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EMS Termination Of Resuscitation And Pronouncement of Death

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Introduction

Emergency medical services (EMS) personnel are often the first medical providers to initiate care of critical patients outside the hospital. As the first contact with patients, they often encounter difficult medical and ethical situations, none more so than when critical patients are in the peri- and cardiac arrest states. These situations include issues of whether to initiate cardiopulmonary resuscitation versus the determination of death already being present or when to terminate an active yet futile resuscitation. Traditional approaches to patients who are not breathing or do not have a pulse have been to transport patients to the nearest hospital as quickly as possible with medical care performed in a moving ambulance. However, recent advances in paramedicine and outcomes-related data have questioned these traditional approaches. Studies have shown that a prehospital emphasis on on-scene cardiopulmonary resuscitation (CPR) until the return of spontaneous circulation (ROSC) results may optimize care for the patient. Staying on the scene to perform high-quality CPR (with ideal compression quality, minimum "hands-off" time, and best conditions to perform interventions) may provide better care with transport commencing if and when ROSC has occurred.

Despite recent advancements in CPR care, data has shown that both prehospital and hospital-related CPR outcomes are exceedingly poor.[1][2] Estimates are that less than 11% of patients suffering from out-of-hospital cardiac arrest (OHCA) survive to discharge from the hospital.[3] The subset of those patients who survive with favorable neurological status is even lower, with studies showing those rates anywhere between 2 to 9% of all patients with OHCA.[4][5]

There are approximately 400,000 OHCA events annually in the United States and Canada. The impact of the decision to initiate resuscitation and for how long those efforts are to continue has revealed potential benefits to not transporting patients receiving CPR or who are deemed to have an exceedingly low chance of ROSC. These benefits extend to the following groups:

Patients

Research has shown the importance of high-quality CPR in achieving ROSC and the difficulty of attaining it during transport.[6] Staying at the scene rather than immediately transporting may provide higher-quality care.

EMS Personnel

Responding to patients with medical emergencies and transporting those patients is not benign. The National Highway Traffic Safety Administration (NHTSA) has published data showing that approximately 59.6% of ambulance crashes occur while responding to a medical emergency. Other data has also shown that ambulances are almost twice as likely to be involved in a crash when performing lights and sirens emergency-type responses versus nonemergent lights and sirens use.[6][7]

Community

The National Association of EMS Physicians (NAEMSP) recently highlighted the effects of resource utilization on the community and the extent to which when an ambulance is transporting a patient, it is not available to transport other patients in need; this leads to delays for those who may also be suffering an emergency.[7]

As the quality of CPR care continues to be studied and further guided by outcomes-related data, the decision to treat patients with complete on-scene CPR (with subsequent transport only if they achieve ROSC) versus immediate transport immediately upon first patient contact should have improved clarity. Protocols should incorporate the latest data and a working knowledge of local community resources to help identify the greatest benefit to patients.

Issues of Concern

Ethics

Many medical ethicists have argued that patient autonomy is paramount for patient care. However, if a patient is incapacitated, providers may be placed in a situation where decisions are necessary with implied or emergency consent, which assumes that interventions are in the patient's best interest. In the absence of a pre-existing do-not-resuscitate (DNR) order or physician/medical order for life-sustaining treatment (POLST/MOLST), the decision of whether to initiate or terminate CPR care is based on the ethical principle of beneficence towards the patient as well as nonmaleficence towards the patient, EMS personnel, and the general public. Utilizing resources to initiate care is not without drawbacks and potential harm.

One goal of resuscitation protocols is to identify futile care where the patient is unlikely to survive or benefit. In general, since 1990, if the benefits of survival due to an intervention or drug treatment are under 1%, it is considered medically futile.[8] This threshold remains a reasonable decision point for determining the benefit of a medical intervention balanced against harm.[9] The benefits of not transporting certain types of cardiac arrest patients are as previously discussed. Additionally, transporting a patient in CPR may be dangerous to EMS personnel, patients, and others on the road regarding vehicular accidents.[7] Initiating treatment in those who have an exceedingly low chance of survival may also pose ethical, moral, and emotional issues for patients' families. For these reasons, the potential for a beneficial outcome must be weighed against the drawbacks. Nationally, most EMS agencies have protocols in place that are in line with the American Heart Association (AHA), NAEMSP, American College of Surgeons (ACS), and American College of Emergency Physicians (ACEP) guidelines.

