutation between genders. CONCLUSION: Gender difference is present in BrS. Females have longer QTc and suffer from syncope earlier than males. Risk of SCD in males is associated with boarder QRS complex and longer QTc, whereas risk of syncope is associated with longer PR interval in males and slower heart rate in females.

FÀRMACS

1. Intern Med. 2019 Jun 15;58(12):1713-1721. doi: 10.2169/internalmedicine.1932-18. Epub 2019 Feb 5.

The Additive Effect of Atropine Sulfate during Cardiopulmonary Resuscitation in Out-of-hospital Non-traumatic Cardiac Arrest Patients with Non-shockable Rhythm.

Yano T, Kawana R, Yamauchi K, Endo G, Nagamine Y.

Abstract

OBJECTIVE The updated guidelines of 2015 for cardiopulmonary resuscitation (CPR) do not recommend the routine use of atropine for cardiopulmonary arrest. Methods The study population included out-of-hospital cardiac arrest (OHCA) patients with non-shockable rhythm who were encountered at a Japanese community hospital between October 1, 2012 and April 30, 2017. Results At the outcome, the epinephrine with atropine and epinephrine-only groups had a similar survival rate to that at hospital admission (28.7% vs. 26.7%: p=0.723). The odds ratio (OR) for the survival to hospital admission after the administration of atropine with epinephrine was 1.33 (95% CI 1.09-1.62; p<0.01), while that after the administration of epinephrine was 0.64 (95% CI: 0.55-0.74, p<0.01). The ORs for the survival to hospital admission for patients with pulseless electrical activity in the epinephrine-alone group and the atropine with epinephrine group were 0.62 (95% CI 0.49-0.78; p<0.01) and 1.35 (95% CI 0.99-1.83; p= 0.06), respectively, and those for such patients with asystole in the epinephrine-alone group and the atropine with epinephrine group were 0.64 (95% CI 0.53-0.76; p<0.01) and 1.39 (95% CI 1.10-1.77; p<0.01), respectively. The OR for the survival to hospital admission after the administration of atropine sulfate (1 mg) was 2.91 (95% CI 1.49-5.67; p<0.01), while that for the survival to hospital admission after the administration of 0, 2 and3 mg atropine sulfate was 0.38 (95% CI 0.29-0.50; p<0.01), 1.54 (95% CI 0.58-4.08; p=0.38) and 0.23 (95% CI 0.09-0.60; p<0.01), respectively. Conclusion The addition of atropine (within 2 mg) following epinephrine was a comprehensive independent predictor of the survival to hospital admission for non-shockable (especially asystole) OHCA adults.

VENTILACIÓ

1. Med Klin Intensivmed Notfmed. 2019 Jun 13. doi: 10.1007/s00063-019-0588-1. [Epub ahead of print]

Out-of-hospital airway management with a laryngeal tube or endotracheal intubation for out-of-hospital cardiac arrest : Influence on in-hospital mortality.

Erath JW[1], Reichert A[1], Büttner S[1], Weiler H[1], Vamos M[1], von Jeinsen B[1], Heyl S[1], Schalk R[2], Mutlak H[2], Zeiher AM[1], Fichtlscherer S[1], Honold J[3].

Abstract

BACKGROUND: Endotracheal (ET) intubation has been the gold standard in **out-of-hospital** airway management for a long time. Recent guidelines suggest an alternative airway management with supraglottic airway devices like the laryngeal tube (LT) especially for less experienced rescue personnel. However, scientific evidence on the prognostic impact of the laryngeal tube in the setting of cardiopulmonary resuscitation is limited. METHODS: We aimed to compare mortality outcomes in **out-of-hospital cardiac arrest** (OHCA) patients after preclinically initiated airway management with either ET or LT in a propensity score matched, single-center retrospective analysis. RESULTS: A total of 208 patients with OHCA were resuscitated and intubated with either ET (n = 160; 77%) or LT (n = 48; 23%) in the urban area of Frankfurt am Main, Germany, and treated thereafter on the intensive care unit of the University **Hospital** Frankfurt from 2006-2014. In-**hospital** mortality was 84% versus 85% in the ET and LT group (p = 0.86). No difference regarding in-**hospital** mortality has been observed between the two airway management techniques in univariate as well as in multivariate mortality analysis (HR = 0.98, 95% confidence interval [CI] 0.69-1.39; p = 0.92; adjusted HR = 1.01, 95% CI 0.76-1.56; p = 0.62). To adjust for potential confounders, propensity score matching was additionally performed resulting in a cohort of 120 matched patients in a 3:1 ratio (ET:LT). Again, survival to **hospital** discharge was comparable between the two patient groups (propensity-adjusted HR = 0.99, 95% CI 0.65-1.51,

p = 0.97). Further, preclinical airway management with LT or ET showed no difference in mortality within first 24 h (propensity-adjusted HR = 1.02; 95% CI 0.44-2.36; p = 0.96). CONCLUSION: Preclinical airway management with LT shows similar mortality outcomes in direct comparison to intubation with ET in OHCA patients. Further randomized studies are warranted.

ECOGRAFIA A LA RESSUSCITACIÓ

1. Cureus. 2019 Apr 13;11(4):e4456. doi: 10.7759/cureus.4456.

Does Point-of-care Ultrasound Use Impact Resuscitation Length, Rates of Intervention, and Clinical Outcomes During Cardiac Arrest? A Study from the Sonography in Hypotension and Cardiac Arrest in the Emergency Department (SHoC-ED) Investigators.

Atkinson PR(1), Beckett N(2), French J(1), Banerjee A(3), Fraser J(1), LewisD(1).

Abstract

INTRODUCTION This third study in the Sonography in Hypotension and Cardiac Arrest in the Emergency Department (SHoC-ED) series examined potential relationships between point-of-care ultrasound (PoCUS) use and the length of resuscitation, the frequency of interventions, and clinical outcomes during cardiac arrest. Methods A health records review was completed for adult patients (>19 years, without a do not resuscitate (DNR) order) who presented to a tertiary emergency department in cardiac arrest between 2010 and 2014. Patients were grouped based on PoCUS use and findings for cardiac activity. Data were analyzed for length of resuscitation, frequency of interventions, return of spontaneous circulation (ROSC), survival to hospital admission (SHA), and survival to hospital discharge (SHD). Results Of the 223 patients who met inclusion criteria, 180 (80.7%) received assessment by PoCUS during cardiac arrest management in the emergency department (ED). In the PoCUS group, 21 (11.6%) demonstrated cardiac activity and 159 (88.4%) did not. Patients with activity on PoCUS had longer mean resuscitation times (27.3; 95% confidence interval 17.7-37.0 min) than patients with no activity (11.51; 10.2-12.8 min) and patients who did not receive a PoCUS exam (14.36; 9.89-18.8 min). Patients with cardiac activity on PoCUS were more likely to receive endotracheal intubation (ET; 95.23%; 86.13-104.35%) and epinephrine (Epi; 100%; 100-100%) than patients with no activity (ET: 46.54%; 38.8-54.3%; Epi: 82.39%; 76.50-88.31%) and those with no PoCUS (ET: 65.11%; 50.87-79.36%; Epi: 81.39%; 69.76-93.03%). Those with no cardiac activity on PoCUS were much less likely to achieve ROSC (19.5%; 13.4-25.6), SHA (6.9%; 2.97-10.86%) and SHD (0.6%; -0.5-1.8%) compared to those with cardiac activity on PoCUS (ROSC; 76.19%; 57.97-94.4%), SHA (33.3%; 13.2-53.5%), SHD (9.5%; -3-22.07%), and those with no PoCUS (ROSC 39.5%; 24.9-54.1%; SHA 27.9%; 14.5- 41.3%, and SHD 6.9%; -0.6-14.59). CONCLUSIONS Emergency department cardiac arrest patients with cardiac activity on PoCUS received longer resuscitation with higher rates of intervention as compared to those with negative findings or when no PoCUS was performed. Patients with cardiac activity on PoCUS had improved clinical outcomes as compared with patients not receiving PoCUS, and patients with no activity on PoCUS.

