



RESUSITATION

CARDIAC? BRAIN? or TOGETHER?

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- Cardiovascular diseases => 1st cause of death all around the World
- The major mortality is from sudden cardiac death (SCD)
- SCD is mostly occurred out of hospital cardiac arrest (OHCA)
- 25% of patients have a return of spontaneous circulation (ROSC)
- < 10 % of patients survive



- Primary cardiac arrest => life threatening ventricular arrhythmia
- breathing is normal before the arrest
- arterial blood O₂ saturation is near normal.
- Secondary cardiac arrest => respiratory insufficiency
- drowning, drug overdose
- arterial blood O₂ saturation ↓



Cardiocerebral Resuscitation (CCR)

1* Community Component

**To educate the bystanders to recognize the arrest immediately and begin 3C «Check, Call, Compress»

**Educations to recognize the «gasping» a sign of cardiac arrest

**«gasping» is defined as primitive form of respiration which is initiated in the brain.

2* Chest Compression-Only CPR (CO-CPR) or Hands only CPR

3* Cardiac Receiving Centers

CO-CPR



Chest Compression–Only CPR by Lay Rescuers and Survival From Out-of-Hospital Cardiac Arrest

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OUT-OF-HOSPITAL CARDIAC arrest is a major public health problem, affecting approximately 300 000 individuals in the United States annually.¹ Although survival rates vary considerably, overall survival is generally less than 10% among those in whom resuscitation is attempted.² The provision of bystander cardiopulmonary resuscitation (CPR) significantly improves outcome³ but is generally per-

Context Chest compression–only bystander cardiopulmonary resuscitation (CPR) may be as effective as conventional CPR with rescue breathing for out-of-hospital cardiac arrest.

Objective To investigate the survival of patients with out-of-hospital cardiac arrest using compression-only CPR (COCPR) compared with conventional CPR.

Design, Setting, and Patients A 5-year prospective observational cohort study of survival in patients at least 18 years old with out-of-hospital cardiac arrest between January 1, 2005, and December 31, 2009, in Arizona. The relationship between layperson bystander CPR and survival to hospital discharge was evaluated using multivariable logistic regression.

Main Outcome Measure Survival to hospital discharge.

Results Among 5272 adults with out-of-hospital cardiac arrest of cardiac etiology not observed by responding emergency medical personnel, 779 were excluded because bystander CPR was provided by a health care professional or the arrest occurred in a medical facility. A total of 4415 met all inclusion criteria for analysis, including 2900 who received no bystander CPR, 666 who received conventional CPR, and 849 who received COCPR. Rates of survival to hospital discharge were 5.2% (95% confidence interval [CI], 4.4%-6.0%) for the no bystander CPR group, 7.8% (95% CI, 5.8%-9.8%) for conventional CPR, and 13.3% (95% CI, 11.0%-15.6%) for COCPR. The adjusted odds ratio (AOR) for survival for conventional CPR vs no CPR was 0.99 (95% CI, 0.69-1.43), for COCPR vs no CPR, 1.59 (95% CI, 1.18-2.13), and for COCPR vs conventional CPR, 1.60 (95% CI, 1.08-2.35). From 2005 to 2009, lay rescuer CPR increased from 28.2% (95% CI, 24.6%-31.8%) to 39.9% (95% CI, 36.8%-42.9%; $P < .001$); the proportion of CPR that was COCPR increased from 19.6% (95% CI, 13.6%-25.7%) to 75.9% (95% CI, 71.7%-80.1%; $P < .001$). Overall survival increased from 3.7% (95% CI, 2.2%-5.2%) to 9.8% (95% CI, 8.0%-11.6%; $P < .001$).

Conclusion Among patients with out-of-hospital cardiac arrest, layperson compression-only CPR was associated with increased survival compared with conventional CPR and no bystander CPR in this setting with public endorsement of chest compression–only CPR.

JAMA. 2010;304(13):1447-1454

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- 5 year,prospective observational study
- Patients ≥ 18 years
- 666 patients received conventional CPR
- 849 patients received COCPR
- $\Rightarrow$ the patients received COCPR had increased survival rates.



