

## REGISTRES, REVISIONS I EDITORIALS

1. **Dtsch Arztebl Int.** 2018 Aug 20;115(33-34):541-548. doi: 10.3238/arztebl.2018.0541.  
**The Effect of Ambulance Response Time on Survival Following Out-of-Hospital Cardiac Arrest.**  
Bürger A1, Wnent J, Bohn A, Jantzen T, Brenner S, Lefering R, Seewald S, Gräsner JT, Fischer M.  
Abstract

BACKGROUND: Out of hospital cardiac arrest (OHCA) is one of the more common causes of death in Germany. Ambulance response time is an important planning parameter for emergency medical services (EMS) systems. We studied the effect of ambulance response time on survival after resuscitation from OHCA.

METHODS: We analyzed data from the German Resuscitation Registry for the years 2010-2016. First, we used a multivariate logistic regression analysis to determine the effect of ambulance response time (defined as the interval from the alarm to the arrival of the first rescue vehicle) on the hospital-discharge rate (in percent), depending on various factors, including resuscitation by bystanders. Second, we compared faster and slower EMS systems (defined as those arriving on the scene within 8 minutes in more than 75% of cases or in  $\leq$  75% of cases) with respect to the frequency of resuscitation and the number of surviving patients.

RESULTS: Our analysis of data from a total of 10 853 patients in the logistical regression model revealed that the rate of hospital discharge was significantly affected by the ambulance response time, bystander resuscitation, past medical history, age, witnessed vs. unwitnessed collapse, the initial heart rhythm, and the site of the collapse. The success of resuscitation was inversely related to the ambulance response time; thus, among patients who did not receive bystander resuscitation, the discharge rate declined from 12.9% at a mean response time of 1 minute and 10 seconds to 6.4% at a mean response time of 9 minutes and 47 seconds. Twelve faster EMS systems and 13 slower ones were identified, with a total of 9669 and 7865 resuscitated patients, respectively. The faster EMS systems initiated resuscitation more frequently and also had a higher discharge rate with good neurological outcome in proportion to the population of the catchment area (7.7 versus 5.6 persons per 100 000 population per year, odds ratio [OR] 0.72, 95% confidence interval [0.66; 0.79],  $p < 0.001$ ).

CONCLUSION: Rapid ambulance response is associated with a higher rate of survival from OHCA with good neurological outcome. The response time, independently of whether bystander resuscitation measures are provided, has a significant independent effect on the survival rate. In drawing conclusions from these findings, one should bear in mind that this was a retrospective registry study, with the corresponding limitations.

2. **Resuscitation.** 2018 Aug 29. pii: S0300-9572(18)30799-8. doi: 10.1016/j.resuscitation.2018.08.022.  
[Epub ahead of print]

**Global Resuscitation Alliance Utstein Recommendations for Developing Emergency Care Systems to Improve Cardiac Arrest Survival.**

Nadarajan GD1, Tiah L2, Ho Ho AFW2, Azazh A2, Castren MK2, Chong SL2, El Sayed MJ2, Hara T2, Leong BS2, Lippert FK2, Ma MHM2, Ng YY2, Ohn HM2, Overton J2, Pek PP2, Perret S2, Wallis LA2, Wong KD2, Ong MEH2.

Abstract

INTRODUCTION: The Global Resuscitation Alliance (GRA) was established in 2015 to improve survival for Out-of-Hospital Cardiac Arrest (OHCA) using the best practices developed by the Seattle Resuscitation Academy. However, these 10 programs were recommended in the context of developed Emergency Care Systems (ECS). Implementing these programs can be challenging for ECS at earlier stages of development. We aimed to explore barriers faced by developing ECS and to establish prerequisites needed. We also developed a framework by which developing ECS may use to build their emergency response capability.

METHOD: A consensus meeting was held in Singapore on 1st-2nd August 2017. The 74 participants were key stakeholders from 26 countries, including Emergency Medical Services (EMS) directors, physicians and academics, including two Physicians who sit on the World Health Organisation (WHO) panel for development of Emergency Care Systems. Five discussion groups examined the chain of survival: community, dispatch, ambulance and hospital; a separate group considered perinatal resuscitation. Discussion points were voted upon to reach a consensus.

RESULTS: The answers and discussion points from each group were classified into a table adapted

from WHO's framework of development for Emergency Services. After which, it was used to construct the modified survival framework with the chain of survival as the backbone. Eleven key statements were then derived to describe the pre-requisites for achieving the GRA 10 programs. The participants eventually voted on the importance and feasibility of these 11 statements as well as the GRA 10 programs using a matrix that is used by organisations to prioritise their action steps. CONCLUSION: In this paper, we propose a modified framework of survival for developing ECS systems. There are barriers for developing ECS systems to improve OHCA survival rates. These barriers may be overcome by systematic prioritisation and cost-effective innovative solutions.