MONITORATGE CEREBRAL

1. Crit Care. 2019 Jun 18;23(1):224. doi: 10.1186/s13054-019-2510-x.

Beyond dichotomy: patterns and amplitudes of SSEPs and neurological outcomes after cardiac arrest.

Oh SH(1), Park KN(2), Choi SP(3), Oh JS(4), Kim HJ(1), Youn CS(1), Kim SH(1), Chang K(5), Kim SH(6).

Abstract

BACKGROUND: We hypothesized that the absence of P25 and the N20-P25 amplitude in somatosensory evoked potentials (SSEPs) have higher sensitivity than the absence of N20 for poor neurological outcomes, and we evaluated the ability of SSEPs to predict long-term outcomes using

pattern and amplitude analyses. Methods: Using prospectively collected therapeutic hypothermia registry data, we evaluated whether cortical SSEPs contained a negative or positive short-latency wave (N20 or P25). The N20-P25 amplitude was defined as the largest difference in amplitude between the N20 and P25 peaks. A good or poor outcome was defined as a Glasgow-Pittsburgh Cerebral Performance Category (CPC) score of 1-2 or 3-5, respectively, 6 months after cardiac arrest. Results: A total of 192 SSEP recordings were included. In all patients with a good outcome (n = 51), both N20 and P25 were present. Compared to the absence of N20, the absence of N20-P25 component improved the sensitivity for predicting a poor outcome from 30.5% (95% confidence interval [CI], 23.0-38.8%) to 71.6% (95% CI, 63.4-78.9%), while maintaining a specificity of 100% (93.0-100.0%). Using an amplitude < 0.64 μV, i.e., the lowest N20-P25 amplitude in the good outcome group, as the threshold, the sensitivity for predicting a poor neurological outcome was 74.5% (95% CI, 66.5-81.4%). Using the highest N20-P25 amplitude in the CPC 4 group (2.31 μV) as the threshold for predicting a good outcome, the sensitivity and specificity were 52.9% (95% CI, 38.5-67.1%) and 96.5% (95% CI, 91.9-98.8%), respectively. The predictive performance of the N20-P25 amplitude was good, with an area under the receiver operating characteristic curve (AUC) of 0.94 (95% CI, 0.90-0.97). The absence of N20 was statistically inferior regarding outcome prediction ($p < 0.05$), and amplitude analysis yielded significantly higher AUC values than did the pattern analysis ($p < 0.05$). CONCLUSIONS: The simple pattern analysis of whether the N20-P25 component was present had a sensitivity comparable to that of the N20-P25 amplitude for predicting a poor outcome. Amplitude analysis was also capable of predicting a good outcome

2. Crit Care. 2018 Aug 18;22(1):196. doi: 10.1186/s13054-018-2119-5.

Carbon dioxide dynamics in relation to neurological outcome in resuscitated out-of-hospital cardiac arrest patients: an exploratory Target Temperature Management Trial substudy.

Ebner F(1), Harmon MBA(2), Aneman A(3), Cronberg T(4), Friberg H(5), Hassager C(6)(7), Juffermans N(2), Kjærgaard J(6)(7), Kuiper M(8), Mattsson N(4), Pelosi P(9), Ullén S(10), Undén J(11), Wise MP(12), Nielsen N(13).

Abstract

BACKGROUND: Dyscarbia is common in out-of-hospital cardiac arrest (OHCA) patients and its association to neurological outcome is undetermined. METHODS: This is an exploratory post-hoc substudy of the Target Temperature Management (TTM) trial, including resuscitated OHCA patients, investigating the association between serial measurements of arterial partial carbon dioxide pressure ($PaCO_2$) and neurological outcome at 6 months, defined by the Cerebral Performance Category (CPC) scale, dichotomized to good outcome (CPC 1 and 2) and poor outcome (CPC 3-5). The effects of hypercapnia and hypocapnia, and the time-weighted mean $PaCO_2$ and absolute $PaCO_2$ difference were analyzed. Additionally, the association between mild hypercapnia (6.0-7.30 kPa) and neurological outcome, its interaction with target temperature (33 °C and 36 °C), and the association between $PaCO_2$ and peak serum-Tau were evaluated. RESULTS: Of the 939 patients in the TTM trial, 869 were eligible for analysis. Ninety-six percent of patients were exposed to hypocapnia or hypercapnia. None of the analyses indicated a statistical significant association between $PaCO_2$ and neurological outcome (P = 0.13-0.96). Mild hypercapnia was not associated with neurological outcome (P = 0.78) and there was no statistically significant interaction with target temperature ($P_{interaction} = 0.95$). There was no association between $PaCO_2$ and peak serum-Tau levels 48 or 72 h after return of spontaneous circulation (ROSC). CONCLUSIONS: Dyscarbia is common after ROSC. No statistically significant association between $PaCO_2$ in the post-cardiac arrest phase and neurological outcome at 6 months after cardiac arrest was detected. There was no significant interaction between mild hypercapnia and temperature in relation to neurological outcome.

FREE FULL TEXT

3. Resuscitation. 2019 Jun 15. pii: S0300-9572(19)30222-9. doi:

10.1016/j.resuscitation.2019.06.009. [Epub ahead of print]

Value of EEG reactivity for prediction of neurologic outcome after cardiac arrest: Insights from the Parisian registry.

Benghanem S(1), Paul M(1), Charpentier J(2), Rouhani S(3), Hadj Salem OB(1), Guillemet L(1), Legriel S(4), Bougouin W(5), Pène F(1), Chiche JD(1), Mira JP(1), Dumas F(6), Cariou A(7).

Abstract

PURPOSE: To evaluate the predictive value of EEG reactivity assessment and confounders for neurological outcome after cardiac arrest. Methods: All consecutive patients admitted in a tertiary cardiac arrest center between 2007 and 2016 still alive 48 h after admission with at least one EEG recorded during coma. EEG reactivity was defined as a reproducible waveform change in amplitude or frequency following standardized stimulation. Each EEG was classified based on American Clinical Neurophysiology Society nomenclatures and classified in highly malignant (including status epilepticus), malignant, or benign EEG. We assessed the predictive values of EEG reactivity and sedation effect for neurologic outcome at ICU discharge using the Cerebral Performance Category scale (with CPC 1-2 assumed as favorable outcome and CPC 3-4-5 considered as poor outcome). Results: Among 428 patients, a poor outcome was observed in 80% patients. The median time to EEG recording was 3 (1-4) days and 51% patients had a non-reactive EEG. The positive predictive value (PPV) of a non-reactive EEG to predict an unfavorable outcome was 97.1% (IC95% 93.6-98.9), increasing to 98.3% (IC95 94.1-99.8) when the EEG had been performed without sedation. In multivariate analysis, a non-reactive EEG was associated with poor outcome (OR 12.6 IC95% 4.7-33.6; p < 0.001). In multivariate analysis, concomitant sedation was not statistically associated with EEG non-reactivity. The PPV of a benign EEG to predict favorable outcome was 49.7% (IC95% 41.5-57.9), increasing to 66.2% (IC95% 54.3-76.8) when EEG was recorded earlier, with ongoing sedation. CONCLUSIONS: After cardiac arrest, absence of EEG reactivity was predictive of unfavorable outcome. By contrast, a benign EEG was slightly predictive of a favorable outcome. Reactivity assessment may have important implications in the neuroprognostication process after cardiac arrest and could be influenced by sedation.