Resuscitation Science

Dissemination of Chest Compression–Only Cardiopulmonary Resuscitation and Survival After Out-of-Hospital Cardiac Arrest

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Background—The best cardiopulmonary resuscitation (CPR) technique for survival after out-of-hospital cardiac arrests (OHCAs) has been intensively discussed in the recent few years. However, most analyses focused on comparison at the individual level. How well the dissemination of bystander-initiated chest compression–only CPR (CCCPR) increases survival after OHCAs at the population level remains unclear. We therefore evaluated the impact of nationwide dissemination of bystander-initiated CCCPR on survival after OHCA.

Methods and Results—A nationwide, prospective, population-based, observational study covering the whole population of Japan and involving consecutive OHCA patients with resuscitation attempts was conducted from January 2005 through December 2012. The main outcome measure was 1-month survival with favorable neurological outcome. The incidence of survival with favorable neurological outcome attributed to types of bystander CPR (CCCPR and conventional CPR with rescue breathing) was estimated. Among 816385 people experiencing OHCAs before emergency medical services arrival, 249970 (30.6%) received CCCPR, 100469 (12.3%) received conventional CPR, and 465946 (57.1%) received no CPR. The proportion of OHCA patients receiving CCCPR or any CPR (either CCCPR or conventional CPR) by bystanders increased from 17.4% to 39.3% (P for trend <0.001) and from 34.6% to 47.3% (P for trend <0.001), respectively. The incidence of survival with favorable neurological outcome attributed to CCCPR per 10 million population significantly increased from 0.6 to 28.3 (P for trend = 0.010), and that by any bystander-initiated CPR significantly increased from 9.0 to 43.6 (P for trend = 0.003).

Conclusion—Nationwide dissemination of CCCPR for lay-rescuers was associated with the increase in the incidence of survival with favorable neurological outcome after OHCAs in Japan. (*Circulation*. 2015;132:415-422. DOI: 10.1161/CIRCULATIONAHA.114.014905.)



- 7 year, prospective, nationwide study
- 249970 received COCPR
- 100469 received conventional CPR
- =>The patients received COCPR had an increase in the incidence of survival with favorable neurologic outcome.



Invited Review

Sudden cardiac death

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Abstract

Introduction: Sudden cardiac arrest continues to be the leading cause of death in the industrialized world.

Sources of data: Original papers, reviews and guidelines.

Areas of agreement: Community programs for lay bystander cardiopulmonary resuscitation (CPR) and automatic external defibrillation improve outcomes. Post-arrest care, including targeted temperature management (TTM) combined with early coronary angiography and percutaneous coronary intervention, is helpful for those suffering cardiac arrest during an ST-segment elevation myocardial infarction.

Areas of controversy: (1) The optimal approach to encourage lay bystanders to assist with resuscitation efforts. (2) Whether TTM combined with early coronary angiography is cost effective for those without ST elevation on their post-arrest ECG is unknown.

Growing points: Increasing data show that chest compression-only CPR is preferred by lay rescuers and improves local survival rates.

Areas timely for developing research: Randomized clinical trials are underway to examine the utility of early coronary angiography in the treatment of post-arrest patients without ST-segment elevation.

Key words: cardiac arrest, chest compression-only CPR, public access defibrillation, post-arrest coronary angiography, refractory out-of-hospital cardiac arrest



Interruptions in Cardiopulmonary Resuscitation From Paramedic Endotracheal Intubation

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Study objective: Emergency cardiac care guidelines emphasize treatment of cardiopulmonary arrest with continuous uninterrupted cardiopulmonary resuscitation (CPR) chest compressions. Paramedics in the United States perform endotracheal intubation on nearly all victims of out-of-hospital cardiopulmonary arrest. We quantified the frequency and duration of CPR chest compression interruptions associated with paramedic endotracheal intubation efforts during out-of-hospital cardiopulmonary arrest.

Methods: We studied adult out-of-hospital cardiopulmonary arrest treated by an urban and a rural emergency medical services agency from the Resuscitation Outcomes Consortium during November 2006 to June 2007. Cardiac monitors with compression sensors continuously recorded rescuer CPR chest compressions. A digital audio channel recorded all resuscitation events. We identified CPR interruptions related to endotracheal intubation efforts, including airway suctioning, laryngoscopy, endotracheal tube placement, confirmation and adjustment, securing the tube in place, bag-valve-mask ventilation between intubation attempts, and alternate airway insertion. We identified the number and duration of CPR interruptions associated with endotracheal intubation efforts.