3. **Am J Emerg Med.** 2018 Aug 29. pii: S0735-6757(18)30717-4. doi: 10.1016/j.ajem.2018.08.066. [Epub ahead of print]

**Clinical characteristics of elderly drowning patients.**  
Lee DH1, Park JH2, Choi SP3, Oh JH4, Wee JH5.  
Abstract

**PURPOSE:** Drowning is one of the major causes of traumatic death. The impact of drowning in the elderly and patients who were not elderly will be different because of physiological differences. We wanted to analyze the clinical differences such as mortality, incidence rate of complications, degree of hypothermia and rate of cardiac arrest between elderly and adult drowning patients. **METHODS:** This study included drowning patients over 18 years old who came to an emergency department (ED) located on a riverside from September 1997 to July 2016. Patients over the age of 65 years were classified as elderly, while those under the age of 65 years were classified as adults. Demographic data and clinical outcomes were surveyed. **RESULTS:** A total of 611 patients were included in this study. Sixty-one patients (9.9%) were elderly, and 550 patients (90.1%) were adults. There were 17 elderly patients (15.8%) and 87 adult patients (27.9%) who had cardiac arrest at the time of ED arrival ( $p = 0.017$ ). The rate of body temperatures  $< 34^{\circ}\text{C}$  was higher in elderly patients than that in adult patients (27.9% vs 17.5%, respectively,  $p = 0.025$ ). The rates of hospitalization in the intensive care unit (icu) and mortality were higher in elderly group (23% vs 15.1%, respectively,  $p = 0.01$ ; 37.7% vs 21.8%, respectively,  $p = 0.01$ ). There was no significant difference in suicidal intent between the elderly and adult patient groups (82.0% vs 78.9%, respectively,  $p = 0.421$ ). **CONCLUSIONS:** Elderly drowning patients accounted for approximately 1/10 of all drowning cases and were more likely to experience a cardiac arrest, hypothermia, mortality, and ICU admission.

4. **Curr Cardiol Rev.** 2018;14(2):79-84. doi: 10.2174/1573403X14666180507160555.  
**Improving Community Survival Rates from Out-of-Hospital Cardiac Arrest.**  
Rao P1, Kern KB1.  
Abstract

Out of hospital cardiac arrest affects 350,000 Americans yearly and is associated with a high mortality rate. Improving survival rates in this population rests on the prompt and effective implementation of four key principles. These include 1) early recognition of cardiac arrest 2) early use of chest compressions 3) early defibrillation, which in turn emphasizes the importance of public access defibrillation programs and potential for drone technology to allow for early defibrillation in private or rural settings 4) early and aggressive post-arrest care including the consideration of therapeutic hypothermia, early coronary angiography +/- percutaneous coronary intervention and a hyper-invasive approach to out-of-hospital refractory cardiac arrest.

## LESIONS ASOCIADAS A LA RCP

1. **J Intensive Care.** 2018 Aug 28;6:54. doi: 10.1186/s40560-018-0325-5. eCollection 2018.  
**Pericardial injury from chest compression: a case report of incidental release of cardiac tamponade.**  
Aoyagi S1, Kosuga T1, Wada K1, Nata S1, Yasunaga H1.  
Abstract

Background: Although chest compression is a standard technique in cardiopulmonary resuscitation, it is well recognized that manual chest compression causes various internal injuries, of which major

injuries are often fatal. Similarly, when cardiac tamponade occurs in patients with type A acute aortic dissection, many patients die before reaching the hospital. We report a rare case in which chest compressions caused pericardial laceration that may have inadvertently played a life-saving role in releasing cardiac tamponade induced by acute aortic dissection.

Case presentation:

A 67-year-old woman developed cardiac arrest soon after complaining of epigastric pain, and after successful resuscitation by manual chest compression, she was transferred to our hospital. On arrival, the patient was 14 on the Glasgow Coma Scale. An ECG showed a normal sinus rhythm, and no arrhythmias or signs of myocardial ischemia were observed. A chest X-ray revealed left pleural effusion, while cardiomegaly and pneumothorax were not identified. Computed tomography revealed type A aortic dissection, mild pericardial effusion, and massive left pleural effusion. No pulmonary embolus was found on the CT. After drainage of bloody effusion from the left pleural space, an emergency operation was begun. During surgery, a pericardial laceration with communication to the left pleural space and a hemothorax were found; however, no cardiac injury was identified. No other intra-thoracic injuries or rupture of the aortic dissection causing the hemothorax were detected. Hemiarch replacement was performed without difficulty, but the patient died of multi-organ failure 30 days after surgery.

Conclusions: We report a case of pericardial injury without skeletal fracture caused by chest compression. The pericardial laceration may have inadvertently served to release the cardiac tamponade induced by the acute aortic dissection, resulting in the hemothorax, and provided time to receive surgery.