ORGANITZACIÓ I FORMACIÓ

1. Circ J. 2019 Jun 15. doi: 10.1253/circj.CJ-19-0065. [Epub ahead of print]

Public-Access Defibrillation and Survival of Out-of-Hospital Cardiac Arrest in Public vs. Residential Locations in Japan.

Kiguchi T(1), Kiyohara K(2), Kitamura T(3), Nishiyama C(4), Kobayashi D(1), Okabayashi S(1), Shimamoto T(1), Matsuyama T(5), Kawamura T(1), Iwami T(1).

Abstract

BACKGROUND: This study assessed whether the dissemination of public-access defibrillation (PAD) at the population level is associated with an increase in neurologically favorable outcomes among patients experiencing ventricular fibrillation (VF) in public vs. residential locations in Japan.Methods and Results:We enrolled adult patients with bystander-witnessed VF between 2013 and 2015. The primary outcome measure was 1-month neurologically favorable outcome defined by cerebral performance category 1 or 2. The number of survivors with neurologically favorable outcome attributed to PAD after VF arrest was estimated by location of arrest. A total of 16,252 adult patients with bystander-witnessed VF arrest were analyzed. In public locations, 29.3% (2,334/7,973) of out-of-hospital cardiac arrest (OHCA) patients received PAD, whereas 1.1% (89/8,279) of OHCA patients received PAD in residential locations. OHCA patients with PAD had significantly better neurological outcomes compared with those without PAD in public locations (51.8% vs. 25.5%, P<0.001), whereas there were no significant differences in neurologically favorable outcome between patients with or without PAD in residential locations (22.5% vs. 18.6%, P=0.357). The total number of patients with neurologically favorable outcomes attributed to PAD was estimated at 615 in public locations, but only 3 in residential locations. CONCLUSIONS: In Japan, when compared with residential locations, PAD works more successfully in public locations for adults with bystander-witnessed VF arrest.

2. CJEM. 2018 Jul;20(4):507-517. doi: 10.1017/cem.2017.429. Epub 2018 May 7.

Barriers and opportunities related to extracorporeal cardiopulmonary resuscitation for out-of-hospital cardiac arrest in Canada: A report from the first meeting of the Canadian ECPR Research Working Group.

Brooks SC(1), Shemie SD(2), Torrance S(3), Hornby L(3), Gillrie C(3), Grunau B(4), Nagpal AD(5), Baker A(6), Christenson J(4), Gill J(7), Morrison L(8).

NO ABSTRACT AVAILABLE

3. Emergencias. 2019 Jun;31(3):195-201.

Formación de escolares en soporte vital básico por sus propios profesores.

Villanueva Ordóñez MJ(1), Rey Galán C(2), Escamilla Pérez R(3), Crespo Ruiz F(1), Díaz González L(4), Martínez Bastida G(1).

Abstract

This project analyzed the feasibility, effectiveness, and sustainability of an educational project to teach cardiopulmonary resuscitation (CPR). This project has been carried out in a publicly subsidized school in a town in Asturias, Spain (population, over 80 000 inhabitants). The enrollment included students in preschool and both primary and secondary education classes. The project had 3 phases: 1) health care experts trained the teachers in CPR and they designed the educational project together; 2) health care experts taught CPR to schoolchildren, and 3) teachers taught CPR to the children. All the children enrolled in preschool and primary school (aged 3 to 12 years) initially participated in the study. Training followed the 2005 guidelines of the International Liaison Committee on Resuscitation (ILCOR) in effect at the time of the study. In the first phase (2006), 19 teachers (79.2% of the faculty) were trained in basic CPR and collaborated with the health care professionals in designing the course, including setting its objectives and developing materials. In the second phase (2006-2011), the health care professionals trained 646 preschool and primary school children and accredited 13 teachers (54.2% of the faculty) in the use of an automated external defibrillator (AED) and to serve as CPR instructional monitors. In the third phase (2012-2014), 7 teachers trained 703 preschool and primary and secondary school students, and 17 teachers (70.8% of the faculty) received training to become CPR monitors and/or to update their knowledge of AED use. A total of 1349 students between the ages of 3 and 15 years received instruction in CPR. The school has had an AED on its premises since 2011. The teachers have made further improvements in the courses, incorporating new teaching materials, updating the objectives, and extending instruction to secondary school students. The implementation of an educational program to teach CPR in a school that enrolls preschool through secondary school students was feasible and sustainable. Teachers have improved the program, extended it to secondary school students, and made the project known in the local media and on the school's web site, thus contributing to the creation of a CPR culture that reached out to the community.

ARTICLE IN ENGLISH, SPANISH; ABSTRACT AVAILABLE IN SPANISH FROM THE PUBLISHER

4. Emergencias. 2019 Jun;31(3):185-188.

Formación de escolares en soporte vital básico por sus propios profesores.

García Del Águila JJ(1), López Rebollo E(1), Escamilla Pérez R(1), Luque Gutiérrez M(2), Fernández Del Valle P(3), García Sánchez M(1), Lucena Serrano C(1), Vivar Díaz I(1), Berbel González F(4), López Pérez S(5), J Mellado Vergel F(6), Rosell Ortiz F(1).

Abstract

OBJECTIVES: To assess first-year secondary-school students' knowledge and performance of basic life support (BLS) 6 months after training given by their regular teachers during school hours. MATERIAL AND METHODS: Sixty-two teachers were trained in BLS instruction. They then instructed 1043 students. The students' knowledge increased significantly from mean (SD) scores of 4.42 (1.64) to 7.28 (1.85) (P < .001) and was maintained at 6 months (mean score, 5.15 [3.16]; P <.001). Performance skills were also maintained at 6 months, although the students had greater difficulty attaining ventilation targets. RESULTS: Sixty-two teachers were trained in BLS instruction. They then instructed 1043 students. The students' knowledge increased significantly from mean (SD) scores of 4.42 (1.64) to 7.28

(1.85) (P < .001) and was maintained at 6 months (mean score, 5.15 [3.16]; P < .001). Performance skills were also maintained at 6 months, although the students had greater difficulty attaining ventilation targets. CONCLUSION: Teachers' training of their own first-year secondary students during regular school hours led to changes in the students' attitudes toward the possibility of cardiac arrest and to the learning of BLS techniques.

ARTICLE IN ENGLISH, SPANISH; ABSTRACT AVAILABLE IN SPANISH FROM THE PUBLISHER

5. Health Soc Care Community. 2019 Jun 21. doi: 10.1111/hsc.12800. [Epub ahead ofprint]

The effect of automatic external defibrillator with a real-time feedback on quality of bystander cardiopulmonary resuscitation: A before-and-after simulation study.