Results: We included 100 of 182 out-of-hospital cardiopulmonary arrests in the analysis. The median number of endotracheal intubation-associated CPR interruption was 2 (interquartile range [IQR] 1 to 3; range 1 to 9). The median duration of the first endotracheal intubation-associated CPR interruption was 46.5 seconds (IQR 23.5 to 73 seconds; range 7 to 221 seconds); almost one third exceeded 1 minute. The median total duration of all endotracheal intubation-associated CPR interruptions was 109.5 seconds (IQR 54 to 198 seconds; range 13 to 446 seconds); one fourth exceeded 3 minutes. Endotracheal intubation-associated CPR pauses composed approximately 22.8% (IQR 12.6-36.5%; range 1.0% to 93.4%) of all CPR interruptions.

Conclusion: In this series, paramedic out-of-hospital endotracheal intubation efforts were associated with multiple and prolonged CPR interruptions. [Ann Emerg Med. 2009;54:645-652.]

Provide feedback on this article at the journal's Web site, www.annemergmed.com.

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ORIGINAL RESEARCH

Open Access

Evaluation of airway management associated hands-off time during cardiopulmonary resuscitation: a randomised manikin follow-up study

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Abstract

Introduction: Airway management is an important component of cardiopulmonary resuscitation (CPR). Recent guidelines recommend keeping any interruptions of chest compressions as short as possible and not lasting more than 10 seconds. Endotracheal intubation seems to be the ideal method for establishing a secure airway by experienced providers, but emergency medical technicians (EMT) often lack training and practice. For the EMTs supraglottic devices might serve as alternatives.

Methods: 40 EMTs were trained in a 1-hour standardised audio-visual lesson to handle six different airway devices including endotracheal intubation, Combitube, EasyTube, I-Gel, Laryngeal Mask Airway and Laryngeal tube. EMTs performances were evaluated immediately after a brief practical demonstration, as well as after 1 and 3 months without any practice in between, in a randomised order. Hands-off time was pair-wise compared between airway devices using a repeated-measures mixed-effects model.

Results: Overall mean hands-off time was significantly ($p < 0.01$) lower for Laryngeal tube (6.1s; confidence interval 5.2-6.9s), Combitube (7.9s; 95% CI 6.9-9.0s), EasyTube (8.8s; CI 7.3-10.3s), LMA (10.2s; CI 8.6-11.7s), and I-Gel (11.9s; CI 10.2-13.7s) compared to endotracheal intubation (39.4s; CI 34.0-44.9s). Hands-off time was within the recommended limit of 10s for Combitube, EasyTube and Laryngeal tube after 1 month and for all supraglottic devices after 3 months without any training, but far beyond recommended limits in all three evaluations for endotracheal intubation.

Conclusion: Using supraglottic airway devices, EMTs achieved a hands-off time within the recommended time limit of 10s, even after three months without any training or practice. Supraglottic airway devices are recommended tools for EMTs with lack of experience in advanced airway management.

Keywords: Anaesthesia, Emergency medical technicians, Hands-off time, Endotracheal intubation, Supraglottic airways, Emergency airway management, CPR



Association of Prehospital Advanced Airway Management With Neurologic Outcome and Survival in Patients With Out-of-Hospital Cardiac Arrest

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OUT-OF-HOSPITAL CARDIAC arrest (OHCA) is a major public health problem, occurring in 375 000 to 390 000 individuals in the United States each year.¹ The rate of survival after OHCA has increased with advances in care via initiatives such as the American Heart Association's 5-step Chain of Survival.² However, the rate is still low, with recent estimates reporting 8% to 10%.³⁻⁵ Better survival has been associated with the improvement in early access to emergency medical care, early cardiopulmonary resuscitation (CPR), rapid defibrillation, and integrated post-cardiac arrest care.⁶ Early advanced life support is often considered of benefit in that it provides intravenous drug therapy and advanced airway management.⁶

Although advanced airway management, such as endotracheal intubation or insertion of supraglottic airways, has long been the criterion standard for airway management of patients with OHCA,⁷ recent studies have challenged the survival benefit of ad-

Importance It is unclear whether advanced airway management such as endotracheal intubation or use of supraglottic airway devices in the prehospital setting improves outcomes following out-of-hospital cardiac arrest (OHCA) compared with conventional bag-valve-mask ventilation.

Objective To test the hypothesis that prehospital advanced airway management is associated with favorable outcome after adult OHCA.