Free Article

## FÀRMACS

1. **Resuscitation.** 2018 Sep 1. pii: S0300-9572(18)30807-4. doi: 10.1016/j.resuscitation.2018.08.025. [Epub ahead of print]

**Effectiveness of antiarrhythmic drugs for shockable cardiac arrest: A systematic review.** Ali MU1, Fitzpatrick-Lewis D2, Kenny M1, Raina P 1, Atkins DL3, Soar J4, Nolan J5, Ristagno G6, Sherifali D7.

Abstract

**PURPOSE:** The purpose of this systematic review is to provide up-to-date evidence on effectiveness of antiarrhythmic drugs for shockable cardiac arrest to help inform the 2018 International Liaison Committee on Resuscitation Consensus on Science with Treatment Recommendations.

**METHODS:** A search was conducted in electronic databases Medline, Embase, and Cochrane Library from inception to August 15, 2017.

**RESULTS:** Of the 9,371 citations reviewed, a total of 14 RCTs and 17 observational studies met our inclusion criteria for adult population and only 1 observational study for pediatric population. Based on RCT level evidence for adult population, none of the anti-arrhythmic drugs showed any difference in effect compared with placebo, or with other anti-arrhythmic drugs for the critical outcomes of survival to hospital discharge and discharge with good neurological function. For the outcome of return of spontaneous circulation, the results showed a significant increase for lidocaine compared with placebo (RR = 1.16; 95% CI, 1.03 to 1.29, p = 0.01).

**CONCLUSION:** The high level evidence supporting the use of antiarrhythmic drugs during CPR for shockable cardiac arrest is limited and showed no benefit for critical outcomes of survival at hospital discharge, survival with favorable neurological function and long-term survival. Future high quality research is needed to confirm these findings and also to evaluate the role of administering antiarrhythmic drugs in children with shockable cardiac arrest, and in adults immediately after ROSC.

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## TRAUMA

1. **Mil Med.** 2018 Sep 1;183(suppl\_2):55-59. doi: 10.1093/milmed/usy143.

**Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for Hemorrhagic Shock.** Cannon J1, Morrison J1, Lauer C1, Grabo D1, Polk T1, Blackbourne L1, Dubose J1, Rasmussen T1.

Author information:

1. Joint Trauma System, 3698 Chambers Pass, Joint Base San Antonio, Fort Sam Houston, TX. Abstract

This clinical practice guideline (CPG) reviews the range of accepted management approaches to profound shock and post-traumatic cardiac arrest and establishes indications for considering Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) as a hemorrhage control adjunct. The specific management approach - within the parameters of mission, resources, and tactical situation - will depend on the casualty's physical location, mechanism and pattern of injury, and the experience level of the surgeon. The optimal management strategy is best determined by the surgeon at the bedside.

2. **Mil Med.** 2018 Sep 1;183(suppl\_2):36-43. doi: 10.1093/milmed/usy112. **Damage Control Resuscitation.**

Cap AP1, Pidcock HF1, Spinella P1, Strandenes G1, Borgman MA1, Schreiber M1, Holcomb J1, Tien HC1, Beckett AN1, Doughty H1, Woolley T1, Rappold J1, Ward K1, Reade M1, Prat N1, Ausset S1, Kheirabadi B1, Benov A1, Griffin EP1, Corley JB1, Simon CD1, Fahie R1, Jenkins D1, Eastridge BJ1, Stockinger Z1. Abstract

Damage control resuscitation (DCR) is a strategy for resuscitating patients from hemorrhagic shock to rapidly restore homeostasis. Efforts are focused on blood product transfusion with whole blood or component therapy closely approximating whole blood, limited use of crystalloid to avoid dilutional coagulopathy, hypotensive resuscitation until bleeding control is achieved, empiric use of tranexamic acid, prevention of acidosis and hypothermia, and rapid definitive surgical control of bleeding. Patients receiving uncrossmatched Type O blood in the emergency department and later receiving cumulative transfusions of 10 or more red blood cell units in the initial 24-hour post-injury (massive transfusion) are widely recognized as being at increased risk of morbidity and mortality due to exsanguination. Ideally, these patients should be rapidly identified, however anticipating transfusion needs is challenging. Useful indicators of massive transfusion reviewed in this guideline include: systolic blood pressure <110 mmHg, heart rate >105 bpm, hematocrit <32%, pH <7.25, injury pattern (above-the-knee traumatic amputation especially if pelvic injury is present, multi-amputation, clinically obvious penetrating injury to chest or abdomen), >2 regions positive on Focused Assessment with Sonography for Trauma (FAST) scan, lactate concentration on admission >2.5, admission international normalized ratio ≥1.2-1.4, near infrared spectroscopy-derived StO<sub>2</sub> <75% (in practice, rarely available), base deficit >6 meq/L. Unique aspects of out-of-hospital DCR (point of injury, en-route, and remote DCR) and in-hospital (Medical Treatment Facilities: Role 2b/Forward surgical teams - role 3/ combat support hospitals) are reviewed in this guideline, along with pediatric considerations.