Kim CH(1), Kim TH(2), Shin SD(2), Song KJ(3), Ro YS(4), Ahn KO(5), Hong KJ(2), Lee YJ(6), Lee EJ(7), Ha SY(8).

Abstract

High-quality bystander cardiopulmonary resuscitation (CPR) and early defibrillation in the community are important for survival in out-of hospital-cardiac-arrest, but maintaining the quality of CPR in bystanders is difficult. We aimed to determine the effect of an automated external defibrillator (AED) with real-time feedback on the quality of bystander CPR in a community setting. A before-and-after simulation study was designed. Trainees of basic life support education were recruited for the simulation experiment. Each team consisted of two bystanders with different roles (initial witness and CPR supporter). 82 teams performed simulation scenarios with the real-time feedback function of AED disabled initially, and then repeated it with feedback function enabled. Quality measures of chest compression depth and no-flow fraction were compared between each of the two simulation scenarios. CPR quality data from 82 teams were analysed. The mean percentage of chest compressions with adequate depth was significantly higher in simulations with real-time feedback (78.1% vs. 89.3%, p < 0.01). Similarly, no-flow fractions were lower in simulation scenarios with real-time feedback (32.0% vs. 30.3% p = 0.05). In a subgroup with the lowest percentage of adequate depth performance in the initial simulation without real-time feedback, a mean increase of 47.7% (95% CI 31.3-64.0) in the fraction of chest compressions with adequate depth was seen with real-time feedback. Use of an AED with real-time feedback improves the quality of bystander CPR in a simulated community setting. The positive effect of real-time feedback is greatest among people with a low level of CPR skill.

6. Resuscitation. 2019 Jun 17. pii: S0300-9572(19)30219-9. doi:10.1016/j.resuscitation.2019.06.006. [Epub ahead of print]

Outcome prediction of out-of-hospital cardiac arrest with presumed cardiac aetiology using an advanced machine learning technique.

Seki T(1), Tamura T(2), Suzuki M(3); SOS-KANTO 2012 Study Group.

Abstract

BACKGROUND: Outcome prediction for patients with out-of-hospital cardiac arrest (OHCA) has the possibility to detect patients who could have been potentially saved. Advanced machine learning techniques have recently been developed and employed for clinical studies. In this study, we aimed to establish a prognostication model for OHCA with presumed cardiac aetiology using an advanced machine learning technique. Methods and results: Cohort data from a prospective multi-centre cohort study for OHCA patients transported by an ambulance in the Kanto area of Japan between January 2012 and March 2013 (SOS-KANTO 2012 study) were analysed in this study. Of 16,452 patients, data for OHCA patients aged ≥18 years with presumed cardiac aetiology were retrieved, and were divided into two groups (training set: n = 5718, between January 1, 2012 and December 12, 2012; test set: n = 1608, between January 1, 2013 and March 31, 2013). Of 421 variables observed during prehospital and emergency department settings, 35 prehospital variables, or 35 prehospital and 18 in-hospital variables, were used for outcome prediction of 1-year survival using a random forest method. In validation using the test set, prognostication models trained with 35 variables, or 53 variables for 1-year survival showed area under the receiver operating characteristics curve (AUC) values of 0.943

(95% CI [0.930, 0.955]) and 0.958 (95% CI [0.948, 0.969]), respectively. CONCLUSIONS: The advanced machine learning technique showed favourable prediction capability for 1-year survival of OHCA with presumed cardiac aetiology. These models can be useful for detecting patients who could have been potentially saved.

7. Resuscitation. 2019 Jun 12;141:63-68. doi: 10.1016/j.resuscitation.2019.05.040. [Epub ahead of print]

Actual resuscitation actions after the training of chest compression-only CPR and AED use among new university students.

Nishiyama C(1), Sato R(2), Baba M(3), Kuroki H(4), Kawamura T(5), Kiguchi T(5), Kobayashi D(5), Shimamoto T(5), Koike K(6), Tanaka S(7), Naito C(8), Iwami T(5).

Abstract

BACKGROUND: Although cardiopulmonary resuscitation (CPR) training is recommended in schools, there are few attempts to train all students at universities and no reports showing actual resuscitation actions at emergency settings after the training. We surveyed how many students encountered a collapsed person, whether they performed any resuscitation actions, and any reasons why they could not do any resuscitation actions. METHODS: We have provided chest compression-only CPR and automated external defibrillator (AED) use training for 3000 new university students every April since 2015 and followed up on their subsequent emergency actions to collapsed persons in the real world. We carried out a questionnaire survey for 2nd through 4th-year students during the annual student health checkup period in 2018. RESULTS: A total of 7595 students underwent the annual health checkup and 5549 of them (73.1%) responded to the survey. The rates of encountering collapsed persons and out-of-hospital cardiac arrest (OHCA) patients were 2.5 and 1.1 per 100 person-years, respectively. Of the 264 students who encountered a collapsed person, 82 (53.6%) who encountered non-OHCA collapsed persons and 54 (48.6%) who encountered OHCA persons performed at least one resuscitation action including either chest compression, AED use, or any other various resuscitation actions. CONCLUSIONS: The incidence rate of encountering OHCA patients was 1.1 per 100 person-years and half of them who encountered a collapsed person performed at least one resuscitation action. Hands-on mass training would encourage university students to perform any resuscitation actions on the emergency scene.

1. Resuscitation. 2019 Jun 15;141:73-80. doi: 10.1016/j.**resuscitation**.2019.06.010. [Epub ahead of print]

A randomized education trial of spaced versus massed instruction to improve acquisition and retention of paediatric resuscitation skills in emergency medical service (EMS) providers.

Patocka C[1], Cheng A[2], Sibbald M[3], Duff JP[4], Lai A[5], Lee-Nobbee P[6], Levin H[7], Varshney T[8], Weber B[9], Bhanji F[10].

Abstract

AIM: Resuscitation courses are typically taught in a massed format despite existing evidence suggesting skill decay as soon as 3 months after training. Our study explored the impact of spaced versus massed instruction on acquisition and long-term retention of provider paediatric resuscitation skills. Methods: Providers were randomized to receive a paediatric resuscitation course in either a spaced (four weekly sessions) or massed format (two sequential days). Infant and adult chest compressions [CC], bag mask ventilation [BMV], and intraosseous insertion [IO] performance was measured using global rating scales. Results: Forty-eight participants completed the study protocol. Skill performance improved from baseline in both groups immediately following training. 3-months post-training the infant and adult CC scores remained significantly improved from baseline testing in both the massed and spaced groups; however, the infant BMV and IO scores remained significantly improved from baseline testing in the spaced: BMV (pre, 1.8 ± 0.7 vs post-3-months, 2.2 ± 7; P = 0.005) IO (pre, 2.5 ± 1 vs post-3-months, 3.1 ± 0.5; P = 0.04) but not in the massed groups: BMV (pre, 1.6 ± 0.5 vs post-3-months, 1.8 ± 0.5; P = 0.98) IO (pre, 2.6 ± 1.1 vs post-3-months, 2.7 ± 0.2; P = 0.98).CONCLUSION: 3-month retention of CC skills are similar regardless of training format; however, retention of other resuscitation skills may be better when taught in a spaced format.

CURES POST-RCE

1. Circ Arrhythm Electrophysiol. 2018 Mar;11(3):e005940. doi:10.1161/CIRCEP.117.005940.

Implantable Defibrillator Therapy in Cardiac Arrest Survivors With a Reversible Cause.