Design, Setting, and Participants Prospective, nationwide, population-based study (All-Japan Utstein Registry) involving 649 654 consecutive adult patients in Japan who had an OHCA and in whom resuscitation was attempted by emergency responders with subsequent transport to medical institutions from January 2005 through December 2010.

Main Outcome Measures Favorable neurological outcome 1 month after an OHCA, defined as cerebral performance category 1 or 2.

Results Of the eligible 649 359 patients with OHCA, 367 837 (57%) underwent bag-valve-mask ventilation and 281 522 (43%) advanced airway management, including 41 972 (6%) with endotracheal intubation and 239 550 (37%) with use of supraglottic airways. In the full cohort, the advanced airway group incurred a lower rate of favorable neurological outcome compared with the bag-valve-mask group (1.1% vs 2.9%; odds ratio [OR], 0.38; 95% CI, 0.36-0.39). In multivariable logistic regression, advanced airway management had an OR for favorable neurological outcome of 0.38 (95% CI, 0.37-0.40) after adjusting for age, sex, etiology of arrest, first documented rhythm, witnessed status, type of bystander cardiopulmonary resuscitation, use of public access automated external defibrillator, epinephrine administration, and time intervals. Similarly, the odds of neurologically favorable survival were significantly lower both for endotracheal intubation (adjusted OR, 0.41; 95% CI, 0.37-0.45) and for supraglottic airways (adjusted OR, 0.38; 95% CI, 0.36-0.40). In a propensity score-matched cohort (357 228 patients), the adjusted odds of neurologically favorable survival were significantly lower both for endotracheal intubation (adjusted OR, 0.45; 95% CI, 0.37-0.55) and for use of supraglottic airways (adjusted OR, 0.36; 95% CI, 0.33-0.39). Both endotracheal intubation and use of supraglottic airways were similarly associated with decreased odds of neurologically favorable survival.

Conclusion and Relevance Among adult patients with OHCA, any type of advanced airway management was independently associated with decreased odds of neurologically favorable survival compared with conventional bag-valve-mask ventilation.

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Cardiac Receiving Centers must have

- Targeted Therapeutic Management (TTM) protocols
- Capability, equipment and laboratory for urgent cardiac catheterization
- Capability, equipment and ICU for applying ECMO
- and this hospitals must be ready for any time at 7/24 .



Review article

Comparing extracorporeal cardiopulmonary resuscitation with conventional cardiopulmonary resuscitation: A meta-analysis[☆]Su Jin Kim^a, Hyun Jung Kim^b, Hee Young Lee^c, Hyeong Sik Ahn^b, Sung Woo Lee^{a,*}^a Department of Emergency Medicine, College of Medicine, Korea University Hospital, Seoul, Republic of Korea^b Institute for Evidence-based Medicine, The Korean Branch of Australasian Cochrane Center, Department of Preventive Medicine, College of Medicine, Korea University, Seoul, Republic of Korea^c Center for Preventive Medicine and Public Health, Seoul National University Bundang Hospital, Gyeonggi-do, Republic of Korea