3. **BMJ Open.** 2018 Sep 5;8(9):e022464. doi: 10.1136/bmjopen-2018-022464.

**Emergency medical dispatch recognition, clinical intervention and outcome of patients in traumatic cardiac arrest from major trauma: an observational study.**

Prentice C1, Jeyanathan J1,2, De Coverly R1, Williams J1,3,4, Lyon R1,5. Abstract

**OBJECTIVES:** The aim of this study is to describe the demographics of reported traumatic cardiac arrest (TCA) victims, prehospital resuscitation and survival to hospital rate. **SETTING:** Helicopter Emergency Medical Service (HEMS) in south-east England, covering a resident population of 4.5 million and a transient population of up to 8 million people. **PARTICIPANTS:** Patients reported on the initial 999 call to be in suspected traumatic cardiac arrest between 1 July 2016 and 31 December 2016 within the trust's geographical region were identified. The inclusion criteria were all cases of reported TCA on receipt of the initial emergency call. Patients were subsequently excluded if a medical cause of cardiac arrest was suspected. **OUTCOME MEASURES:** Patient records were analysed for actual presence of cardiac arrest, prehospital resuscitation procedures undertaken and for survival to hospital rates. **RESULTS:** 112 patients were reported to be in TCA on receipt of the 999/112 call. 51 (46%) were found not to be in TCA on arrival of emergency medical services. Of the 'not in TCA cohort', 34 (67%) received at least one advanced prehospital medical intervention (defined as emergency anaesthesia, thoracostomy, blood product transfusion or resuscitative thoracotomy). Of the 61 patients in actual TCA, 10 (16%) achieved return-of-spontaneous circulation. In 45 (88%) patients, the HEMS team escorted the patient to hospital.

CONCLUSION: A significant proportion of patients reported to be in TCA on receipt of the emergency call are not in actual cardiac arrest but are critically unwell requiring advanced prehospital medical intervention. Early activation of an enhanced care team to a reported TCA call allows appropriate advanced resuscitation. Further research is warranted to determine which interventions contribute to improved survival.

Free Article

4. **S Afr Med J.** 2018 Jul 25;108(8):660-666. doi: 10.7196/SAMJ.2018.v108i8.12670. **Emergency intubation in trauma in KwaZulu-Natal Province, South Africa.** Lewis CT1, Brown J, Inglis AC, Naumann DN, Crombie N. Abstract

BACKGROUND: Advanced airway management is a research priority in prehospital care. There is a high burden of major trauma in KwaZulu-Natal (KZN) Province, South Africa (SA), and transfer times to trauma units are often prolonged. OBJECTIVES: To examine emergency intubation practice in trauma and burns patients in Pietermaritzburg, KZN, and its environs. METHODS: This was a prospective consecutive case series, conducted from 11 May to 17 July 2016. Data were collected from urban emergency department (ED), rural hospital and roadside procedures in Pietermaritzburg and its drainage area. Patients with emergency intubation following trauma were eligible for inclusion. The primary outcome was successful airway management. Secondary outcomes included first-pass success and adverse events. RESULTS: Forty-one cases were recorded in patients aged 1 - 60 years. No instances of unsuccessful airway management were reported. Recorded first-pass intubation success rates were higher in receiving EDs than rural hospitals (19/22 v. 2/7;  $p=0.003$ ). Use of a formal preintubation checklist was associated with a higher first-pass success rate (21/23 v. 6/15;  $p=0.001$ ) and fewer adverse events (0/23 v. 7/16;  $p<0.001$ ). Identified adverse event rates were 1/22 (EDs), 5/8 (rural hospitals) and 2/9 (roadside). Unmedicated intubation was more common in rural hospitals than EDs (3/8 v. 1/22;  $p=0.019$ ), despite absence of cardiac arrest in these cases. Minimum standards of anaesthetic monitoring were not consistently met in any setting. CONCLUSIONS: The use of a preprocedural checklist was associated with improved intubation outcomes and may improve practice in SA trauma care and the prehospital environment, including in rural hospitals. Standardised rapid sequence induction protocols, routine use of introducers and end-tidal carbon dioxide monitoring, and increased availability of intraosseous devices also merit consideration. Key performance indicators should be monitored routinely.