Ladejobi A(1), Pasupula DK(1), Adhikari S(1), Javed A(1), Durrani AF(1), Patil S(1), Qin D(1), Ahmad S(1), Munir MB(1), Rijal S(1), Wayne M(1), Adelstein E(1), Jain S(1), Saba S(2).

Abstract

BACKGROUND: Current guidelines recommend implantable cardioverter-defibrillator (ICD) therapy in survivors of sudden cardiac arrest (SCA), except in those with completely reversible causes. We sought to examine the impact of ICD therapy on mortality in survivors of SCA associated with reversible causes. Methods and results: We evaluated the records of 1433 patients managed at our institution between 2000 and 2012 who were discharged alive after SCA. A reversible and correctable cause was identified in 792 (55%) patients. Reversible SCA cause was defined as significant electrolyte or metabolic abnormality, evidence of acute myocardial infarction or ischemia, recent initiation of antiarrhythmic drug or illicit drug use, or other reversible circumstances. Of the 792 SCA survivors because of a reversible and correctable cause (age 61±15 years, 40% women), 207 (26%) patients received an ICD after their index SCA. During a mean follow-up of 3.8±3.1 years, 319 (40%) patients died. ICD implantation was highly associated with lower all-cause mortality (*P*<0.001) even after correcting for unbalanced baseline characteristics (*P*<0.001). In subgroup analyses, only patients whose SCA was not associated with myocardial infarction extracted benefit from ICD (*P*<0.001). CONCLUSIONS: In survivors of SCA because of a reversible and correctable cause, ICD therapy is associated with lower all-cause mortality except if the SCA was because of myocardial infarction. These data deserve further investigation in a prospective multicenter randomized controlled trial, as they may have important and immediate clinical implications.

2. Crit Care. 2018 May 12;22(1):126. doi: 10.1186/s13054-018-2042-9.

TIMP-2/IGFBP7 predicts acute kidney injury in out-of-hospital cardiac arrest survivors.

Adler C(1), Heller T(2), Schregel F(2), Hagmann H(3), Hellmich M(4), Adler J(2), Reuter H(2)(5).

Abstract

BACKGROUND: Acute kidney injury (AKI) is a common complication after cardiopulmonary resuscitation (CPR) and predicts in-hospital mortality. To which extent post-resuscitation disease or the initial event of cardiac arrest and the duration of insufficient cardiac output triggers AKI is challenging to discriminate. Knowledge on molecular mediators of AKI is scarce. Early identification of patients at high risk of AKI is hampered by the low sensitivity of the established tests in clinical routine practice. The present study aimed to determine the diagnostic utility of the novel urine biomarkers tissue inhibitor of metalloproteinases-2 (TIMP-2) and insulin-like growth factor-binding protein 7 (IGFBP7) for the early recognition of AKI in patients with non-traumatic shock. Methods: The performance of [TIMP-2]·[IGFBP7] was prospectively analysed in 48 patients with shock following out-of-hospital cardiac arrest (OHCA). All patients were treated with target temperature management (TTM) for 24 h. Urinary [TIMP-2]·[IGFBP7] samples were collected at 3 and 24 h after determination of OHCA. Results: Patients (n = 31 (65%)) developed AKI after an average of 26 ± 12 h. Patients who developed AKI had significantly higher [TIMP-2]·[IGFBP7] compared to individuals that did not develop AKI (1.52 ± 0.13 vs. 0.13 ± 0.14; p < 0.05) as early as 3 h after determination of OHCA,. For urine [TIMP-2]*[IGFBP7], the area under the curve (AUC) for the development of AKI was 0.97 (CI 0.90-1.00) at 3 h after OHCA. The optimal [TIMP-2]·[IGFBP7] cut-off value for the prediction of AKI was 0.24. The sensitivity was 96.8% and specificity was 94.1%. CONCLUSIONS: Urinary [TIMP-2]•[IGFBP7] reliably predicts AKI in high-risk patients only 3 h after determination of OHCA with a cut-off at 0.24. This novel

test may help to identify patients at high risk of AKI to enrol into clinical studies to further elucidate the pathophysiology of AKI and devise targeted interventions in the future.

3. Crit Care Res Pract. 2019 May 7;2019:4384796. doi: 10.1155/2019/4384796. eCollection 2019.

Urine β-2-Microglobulin, Osteopontin, and Trefoil Factor 3 May Early Predict Acute Kidney Injury and Outcome after Cardiac Arrest.

Beitland S(1)(2), Nakstad ER(3), Berg JP(1)(4), Trøseid AS(4), Brusletto BS(4), Brunborg C(5), Lundqvist C(1)(6), Sunde K(1)(2).

Abstract

PURPOSE: Acute kidney injury (AKI) is a common complication after out-of-hospital cardiac arrest (OHCA), leading to increased mortality and challenging prognostication. Our aim was to examine if urine biomarkers could early predict postarrest AKI and patient outcome. Methods: A prospective observational study of resuscitated, comatose OHCA patients admitted to Oslo University Hospital in Norway. Urine samples were collected at admission and day three postarrest and analysed for *β*-2-microglobulin (*β*2M), osteopontin, and trefoil factor 3 (TFF3). Outcome variables were AKI within three days according to the Kidney Disease Improving Global Outcome criteria, in addition to six-month mortality and poor neurological outcome (PNO) (cerebral performance category 3-5). Results: Among 195 included patients (85% males, mean age 60 years), 88 (45%) developed AKI, 88 (45%) died, and 96 (49%) had PNO. In univariate analyses, increased urine *β*2M, osteopontin, and TFF3 levels sampled at admission and day three were independent risk factors for AKI, mortality, and PNO. Exceptions were that *β*2M measured at day three did not predict any of the outcomes, and TFF3 at admission did not predict AKI. In multivariate analyses, combining clinical parameters and biomarker levels, the area under the receiver operating characteristics curves (95% CI) were 0.729 (0.658-0.800), 0.797 (0.733-0.861), and 0.812 (CI 0.750-0.874) for AKI, mortality, and PNO, respectively. CONCLUSIONS: Urine levels of *β*2M, osteopontin, and TFF3 at admission and day three were associated with increased risk for AKI, mortality, and PNO in comatose OHCA patients. This trail is registered with NCT01239420.

4. Med Glas (Zenica). 2019 Aug 1;16(2). doi: 10.17392/1040-19. [Epub ahead of print]

Therapeutic hypothermia as a treatment option after out-ofhospital cardiac arrest: our experience.

Iglica A(1), Godinjak A(2), Begić E(3)(4), Hodžić E(1), Zvizdić F(1), Kukavica N(1), Aganović K(1), Šabanović-Bajramović N(1), Kukuljac A(5), Gojak R(6).

Abstract

Aim To examine the effects of therapeutic hypothermia on the outcome of patients with the diagnosis of out-of-hospital cardiac arrest (OHCA). Methods The study included 76 patients who were hospitalised at the Medical Intensive Care Unit (MICU) of the Clinical Centre University of Sarajevo, with the diagnosis of out-of-hospital cardiac arrest, following the return of spontaneous circulation. Therapeutic hypothermia was performed with an average temperature of 33°C (32.3 - 34.1° C) on the patients who had coma, according to the Glasgow Coma Scale (GCS). Results Multiple organ dysfunction syndrome (MODS) significantly affected survival (p=0.0001), as its presence reduced patients' survival by 96%. In addition, ventricular fibrillation (VF) as the presenting rhythm, also significantly affected survival (p=0.019). A degree of patient's coma, as measured by the GCS, significantly affected survival (p=0.011). For each increasing point on the GCS, the chance for survival increased twice. Moreover, other physiological factors such as the pH and the lactate serum levels significantly affected patients' survival (p=0.012 and p=0.01, respectively). Conclusion In patients with the diagnosis of OHCA who underwent to the treatment with therapeutic hypothermia, verified VF as a presenting rhythm was a positive predictive factor for their outcome. Therefore, therapeutic hypothermia represents an option of therapeutic modality for this type of patients.