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ABSTRACT

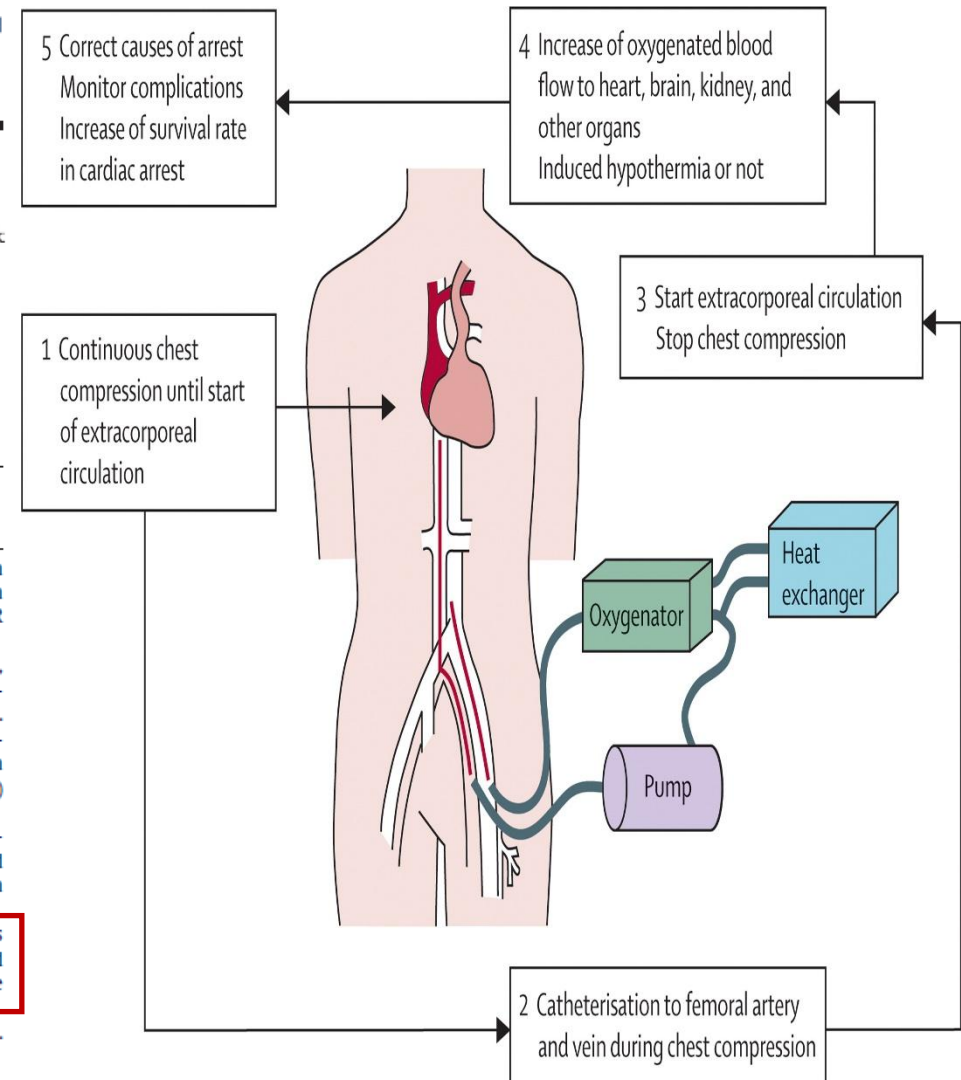
Introduction: The objective was to determine whether extracorporeal cardiopulmonary resuscitation (ECPR), when compared with conventional cardiopulmonary resuscitation (CCPR), improves outcomes in adult patients, and to determine appropriate conditions that can predict good survival outcome in ECPR patients through a meta-analysis.

Methods: We searched the relevant literature of comparative studies between ECPR and CCPR in adults, from the MEDLINE, EMBASE, and Cochrane databases. The baseline information and outcome data (survival, good neurologic outcome at discharge, at 3–6 months, and at 1 year after arrest) were extracted. Beneficial effect of ECPR on outcome was analyzed according to time interval, location of arrest (out-of-hospital cardiac arrest (OHCA) and in-hospital cardiac arrest (IHCA)), and pre-defined population inclusion criteria (witnessed arrest, initial shockable rhythm, cardiac etiology of arrest and CPR duration) by using Review Manager 5.3. Cochran's Q test and I^2 were calculated.

Results: 10 of 1583 publications were included. Although survival to discharge did not show clear superiority in OHCA, ECPR showed statistically improved survival and good neurologic outcome as compared to CCPR, especially at 3–6 months after arrest. In the subgroup of patients with pre-defined inclusion criteria, the pooled meta-analysis found similar results in studies with pre-defined criteria.

Conclusion: Survival and good neurologic outcome tended to be superior in the ECPR group at 3–6 months after arrest. The effect of ECPR on survival to discharge in OHCA was not clearly shown. As ECPR showed better outcomes than CCPR in studies with pre-defined criteria, strict indications criteria should be considered when implementation of ECPR.

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Review article

Prognostic factors for extracorporeal cardiopulmonary resuscitation recipients following out-of-hospital refractory cardiac arrest. A systematic review and meta-analysis[☆]



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ABSTRACT

Purpose: Association estimates between baseline characteristics and outcomes are imprecise and inconsistent among extracorporeal cardiopulmonary resuscitation (ECPR) recipients following refractory out-of-hospital cardiac arrest (OHCA). This systematic review and meta-analysis aimed to investigate the prognostic significance of pre-specified characteristics for OHCA treated with ECPR.

Methods: The Medline electronic database was searched via PubMed for articles published from January 2000 to September 2016. The electronic search was supplemented by scanning the reference lists of retrieved articles and contacting field experts. Eligible studies were historical and prospective cohort studies of adult patients undergoing ECPR following OHCA.