Free Article

## VENTILACIÓ

1. **J Int Med Res.** 2018 Sep 5;300060518786916. doi: 10.1177/0300060518786916. [Epub ahead of print] **Arterial blood gas changes during cardiac arrest and cardiopulmonary resuscitation combined with passive oxygenation/ventilation: a METI HPS study.** Strnad M1,2,3, Lešnik D2,3, Križmarić M1,2. Abstract

Objective High-fidelity simulators can simulate physiological responses to medical interventions. The dynamics of the partial arterial pressure of oxygen (PaO<sub>2</sub>), partial arterial pressure of carbon dioxide (PaCO<sub>2</sub>), and oxygen pulse saturation (SpO<sub>2</sub>) during simulated cardiopulmonary resuscitation (CPR) were observed and compared with the results from the literature. Methods Three periods of cardiac arrest were simulated using the METI Human Patient Simulator™ (Medical Education Technologies, Inc., Sarasota, FL, USA): cardiac arrest, chest compression-only CPR, and chest compression-only CPR with continuous flow insufflation of oxygen (CFIO). Results In the first period, the observed values remained constant. In the second period, PaCO<sub>2</sub> started to rise and peaked at 63.5 mmHg. In the CFIO period, PaCO<sub>2</sub> slightly fell. PaO<sub>2</sub> and SpO<sub>2</sub> declined only in the second period, reaching their lowest values of 44 mmHg and 70%, respectively. In the CFIO period, PaO<sub>2</sub> began to rise and peaked at 614 mmHg. SpO<sub>2</sub> exceeded 94% after 2 minutes of CFIO. Conclusions The METI Human Patient Simulator™ accurately simulated the dynamics of changes in PaCO<sub>2</sub>. Use of this METI oxygenation model has some limitations because the simulated levels of PaO<sub>2</sub> and SpO<sub>2</sub> during cardiac arrest correlate poorly with the results from published studies.

2. **Resuscitation.** 2018 Aug 30. pii: S0300-9572(18)30829-3. doi: 10.1016/j.resuscitation.2018.08.032. [Epub ahead of print]

**How much experience do rescuers require to achieve successful tracheal intubation during cardiopulmonary resuscitation?**

Young Kim S1, Park SO2, Kim JW1, Sung J3, Lee KR1, Lee YH4, Young Hong D1, Baek KJ1.  
Abstract

**AIM:** The cardiopulmonary resuscitation (CPR) guidelines recommend that endotracheal intubation (ETI) should be performed only by highly skilled rescuers. However, the definition of 'highly skilled' is unclear. This study evaluated how much experience with ETI is required for rescuers to perform successful ETI quickly without complications including serious chest compression interruption (interruption time <10 sec) or="" oesophageal="" intubation="" during="" cpr="">  
**METHODS:** This was a clinical observation study using review of CPR video clips in an urban emergency department (ED) over 2 years. Accumulated ETI experience and performance of ETI were analysed. Main outcomes were 1) 'qualified ETI': successful ETI within 60 sec without complications and 2) 'highly qualified ETI': successful ETI within 30 sec without complications.  
**RESULTS:** We analysed 110 ETIs using direct laryngoscopy during CPR. The success rate improved and the time to successful ETI decreased with increasing experience; however, the total interruption time of chest compression did not decrease. A 90% success rate for qualified ETI required 137 experiences of ETIs (1,218 days of training). A 90% success rate for highly qualified ETI required at least 243 experiences of ETIs (1,973 days of training).  
**CONCLUSIONS:** Accumulated experience can improve the ETI success rate and time to successful ETI during CPR. Because ETI must be performed quickly without serious interruption of chest compression during CPR, becoming proficient at ETI requires more experience than that required for non-arrest patients. In our analysis, more than 240 experiences were required to achieve a 90% success rate of highly qualified ETI.

**ECOGRAFIA**

**EN**

**L'ACR**

1. **Prehosp Emerg Care.** 2018 Sep 7:1-19. doi: 10.1080/10903127.2018.1518505. [Epub ahead of print]

**Feasibility of Out-of-Hospital Cardiac Arrest Ultrasound by EMS Physicians.**

Fitzgibbon JB, Lovallo E, Escajeda J, Radomski MA, Martin-Gill C.  
Abstract

**INTRODUCTION:** Point-of-care ultrasound (POCUS) has been suggested as a useful tool to predict survival and guide interventions in out-of-hospital cardiac arrest (OHCA). While POCUS has been deployed in prehospital settings, little data exists on prehospital use, particularly by personnel with limited ultrasound experience. We aimed to characterize the feasibility and barriers to prehospital POCUS during OHCA by EMS physicians in training.  
**METHODS:** We deployed the SonoSite iViz portable ultrasound device for use by EMS physicians for OHCA in an urban EMS system. All physicians received POCUS education as part of their graduate medical training and were provided an instructional video on use of the SonoSite iViz device. POCUS use was limited to identifying cardiac motion during pulse checks, without interrupting resuscitation, and the results could be used to supplement management at the physicians' discretion. Data were recorded prospectively by saving images on the device and through a custom electronic form within the patient care report. The primary measure was the frequency of use of POCUS during OHCA. Secondarily, we characterized agreement by expert (ultrasound fellowship trained) faculty (using a kappa statistic) and identified reported barriers to the use of prehospital POCUS.  
**RESULTS:** From November 2016 to March 2017, 348 physician field responses were reviewed, including 127 cases of OHCA. There were 106 patients remaining in arrest on physician arrival, with 56 (52.8%) cases of POCUS use. Still or video images were recorded in 48 cases; video in 34 cases. From video images, agreement in identifying cardiac motion between the EMS physician and expert reviewer occurred in 91% of cases (K = 0.82). Reasons cited for not using POCUS included return of circulation soon before or after arrival, prioritizing clinical interventions, not having the ultrasound device, mechanical failure, and cessation of resuscitation per advanced directives.  
**CONCLUSION:** Use of POCUS by EMS physicians to detect cardiac activity in OHCA is feasible and correlates with expert interpretation. Several avoidable barriers were identified and should be considered in the future implementation of prehospital POCUS. Larger studies are needed to