5. Resuscitation. 2019 Jun 16. pii: S0300-9572(19)30221-7. doi: 10.1016/j.resuscitation.2019.06.008. [Epub ahead of print]

The urine biomarkers TIMP2 and IGFBP7 can identify patients who will experience severe acute kidney injury following a cardiac arrest: A prospective multicentre study.

Titeca-Beauport D(1), Daubin D(2), Chelly J(3), Zerbib Y(4), Brault C(5), Diouf M(6), Slama M(7), Vinsonneau C(8), Klouche K(9), Maizel J(10).

Abstract

AIM: To determine whether the urine biomarkers tissue inhibitor of metalloproteinases-2 (TIMP-2) and insulin-like growth factor-binding protein 7 (IGFBP7) can identify patients who will develop severe acute kidney injury (AKI) soon after cardiac arrest. Methods: We performed a prospective, multicentre study in three French ICUs. The performance of [TIMP-2]*[IGFBP7] was assessed for urine samples collected a median [IQR] of 240 [169-315] minutes post-collapse. The primary end-point was severe AKI (KDIGO stage 3), within 48 h of admission. Results: Of the 115 patients analyzed, 32 (28%) developed severe AKI. Eleven of these required renal replacement therapy. The median [IQR] baseline [TIMP-2]*[IGFBP7] level was higher in patients who developed severe AKI (1.57 [0.80-6.62] $(ng/ml)^2/1000$) than in those who did not (0.17 [0.05-0.59] $(ng/ml)^2/1000$; $p < 0.001$). The baseline [TIMP2]*[IGFBP7] predicted -severe AKI with an area under the curve [95% confidence interval (CI)] of 0.91 [0.84-0.95], an optimal cut-off value of 0.39 $(ng/ml)^2/1000$, a sensitivity [95%CI] of 97% [84-100], and a specificity of 72% [61-82]. A cut-off of 2.0 $(ng/ml)^2/1000$ yielded a specificity of 98% [92-100]. For predicting severe AKI, baseline [TIMP-2]*[IGFBP7] was significantly more discriminant than baseline SCr (AUC [95%CI]: 0.73 [0.63-0.84]; $p = 0.005$), and slightly but not significantly more discriminant than baseline UO (AUC [95%CI]: 0.86 [0.78–0.94], $p = 0.08$) Combining the baseline [TIMP2]*[IGFBP7] with baseline SCr and UO significantly improved the latter markers' predictive performance. CONCLUSION: Urine [TIMP-2]*[IGFBP7] effectively identify patients with a risk of severe AKI. Below a cut-off of 0.39 $(ng/ml)^2/1000$, the risk of severe AKI is low.

TARGETED TEMPERATURE MANAGEMENT

1. Acta Anaesthesiol Scand. 2019 Jun 17. doi: 10.1111/aas.13386. [Epub ahead ofprint]

Age-associated outcomes after survived out-of-hospital cardiac arrest and subsequent target temperature management.

Pätz T(1), Stelzig K(2), Pfeifer R(3), Pittl U(4), Thiele H(4), Busch HJ(5), Reinhard I(6), Wolfrum S(2).

Abstract

BACKGROUND: The registry of the German Society of Intensive Care and Emergency Medicine was founded to analyze outcome of modern post-resuscitation care. Methods: A total of 902 patients were analyzed in this retrospective, multicenter, and population-based observational trial on individuals suffering from out-of-hospital cardiac arrest. All patients had return of spontaneous circulation (ROSC) and received TTM after admitted to an intensive care unit. Outcome was focused on age and analyzed by creating 4 subgroups (<65, 65-74, 75-84, ≥85 years). Twenty-eight day and 180-day survival and a favorable neurological outcome according to the Cerebral Performance Category scale were evaluated as clinical endpoints. Results: At 28-day and 180-day follow-up, 44.8% and 53.4% of all patients had died, respectively. The evaluation of survival rate by age category revealed a higher mortality, but not an unfavorable neurological prognosis with increasing age. In multiple stepwise regressions, age, time to ROSC, bystander resuscitation, and cardiac cause of cardiac arrest were associated with increased chance of 180-day survival and, in addition, bystander resuscitation, time of hypoxia, and a defibrillation performed by emergency medical service were associated with a favorable neurological outcome at 180-day follow-up. CONCLUSION: Increasing age was associated with a higher mortality,

but not with an unfavorable neurological outcome. The majority of survivors had a favorable neurologic outcome 6 months after cardiac arrest.

ELECTROFISIOLOGIA I DESFIBRIL·LACIÓ

1. Am J Emerg Med. 2018 Aug;36(8):1474-1479. doi: 10.1016/j.ajem.2018.04.060. Epub

2018 Apr 30.

Dual defibrillation in patients with refractory ventricular fibrillation.

Hajjar K(1), Berbari I(2), El Tawil C(1), Bou Chebl R(1), Abou Dagher G(3).

Abstract

In the setting of cardiac arrest, refractory ventricular fibrillation (VF) is difficult to manage, and mortality rates are high. Double sequential defibrillation (DSD) has been described in the literature as a successful means to terminate this malignant rhythm, after failure of traditional Advanced Cardiac Life Support (ACLS) measures. The authors herein present a case of refractory VF in a patient with cardiac arrest, on whom DSD was successful in reversion to sinus rhythm, and provide a thorough review of similar cases in the literature.

2. Circ Arrhythm Electrophysiol. 2018 Feb;11(2):e005762. doi: 10.1161/CIRCEP.117.005762.

Repolarization Heterogeneity Measured With T-Wave Area Dispersion in Standard 12-Lead ECG Predicts Sudden Cardiac Death in General Population.

Kenttä TV(1), Sinner MF(2), Nearing BD(2), Freudling R(2), Porthan K(2), Tikkanen JT(2), Müller-Nurasyid M(2), Schramm K(2), Viitasalo M(2), Jula A(2), Nieminen MS(2), Peters A(2), Salomaa V(2), Oikarinen L(2), Verrier RL(2), Kääb S(2), Junttila MJ(2), Huikuri HV(2).