Results: Fifteen primary studies were included, totaling 841 participants. The median prevalence of the primary outcome (i.e., short- or long-term survival for five studies and cerebral performance for ten studies) was 15% (range, 0–50%). The primary outcome was associated with an increased odds ratio of initial shockable cardiac rhythm (2.20; 95% confidence interval [CI], 1.30–3.72; $P=0.003$), shorter low-flow duration (geometric mean ratio, 0.90; 95% CI, 0.81–0.99; $P=0.04$), higher arterial pH value (difference, 0.12; 95% CI, 0.03–0.22; $P=0.01$) and lower serum lactate concentration (difference, -3.52 mmol/L; 95% CI, -5.05 to -1.99 ; $P<0.001$). No significant association was found between the primary outcome and patient age (the odds of female gender and bystander CPR attempt).

Conclusion: Observational evidence from published primary studies indicates that shorter low-flow duration, shockable cardiac rhythm, higher arterial pH value and lower serum lactate concentration on hospital admission are associated with better outcomes for ECPR recipients after OHCA.



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



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Study objective: We evaluate the time to awakening after out-of-hospital cardiac arrest in patients treated with targeted temperature management and determine whether there was an association with any patient or event characteristics.

Methods: This was a prospective, observational cohort study of consecutive adult survivors of out-of-hospital cardiac arrest of presumed cardiac cause who were treated with targeted temperature management between January 1, 2008, and March 31, 2014. Data were obtained from hospitals and emergency medical services agencies responding to approximately 90% of Arizona's population as part of a state-sponsored out-of-hospital cardiac arrest quality improvement initiative.

Results: Among 573 out-of-hospital cardiac arrest patients who completed targeted temperature management, 316 became responsive, 60 (19.0%) of whom woke up at least 48 hours after rewarming. Eight patients (2.5%) became responsive more than 7 days after rewarming, 6 of whom were discharged with a good Cerebral Performance Category score (1 or 2). There were no differences in standard Utstein variables between the early and late awakeners. The early awakeners were more likely to be discharged with a good Cerebral Performance Category score (odds ratio 2.93; 95% confidence interval 1.09 to 7.93).

Conclusion: We found that a substantial proportion of adult out-of-hospital cardiac arrest survivors treated with targeted temperature management became responsive greater than 48 hours after rewarming, with a resultant good neurologic outcome. [Ann Emerg Med. 2017;69:36-43.]





Improving Survival From Cardiac Arrest: A Review of Contemporary Practice and Challenges



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Cardiac arrest is a common and lethal condition frequently encountered by emergency medicine providers. Resuscitation of persons after cardiac arrest remains challenging, and outcomes remain poor overall. Successful resuscitation hinges on timely, high-quality cardiopulmonary resuscitation. The optimal method of providing chest compressions and ventilator support during cardiac arrest remains uncertain. Prompt and effective defibrillation of ventricular arrhythmias is one of the few effective therapies available for treatment of cardiac arrest. Despite numerous studies during several decades, no specific drug delivered during cardiac arrest has been shown to improve neurologically intact survival after cardiac arrest. Extracorporeal circulation can rescue a minority of highly selected patients with refractory cardiac arrest. Current management of pulseless electrical activity is associated with poor outcomes, but it is hoped that a more targeted diagnostic approach based on electrocardiography and bedside cardiac ultrasonography may improve survival. The evolution of postresuscitation care appears to have improved cardiac arrest outcomes in patients who are successfully resuscitated. The initial approach to early stabilization includes standard measures, such as support of pulmonary function, hemodynamic stabilization, and rapid diagnostic assessment. Coronary angiography is often indicated because of the high frequency of unstable coronary artery disease in comatose survivors of cardiac arrest and should be performed early after resuscitation. Optimizing and standardizing our current approach to cardiac arrest resuscitation and postresuscitation care will be essential for developing strategies for improving survival after cardiac arrest. [Ann Emerg Med. 2016;68:678-689.]



In conclusion,

- There are improvements in CPR and postresuscitation care protocols;
- Today mortality rate of cardiac arrest is still high .
- Many studies were designed to reach better neurologic outcome .
- Yet, there is no exact consensus for postresuscitation care protocols.
- Only consensus is as following:
 - Rapidly initiated, high quality chest compressions are the most important intervention for early ROSC and better neurologic outcome.



Questions???? Additions

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