determine what role POCUS may play in prehospital cardiac arrest management.

## ORGANITZACIÓ

I

## ENTRENAMENT

1. **Crit Care Clin.** 2018 Apr;34(2):259-266. doi: 10.1016/j.ccc.2017.12.009. Epub 2018 Feb 13. **Intensivist Presence at Code Events Is Associated with High Survival and Increased Documentation Rates.**

Romig M1, Duval-Arnould J2, Winters BD3, Newton H4, Sapirstein A3. Abstract

To better support the highest function of the Johns Hopkins Hospital adult code and rapid response teams, a team leadership role was created for a faculty intensivist, with the intention to integrate improve processes of care delivery, documentation, and decision-making. This article examines process and outcomes associated with the introduction of this role. It demonstrates that an intensivist has the potential to improve patient care while offsetting costs through improved billing capture.

## CURES

## POST

1. **Curr Cardiol Rev.** 2018;14(2):85-91. doi: 10.2174/1573403X14666180517080828. **Role of Cardiac Catheterization Lab Post Resuscitation in Patients with ST Elevation Myocardial Infarction.**

Reddy S1, Lee KS1. Abstract

BACKGROUND: Cardiac arrest remains a common and lethal condition associated with high morbidity and mortality. Even with improving survival rates, the successfully resuscitated post cardiac arrest patient is also at risk for poor neurological outcomes, functional status and long-term survival if not managed appropriately. Given that acute coronary occlusion has been found to be the leading cause of cardiac arrest, long-term prognosis is good in selected patients after successful out-of-hospital resuscitation and ST elevation myocardial infarction who are taken for immediate coronary angiography, treated with primary percutaneous coronary intervention and hypothermia when indicated.

CONCLUSION: A priority should therefore be placed in diagnosing as quickly as possible patients who have an acute coronary occlusion (i.e. ST elevation myocardial infarction) and implementing the appropriate and timely therapeutic strategy, which will require close chain of survival co-ordination and the services of the cardiac catheterization lab. Here we review previous and current guidelines as well as associated evidence.

2. **Curr Cardiol Rev.** 2018;14(2):92-96. doi: 10.2174/1573403X14666180507154107. **The Role of Coronary Catheterization Laboratory in Post-Resuscitation Care of Patients Without ST Elevation Myocardial Infarction.**

Kumar K1, Lotun K2. Abstract

BACKGROUND: Out of hospital cardiac arrest management of patients with non-ST myocardial infarction per current American Heart Association and European Resuscitation Council guidelines leave the decision in regard to early angiography up to the physician operators. Guidelines are clear on the positive impact of early intervention on survival and improvement on left ventricular function in patients presenting with cardiac arrest and ST elevation myocardial infarction on electrocardiogram. This review aims to analyze the data that current guidelines are based upon in regards to out of hospital cardiac arrest with electrocardiogram findings of non-ST elevation myocardial infarction as well as review of other clinical trials that support early angiography and reperfusion strategies. CONCLUSION: Analysis of current literature shows that early coronary evaluation in patients with no finding of ST elevation on ECG can help improve survival in patients suffering out of hospital cardiac arrest.

3. **Scand Cardiovasc J.** 2018 Sep 5:1-6. doi: 10.1080/14017431.2018.1503707. [Epub ahead of print] **Use of renal replacement therapy after out-of-hospital cardiac arrest in Denmark 2005-2013.** Winther-Jensen M1, Kjaergaard J1, Lassen JF1, Køber L1, Torp-Pedersen C2, Hansen SM2, Lippert F3,