Abstract

BACKGROUND: We developed a novel electrocardiographic marker, T-wave area dispersion (TW-Ad), which measures repolarization heterogeneity by assessing interlead T-wave areas during a single cardiac cycle and tested whether it can identify patients at risk for sudden cardiac death (SCD) in the general population. Methods and results: TW-Ad was measured from standard digital 12-lead ECG in 5618 adults (46% men; age, 50.9±12.5 years) participating in the Health 2000 Study-an epidemiological survey representative of the Finnish adult population. Independent replication was performed in 3831 participants of the KORA S4 Study (Cooperative Health Research in the Region of Augsburg; 49% men; age, 48.7±13.7 years; mean follow-up, 8.8±1.1 years). During follow-up (7.7±1.4 years), 72 SCDs occurred in the Health 2000 Survey. Lower TW-Ad was univariately associated with SCD (0.32±0.36 versus 0.60±0.19; *P*<0.001); it had an area under the receiver operating characteristic curve of 0.809. TW-Ad (≤0.46) conferred a hazard ratio of 10.8 (95% confidence interval, 6.8-17.4; *P*<0.001) for SCD; it remained independently predictive of SCD after multivariable adjustment for clinical risk markers (hazard ratio, 4.6; 95% confidence interval, 2.7-7.4; *P*<0.001). Replication analyses performed in the KORA S4 Study confirmed an increased risk for cardiac death (unadjusted hazard ratio, 5.5; 95% confidence interval, 3.2-9.5; *P*<0.001; multivariable adjusted hazard ratio, 1.9; 95% confidence interval, 1.1-3.5; *P*<0.05). CONCLUSION: Low TW-Ad, reflecting increased heterogeneity of repolarization, in standard 12-lead resting ECGs is a powerful and independent predictor of SCD in the adult general population.

3. JACC Cardiovasc Imaging. 2019 Jun 8. pii: S1936-878X(19)30430-9. doi:

10.1016/j.jcmg.2019.03.025. [Epub ahead of print]

Prediction of Ventricular Arrhythmias With Left Ventricular Mechanical Dispersion: A Systematic Review and Meta-Analysis.

Kawakami H(1), Nerlekar N(1), Haugaa KH(2), Edvardsen T(2), Marwick TH(3).

Abstract

OBJECTIVES: The aim of this study was to assess the association between left ventricular mechanical dispersion (LVMD) and the incidence of ventricular arrhythmias (VAs). Background: Recent, mainly single-center, studies have demonstrated that LVMD assessed using speckle tracking might be a powerful marker in risk stratification for VA. A systematic review and meta-analysis provides a means of understanding the prognostic value of this parameter, relative to other parameters, the most appropriate cutoff for designating risk. Methods: A systemic review of studies reporting the predictive value of LVMD for VA was undertaken from a search of MEDLINE and Embase. VA events were defined as sudden cardiac death, cardiac arrest, documented ventricular tachyarrhythmia, and appropriate implantable cardioverter-defibrillator (ICD) therapy. Hazard ratios were extracted from univariate and multivariate models reporting on the association of LVMD and VA and described as pooled estimates with 95% confidence intervals. In a meta-analysis, the predictive value of LVMD was compared with that of left ventricular ejection fraction and global longitudinal strain. Results: Among 3,198 patients in 12 published studies, 387 (12%) had VA events over follow-up ranging from 17 to 70 months. Patients with VAs had greater LVMD than those without (weighted mean difference -20.3 ms; 95% confidence interval: -27.3 to -13.2; $p < 0.01$). Each 10 ms increment of LVMD was significantly and independently associated with VA events (hazard ratio: 1.19; 95% confidence interval: 1.09 to 1.29; $p < 0.01$). The predictive value of LVMD was superior to that of left ventricular ejection fraction or global longitudinal strain. CONCLUSIONS: LVMD assessed using speckle tracking provides important predictive value for VA in patients with a number of cardiac diseases and appears to have superior predictive value over left ventricular ejection fraction and global longitudinal strain for risk stratification.

PEDIATRIA

1. Minerva Pediatr. 2019 Apr;71(2):159-173. doi: 10.23736/S0026-4946.18.05452-X. Epub 2018 Dec 3.

Evidence for vasopressors during cardiopulmonary resuscitation in newborn infants.

O'reilly M(1)(2), Schmölzer GM(3)(2).

Abstract

An estimated 0.1% of term infants and up to 15% of preterm infants (2-3 million worldwide) need extensive resuscitation, defined as chest compression and 100% oxygen with or without epinephrine in the delivery room. Despite these interventions, infants receiving extensive resuscitation in the DR have a high incidence of mortality and neurologic morbidity. Successful resuscitation from neonatal cardiac arrest requires the delivery of high-quality chest compression using the most effective vasopressor with the optimal dose, timing, and route of administration during CPR. Current neonatal resuscitation guidelines recommend administration of epinephrine once CPR has started at a dose of 0.01-0.03 mg/kg preferably given intravenously, with repeated doses every 3-5 min until return of spontaneous circulation. This review examines the current evidence for epinephrine and alternative vasopressors during neonatal cardiopulmonary resuscitation.

RECERCA EXPERIMENTAL

1. Brain Res. 2019 Jun 12. pii: S0006-8993(19)30339-7. doi:10.1016/j.brainres.2019.06.012. [Epub ahead of print]

Mesenchymal stem cells derived from induced pluripotent stem cells play a key

role in immunomodulation during cardiopulmonary resuscitation.

Yu Y(1), Wang D(2), Li H(3), Fan J(4), Liu Y(5), Zhao X(3), Wu J(3), Jing X(6).

Abstract

BACKGROUND: /Aims Previous in vitro experiments have demonstrated the immunomodulatory functions of mesenchymal stem cells derived from induced pluripotent stem cells (iPSC-MSCs) in brain injury. We have tried to further understand these functions by investigating the neuroprotective effects of iPSC-MSCs in a rat model of cardiac arrest (CA). METHODS: CA was induced in adult Sprague-Dawley rats by transcutaneous electrical epicardium stimulation. The rats were divided into four groups. In a separate cohort of sham operation animals, iPSC-MSCs or PBS was infused via the femoral vein after restoration of spontaneous circulation. Survival was evaluated every 2 h until 24h after CA. Markers of classically activated macrophages (M1) and alternatively activated (M2) macrophages were assessed by qPCR and western blot analysis, and the gene expression profiles of the macrophages were studied in order to identify differentially expressed proteins. RESULTS: The 24-h survival rate was significantly different between the CPR group and iPSC-MSC group (P = 0.033). Additionally, a significant number of mRNAs were differentially expressed between the iPSC-MSC and PBS group. Compared with the sham operation group, both M1 (27/29) and M2 (2/29) mRNAs showed a significant increase in expression in the CPR group, while only M2 (22) mRNAs showed a significant increase in expression in the iPSC-MSC group. Western blotting analysis showed that the expression of Arg-1 and CD14 (M2 macrophage markers) was increased in the iPSC-MSC group (P < 0.05), while CD86 and iNOS (M1 macrophage markers) expression was increased in the CPR group (P < 0.05). CONCLUSION: IPSC-MSCs, which play a key role in immunomodulation, downregulate the level of M1 macrophages and upregulate the level of M2 macrophages after CA.

2. J Trauma Acute Care Surg. 2019 Apr 18. doi: 10.1097/TA.0000000000002315. [Epub ahead of print]

Selective Aortic Arch Perfusion with fresh whole blood or HBOC-201 reverses hemorrhage-induced traumatic cardiac arrest in a lethal model of non-compressible torso hemorrhage.

Hoops HE(1), Manning JE(2), Graham TL(3), McCully BH(3), McCurdy SL(2), Ross JD(3).