Pediatrics

Pediatric out-of-hospital deaths represent nearly one-third of all pediatric deaths in the United States, and approximately 2% of all pediatric EMS calls result from OHCA.[10][11] Despite general care advances in treatment and near-universal transport of pediatric patients to the emergency department regardless of presenting features, outcomes for pediatric OHCA remain poor.

- **Ages 0 to 1 year:** 3.3%
- **Ages 1 to 11 years:** 10.5%
- **Ages 12 to 19 years:** 15.8% [12][13][14]

Given the poor prognosis associated with OHCA, especially with presenting signs that suggest poor outcomes, there has been increased interest in guidelines to assist in the termination of resuscitation after various CPR periods before transport to the hospital. However, there remains a profound reluctance to stop resuscitative measures in pediatric populations by healthcare providers.[15] This reluctance may stem from a lack of awareness of OHCA outcomes, fear of discussing pediatric death with family members, the perceived need of the family to see life-saving efforts

undertaken, and fear of liability related to the death.[16] While research is underway, there are no accepted guidelines on stopping resuscitation in the pre-hospital setting for pediatric patients.

Clinical Significance

Initiation of Resuscitation

Although EMS personnel do not pronounce death, they may be asked to determine if death is already present when arriving on the scene of a pulseless patient. The 2015 AHA guidelines recommend that EMS providers do not initiate resuscitation of any patient in the following scenarios:

- Situations where attempts to perform CPR would place the rescuer at risk of serious injury or mortal peril
- Overt clinical signs of irreversible death (eg, rigor mortis, dependent lividity, decapitation, transection, decomposition)
- A valid advanced directive, a POLST form indicating that resuscitation is not desired, or a valid DNR order [17]

For patients who do not meet these criteria, resuscitation should be initiated as soon as possible based on the nature of the cardiac arrest. OHCA, due to traumatic mechanisms, has a very different underlying pathophysiology than medical causes and, therefore, merits a separate discussion below. Once the decision to initiate resuscitation is made, both basic life support (BLS) and advanced life support (ALS) providers are trained in managing cardiac arrest patients within their scope of practice and protocols.

Resuscitation in Nontraumatic Cardiopulmonary Arrest

Once a patient suffers a cardiac arrest, the chance of achieving a ROSC ranges from 7.2% to 11%.[18][19][20] Furthermore, studies have shown that the survival rate declines when the duration of CPR is greater than 10 minutes without ROSC and rapidly declines after 30 minutes.[21] These lower rates may be attributable to rapid loss of neurological function secondary to hypoxia, the poor underlying prognosis from the pathology, or challenges in delivering optimal care in the prehospital setting. Even automatic compression devices and other measures to optimize cardiopulmonary arrest treatment during ambulance transport have not been shown to improve outcomes.[22] The argument has been that maintaining optimal CPR care on the scene may provide higher quality CPR, compressions, and ALS interventions than attempting to perform CPR while transporting to the hospital in a moving ambulance.[23] For this reason, many departments have implemented policies for resuscitating the field for a predetermined amount of time.

Once the resuscitation has started, EMS personnel care for patients within their medical-approved protocols. As more EMS personnel deliver CPR care on scene, EMS medical directors have been exploring protocols to guide EMTs and paramedics in how long to continue the resuscitation and when in that sequence to transport the patient. The use of termination of resuscitation (TOR) evidenced-based rules was first proposed in 2002 for BLS providers to predict the likelihood of ROSC during continued resuscitation accurately.[24] Additional guidance has been proposed for ALS providers and incorporates the additional training ALS providers receive.[18] NAEMSP has endorsed these criteria and helps guide local departments when crafting protocols. These guidelines have a higher than 99% positive predictive value for accurately predicting no chance for survival.[18] NAEMSP endorses the following criteria as evidence-based when making termination or resuscitation protocols:

- When emergency medical services personnel did not witness the event
- When there is no shockable rhythm identified by an automated external defibrillator (AED) or other electronic monitors
- When spontaneous circulation does not return in the out-of-hospital setting

While the current NAEMSP guidelines do not endorse any set time for EMS to perform resuscitation at the scene, the previous NAEMSP guidelines and the current European Resuscitation Council recommend 20 minutes of on-scene efforts before terminating efforts.[25][26][25] This recommendation has led to many departments implementing rules for terminating resuscitation, including providing at least 20 minutes of on-scene CPR.[27] Also, EMS agencies must have active physician oversight when making protocols and must consider the providers' training.