**OBJECTIVES:** Renal replacement therapy (RRT) is used to treat acute kidney injury as part of multi organ failure. Use and prognostic implications after out-of-hospital cardiac arrest (OHCA) is not well known. This study aims to assess incidence and use of RRT and whether RRT post-arrest was associated with 30-day mortality in Denmark in the years 2005-2013.  
**METHODS:** The Danish Cardiac Arrest Registry holds information on all OHCA patients in Denmark from 2005 to 2013. We identified 3,012 one-day survivors of OHCA  $\geq 18$  years, with presumed cardiac aetiology of arrest, admitted to ICU without previous RRT. Change in use of RRT during the study period was assessed using competing risk analysis. Mortality was assessed with Cox regression.  
**RESULTS:** On average, RRT was performed in 6% of the patient population with an average annual 1% increase, HR: 1.01, CI: 0.95-1.07,  $p = .69$ . Hazard of RRT was lower in patients receiving bystander cardiopulmonary resuscitation (CPR) ( $p < .001$ ), patients with a shockable primary rhythm ( $p = .009$ ) and elderly patients ( $p = .03$ ). Socioeconomic factors did not influence hazard of rrt, but patients admitted to tertiary centres had higher hazard of rrt ( $p = .009$ ). Use of rrt was associated with increased mortality in multivariate cox regression (hr: 1.28, ci: 1.06-1.55,  $p = .01$ ).  
**CONCLUSION:** Use of RRT as part of post resuscitation care following OHCA did not increase from 2005 to 2013; use was more common in tertiary centres and in patients with negative prehospital predictors (no bystander CPR, non-shockable rhythm). RRT was associated with increased mortality.

**TARGET TEMPERATURE MANAGEMENT**

1. **Curr Cardiol Rev.** 2018;14(2):97-101. doi: 10.2174/1573403X14666180507154849.  
**Targeted Temperature Management; Review of Literature and Guidelines; A Cardiologist's Perspective.**

Hashim T1, Shetty R1.  
Abstract

**BACKGROUND:** Out of Hospital Cardiac Arrest (OHCA) remains not an uncommon occurrence in USA and the rest of the world. However, the survival to discharge following an episode of OHCA in adults is still very disappointing at around 10%. Several areas of improvement including education of general public in early Cardio Pulmonary Resuscitation (CPR) by bystander, chest compression first, and improvement of Emergency Medical response time have had a positive effect on the outcomes and survival but still much needs to be done. Recently, new data has emerged with regards to post resuscitation care and mild induced hypothermia (now preferably called; Targeted Temperature Management {TTM}) and several advances have been made.  
**CONCLUSION:** The purpose of this review is to summarize and compare the most recent guidelines and also provide a practical approach to TTM especially with regards to the field of cardiology.

**ECMO**

1. **Resuscitation.** 2018 Aug 29. pii: S0300-9572(18)30821-9. doi: 10.1016/j.resuscitation.2018.08.030.  
[Epub ahead of print]

**Surviving Refractory Out-of-Hospital Ventricular Fibrillation Cardiac Arrest: Critical Care and Extracorporeal Membrane Oxygenation Management.**

Bartos JA1, Carlson K2, Carlson C2, Raveendran G2, John R3, Aufderheide TP4, Yannopoulos D2.  
Author information:

Abstract

**BACKGROUND:** Resuscitation of refractory out-of-hospital ventricular fibrillation/ventricular tachycardia (VF/VT) cardiac arrest using extracorporeal membrane oxygenation (ECMO) establishes a complex patient population. We aimed to describe the critical care strategies and outcomes in this population.

**METHODS:** Between December 1, 2015 and January 1, 2018, 100 consecutive adult patients with refractory VF/VT out-of-hospital cardiac arrest and ongoing CPR were transported to the cardiac



catheterization laboratory. ECMO, coronary angiography, and percutaneous coronary intervention were performed. Patients achieving an organized cardiac rhythm were admitted to the cardiac intensive care unit (CICU). All patients were considered eligible for necessary intervention/surgery until declaration of death.

**RESULTS:** Of 100 appropriately transported patients, 83 achieved CICU admission. 40/83 (48%) discharged functionally intact. Multi-system organ failure occurred in all patients. Cardiac, pulmonary, renal, and liver injury improved within 3-4 days. Neurologic injury caused death in 26/37 (70%) patients. Poor neurologic outcomes were associated with anoxic injury or cerebral edema on admission head CT, decline in cerebral oximetry over the first 48 hours, and elevated neuron specific enolase on CICU admission. For survivors, mean time to ECMO decannulation was  $3.5 \pm 0.2$  days, following commands at  $5.7 \pm 0.8$  days, and hospital discharge at  $21 \pm 3.2$  days. 41/83 (49%) patients developed infections. CPR caused traumatic injury requiring procedural/surgical intervention in 22/83 (27%) patients.

**CONCLUSIONS:** Multi-system organ failure is ubiquitous but treatable with adequate hemodynamic support. Neurologic recovery was prolonged requiring delayed prognostication. Immediate 24/7 availability of surgical and medical specialty expertise was required to achieve 48% functionally intact survival.

2. **Transplant Proc.** 2018 Sep;50(7):1957-1961. doi: 10.1016/j.transproceed.2018.02.159. Epub 2018 Mar 15.