Abstract

BACKGROUND: Hemorrhage-induced traumatic cardiac arrest (HiTCA) has a dismal survival rate. Previous studies demonstrated selective aortic arch perfusion (SAAP) with fresh whole blood (FWB) improved the rate of return of spontaneous circulation (ROSC) after HiTCA, compared to REBOA and CPR. Hemoglobin-based oxygen carriers, such as HBOC-201, may alleviate the logistical constraints of using FWB in a prehospital setting. It is unknown whether SAAP with HBOC-201 is equivalent in efficacy to FWB, whether conversion from SAAP to Extracorporeal Life Support (ECLS) is feasible, and whether physiologic derangement post-SAAP therapy is reversible. Methods: Twenty-six swine (79±4kg) were anesthetized and underwent HiTCA which was induced via liver injury and controlled hemorrhage. Following arrest, swine were randomly allocated to resuscitation using SAAP with FWB (n=12) or HBOC-201 (n=14). After SAAP was initiated, animals were monitored for a 20-minute pre-hospital period prior to a 40-minute damage control surgery and resuscitation phase, followed by 260 minutes of critical care. Primary outcomes included rate of ROSC, survival, conversion to ECLS, and correction of physiology. Results: Baseline physiologic measurements were similar between groups. ROSC was achieved in 100% of the FWB animals and 86% of the HBOC-201 animals (p=0.483). Survival (t=320-min) was 92% (11/12) in the FWB group and 67% (8/12) in the HBOC-201 group (p=0.120). Conversion to ECLS was successful in 100% of both groups. Lactate peaked at 80 minutes in both groups, and significantly improved by end of experiment in the HBOC-201 group (p=0.001) but not in the FWB group (p=0.104). There was no significant difference in peak or end lactate between groups. CONCLUSIONS: SAAP is effective in eliciting ROSC after HiTCA in a swine model, using either FWB or HBOC-201. Transition from SAAP to ECLS after definitive hemorrhage control is feasible, resulting in high overall survival and improvement in lactic acidosis over the study period. Level of evidence: Basic science, therefore this study does not require a defined level ofevidence STUDY TYPE: Therapeutic.

CASE REPORTS

1. Age Ageing. 2019 Jun 17. pii: afz070. doi: 10.1093/ageing/afz070. [Epub ahead of print]

Fatal acute haemopericardium associated with rivaroxaban in a patient with non-valvular atrial fibrillation.

Omer S(1), Magezi F(2), Patel M(3), Alsawaf A(4).

Abstract

An 82-year-old female was admitted with chest pain and non-specific T wave changes on her ECG. After 72 hours of conservative management she deteriorated Vwith non-specific symptoms including nausea and a single episode of vomiting.

Abdominal and Chest X-rays were unremarkable, blood tests showed worsening Acute Kidney Injury (AKI) on Chronic Kidney Disease (CKD); and raised C-Reactive Protein (CRP) with no obvious symptoms or focus of infection. She rapidly

deteriorated going into asystole cardiac arrest and attempts at resuscitation failed. Post-mortem examination suggested the most likely cause of death was acute spontaneous Haemopericardium due to Rivaroxaban therapy which she was on

for non-valvular Atrial Fibrillation (AF). We believe that this might be the first reported mortality with Rivaroxaban-associated spontaneous haemopericardium in the UK.

2. BMJ Case Rep. 2019 Mar 8;12(3). pii: e228208. doi: 10.1136/bcr-2018-228208.

A case of refractory ventricular fibrillation successfully treated with low-dose

esmolol.

Hwang CW(1), Gamble G(1), Marchick M(1), Becker TK(1).

Abstract

Current advanced cardiac life support (ACLS) guidelines for the management of ventricular fibrillation (VF) and pulseless ventricular tachycardia is defibrillation. However, refractory VF, which is defined as VF that persists despite three defibrillation attempts, is challenging for all ACLS providers; the best resuscitation strategy for patients that persist in refractory VF remains unclear. We report on a 51-year-old man who presented to the emergency department with chest pain and subsequently went into witnessed VF cardiac arrest. Despite standard ACLS management consisting of high-quality cardiopulmonary resuscitation, serial epinephrine and serial defibrillation, the return of spontaneous circulation (ROSC) was unable to be achieved. Double sequential defibrillation (DSD) was attempted multiple times unsuccessfully. After administration of low-dose esmolol, he immediately achieved ROSC. DSD and β-blockade are increasingly recognised in the literature and practice for refractory VF. However, to the best of our knowledge, this is the first case of refractory VF that responded to low-dose esmolol β-blockade.

3. Chest. 2018 Jan;153(1):e1-e3. doi: 10.1016/j.chest.2017.07.041.

A Man in his 80s With Refractory Hypoxia and Shock Postcardiac Arrest.

He T(1), Quintero L(2), Koenig S(2).

NO ABSTRACT AVAILABLE

4. Int Heart J. 2019 Jun 14. doi: 10.1536/ihj.18-659. [Epub ahead of print]

Cardiac Rupture Due to Reinfarction in the Early Phase of Apical Myocardial Infarction.

Matsumura K(1), Kin H(1), Matsuki R(1), Adachi K(1), Goda T(1), Yamamoto Y(1), Sugiura T(2), Shiojima I(3).

Abstract

A 72-year-old woman with hypertension, dyslipidemia, and diabetes mellitus presented to our hospital because of the sudden onset of chest pain. Emergency coronary angiography showed acute occlusion of the distal left anterior descending artery and coronary intervention with a drug-eluting stent was performed. Sudden cardiopulmonary arrest occurred on the sixth day of hospitalization, but coronary angiography showed no remarkable progression of the coronary artery diseases, including the site of stent implantation. An autopsy revealed that the cause of the sudden death was apical free wall rupture. In addition, the different timing of acute and sub-acute infarct findings were observed in the apical wall by histology, which indicated cardiac rupture was due to reinfarction at early phase of apical acute myocardial infarction. Although the rate of mechanical complications, including cardiac rupture, is decreasing in the era of primary coronary intervention, in addition to the well-known risk factors of cardiac rupture, the reinfarction of the culprit myocardial site in the early phase of acute myocardial infarction was considered as a possible risk factor of cardiac rupture.

5. J Med Case Rep. 2019 Jun 15;13(1):194. doi: 10.1186/s13256-019-2096-6.

Out-of-hospital cardiac arrest and survival in a patient with Noonan syndrome and multiple lentigines: a case report.

Eichhorn C(1), Voges I(2)(3), Daubeney PEF(1)(4).

Abstract

BACKGROUND: A 9-year-old Arabic boy attending middle school presented with an out-of-hospital cardiac arrest due to ventricular fibrillation recorded by Holter electrocardiographic monitoring. He had a background history of Noonan syndrome with multiple lentigines (also known as LEOPARD syndrome), a rare condition of autosomal dominant inheritance with approximately 200 cases reported worldwide. Case presentation: Apart from characteristic features, the boy was known to have asymmetric septal hypertrophy with a maximum wall thickness of 24 mm measured by cardiovascular magnetic resonance imaging. A day prior to the event, he attended cardiology follow-up at our institution, and Holter monitoring was commenced. Following cardiopulmonary resuscitation by bystanders and paramedics, he reverted back into sinus rhythm after a total downtime of 24 min. He was initially treated in the intensive care unit and underwent implantable cardioverter defibrillator implantation. He has made a full recovery and remains at the top of his class. CONCLUSION: This case demonstrates that sudden cardiac arrest in patients with secondary forms of hypertrophic cardiomyopathy is not necessarily protected by apparently favorable phenotypes and that events may be preceded by non-sustained ventricular tachycardia observed by Holter monitoring. Implantable cardioverter defibrillator implantation plays a critical role in both primary and secondary prevention in patients at high risk of out-of-hospital cardiac arrest.