Below is an example protocol from an active suburban/urban EMS service:

CPR may be terminated by ALS and BLS personnel when:

- A patient has in his or her possession (or at the bedside) a completed, legal DNR
- Spontaneous circulation has been restored (return of spontaneous circulation, ROSC), and effective spontaneous or assisted ventilation is achieved per current AHA guidelines
- Resuscitation efforts have been transferred to a person(s) of no less skill than the initial providers
- Rescuers are exhausted and physically unable to continue resuscitation
- The patient meets the requirements for the determination of death protocol
- The online medical control physician advises the termination of resuscitation

Additionally, ALS personnel may terminate resuscitative efforts for cardiac arrest if all of the following criteria exist:

- The patient is 18 years or older
- EMS has provided over 20 minutes of CPR
- The initial rhythm is asystole or pulseless electrical activity, confirmed in 2 leads on a printed rhythm strip
- Rhythm remains in asystole or pulseless electrical activity throughout resuscitative efforts (no VFib or VTach)
- There is no ROSC
- No defibrillation is performed
- EMS did not witness an arrest
- A secure airway is confirmed by digital waveform capnography.
- The quantitative end-tidal CO2 (ETCO2) value is less than 10 mmHg despite effective CPR.

The AHA has endorsed the use of locally defined determination of death and termination of resuscitation protocols based on national guidelines, and they continue to expand to more agencies to improve emergency care.[17] The National Association of EMS Physicians has also endorsed the promotion of protocols in all EMS systems that ensure high-quality emergency care in cardiac arrest.[28]

Emerging evidence shows that select patients may benefit from newer technologies in the right systems, such as emergency department extracorporeal membrane oxygenation (ECMO).[17] Medical directors and EMS agencies need to continue to monitor these advancements as they may impact which patients may benefit from transport to the emergency department.

Resuscitation in Trauma

The pathophysiology of OHCA in trauma patients is very different from OHCA in nontrauma patients. Although some patients, such as the elderly and those with chronic comorbidities, may be predisposed to cardiac arrest, the traumatic event adds new pathology, leading to different treatment approaches. Whether the arrest is due to a direct result of the

injury, such as blunt or penetrating trauma to the chest, or due to other mechanisms, such as hemorrhagic shock, outcomes are inferior, with survival rates of less than 2%.[29] For this reason, the NAEMSP, in conjunction with the American College of Surgeons Committee on Trauma (ACSCOT), released guidelines on withholding resuscitation in trauma patients in 2003 and updated in 2012:

- Where death is a predictable outcome
- Where injuries are incompatible with life, such as decapitation or hemicorporectomy
- For patients with blunt or penetrating trauma where there is evidence of prolonged cardiac arrest, including dependent lividity and rigor mortis
- For patients with blunt trauma who, on the arrival of EMS personnel, are found to be apneic, pulseless, and without organized cardiac activity
- For patients with penetrating trauma who, on the arrival of EMS personnel, are found to be pulseless and apneic and there are no other signs of life, including spontaneous movement, electrocardiographic activity, and pupillary response

While the TOR criteria for OHCA in nontraumatic patients have been studied extensively, TOR research in trauma patients has been scarce. However, many causes of OHCA in trauma patients are due to acute blood loss and traumatic injuries that may be repaired with prompt surgical intervention. The NAEMSP-ASCOT 2012 update suggested that TOR protocols may be appropriate for EMS agencies.[30] The TOR rules are predicated on EMS providers' ability to get patients to definitive care in a reasonable amount of time. This would take precedence over any on-scene measures due to the likely need for surgical intervention. EMS agencies must coordinate with their local trauma centers and assess their resources to develop appropriate TOR rules for their community. More research is necessary before the widespread implementation of standard TOR rules in trauma patients.

Out-of-hospital cardiac arrest (OHCA) is a catastrophic event with known poor survival rates. Since most patients who suffer OHCA have poor outcomes and transporting these patients also has potential drawbacks, there has been growing interest in identifying which patients benefit from initiation of CPR and subsequent hospital transport versus termination of efforts on scene. While the termination of resuscitation guidelines has been promoted since the early 2000s, continued research and development are needed for widespread use. EMS medical directors and other stakeholders must continue developing best practices to benefit patients, EMS personnel, and the community.

Review Questions

- Access free multiple choice questions on this topic.
- Comment on this article.

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