**"Extracorporeal Membrane Oxygenation for Greater Poland" Program: How to Save Lives and Develop Organ Donation?**

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**Abstract**

The "ECMO for Greater Poland" program takes full advantage of the extracorporeal membrane oxygenation (ECMO) perfusion therapy opportunities to promote the health of the 3.5 million inhabitants in the region. The main implementation areas are treatment of patients with hypothermia; severe reversible respiratory failure (RRF); critical states resulting in heart failure, that is, cardiac arrest, cardiogenic shock, or acute intoxication; and promotion of the donor after circulatory death (DCD) strategy in selected organ donor cases, after unsuccessful life-saving treatment, to achieve organ recovery. This organizational model is complex and expensive, so we used advanced high-fidelity medical simulation tests to prepare for real-life experience. Over the course of 4 months we performed scenarios including "ECMO for DCD," "ECMO for extended cardiopulmonary resuscitation," "ECMO for RRF," and "ECMO in hypothermia." Soon after these simulations, Maastricht category II DCD procedures were performed involving real patients and resulting in 2 successful double kidney transplantations for the first time in Poland. One month later we treated 2 hypothermia patients (7 adult patients with heart failure and 5 patients with reversible respiratory failure) with ECMO for the first time in the region. Fortunately, we have discovered an important new role of medical simulation. It can be used not only for skills testing but also as a tool to create non-existing procedures and unavailable algorithms. The result of these program activities will promote the care and treatment of patients in critical condition with ECMO therapy as well as increase the potential organ pool from DCDs in the Greater Poland region of Poland.

**CASE**

**REPORTS**

1. **J Med Case Rep.** 2018 Sep 1;12(1):244. doi: 10.1186/s13256-018-1780-2. **Successful treatment of out-of-hospital cardiopulmonary arrest due to streptococcal toxic shock syndrome - effectiveness of extracorporeal membrane oxygenation and the rapid antigen group A streptococcus test: a case report.**

Mizuguchi Y1, Taniguchi N2, Takahashi A2.

**Abstract**

**BACKGROUND:** Streptococcal toxic shock syndrome caused by *Streptococcus pyogenes*, a group A streptococcus, infection is a rare condition that rapidly progresses to multiple organ failure, shock, and death. It is thus important to promptly establish a diagnosis, provide hemodynamic support, and

initiate appropriate antibiotics therapy.  
CASE PRESENTATION: A 70-year-old Asian man presented with ventricular fibrillation. Extracorporeal membrane oxygenation was initiated 20 minutes after admission after unsuccessful conventional cardiopulmonary resuscitation including five attempts of electrical cardioversion. On the sixth attempt, a sinus rhythm was obtained. A physical examination revealed a large abscess in his right gluteal region, and computed tomography showed a large low-density area in the right gluteus maximus. Blood examination revealed elevated levels of inflammatory markers, hepatic enzymes, creatinine, and creatinine kinase. Transthoracic echocardiography demonstrated diffuse hypokinesis with an ejection fraction of 25%. A subsequent coronary angiography revealed normal findings. Therefore, we diagnosed our patient as having septic shock and conducted surgical drainage. A rapid antigen group A streptococcus test yielded positive results, which necessitated treatment comprising benzylpenicillin and clindamycin. He was successfully weaned from extracorporeal membrane oxygenation and continuous hemodiafiltration 4 days later and ventilation 9 days later; he was later transferred to another hospital to receive a skin graft.  
CONCLUSIONS: Our case report is the first to demonstrate the successful treatment of cardiac arrest caused by streptococcal toxic shock syndrome via extracorporeal membrane oxygenation and prompt initiation of antibiotic therapy. The rapid antigen group A streptococcus test may be an effective approach to promptly diagnose streptococcal toxic shock syndrome caused by group A streptococcus infection.

Free

Article

2. **Brain Inj.** 2018 Sep 5:1-3. doi: 10.1080/02699052.2018.1496479. [Epub ahead of print] **'Thunder bolts and lightning': survival and neurorehabilitation following out of hospital cardiac arrest secondary to lightning strike.**

Anketell J1, Wilson FC1, McCann J1.

Abstract

BACKGROUND: There is a limited evidence base to inform patient management following lightning-induced injuries.

CASE REPORT: A 36-year-old right-handed Caucasian male struck by lightning while outdoors suffered an out-of-hospital cardiac arrest with a recorded 50-min interval before the restoration of spontaneous circulation. Multiple life threatening injuries were sustained and a profound peripheral neuropathy developed. Cognitively, he was remarkably intact. We document his acute admission and his recovery during an inpatient stay in a UK-based Neurorehabilitation Unit.

CONCLUSION: Intensive neurorehabilitation in this case improved functional independence and facilitated neuropsychological recovery, to the point that our patient was discharged to independent living. This case offers some support to the hypothesis that the electrical activity of a lightning strike can be both cardioprotective and neuroprotective, and that prolonged cardiopulmonary resuscitation is warranted in such cases