INTRODUCTION

The irreversible cessation of life may be difficult to determine with complete confidence, particularly in the austere environment of out-of-hospital emergency care. As a result, resuscitation efforts are often initiated and continued by EMS providers, even in circumstances that are likely to be medically futile.

In cases of nontraumatic cardiac arrest, few unassailable criteria exist for determining medical futility at the time of initial patient encounter other than certain physical signs of irreversibility such as dependent lividity or rigor mortis. Thus historically, the general medical recommendation has been to attempt to resuscitate all patients, adult or child, in the absence of rigor or lividity.

Conversely, well-founded medical guidelines are available for decisions regarding termination of resuscitation in such medical patients once they have received a trial of BLS and advanced cardiac life support (ACLS) for a finite period of time. In practice, however, the final decision to proceed with on-scene termination of resuscitation ultimately may be determined more by family and EMS provider comfort levels within the specific on-scene environment and circumstances.

For patients with posttraumatic circulatory arrest, the type of injury (blunt or penetrating), presence of vital signs, and the ECG findings are most commonly used to determine futility, both in terms of initiating or continuing resuscitation efforts. In general, trauma patients who are asystolic (confirmed ECG flat line) on-scene are candidates for on-scene determination of futility and cessation of efforts, regardless of the mechanism of injury. With a few exceptions, blunt trauma patients with a clearly associated mechanism of lethal injury are also candidates for immediate cessation of efforts once they lose their pulses and respirations. Again, some logistical issues may affect these decisions beyond the medical criteria for termination of efforts.

Regardless of the medical futility criteria, appropriate training of EMS providers, involving both operational and psychosocial issues, must be implemented before those personnel are authorized to implement on-scene termination of resuscitation policies. In addition, the policies themselves need to be modified and adapted for various jurisdictional issues and resources. Furthermore, although current determinations of medical futility, as delineated in this discussion, are important to establish for societal needs, the individual patient’s ultimate right to receive resuscitative efforts must be kept in mind, particularly as new medical advances are developed.

Although the same criteria for termination of resuscitation might be applied in the in-hospital setting for similar medical futility reasons, for all of these stated reasons, the termination of resuscitation efforts in the out-of-hospital setting, using EMS personnel to do so, is a unique situation that
requires intimate knowledge of the special circumstances. The peculiar and complex psychosocial issues of determining the end of a life for a child or an adult, be it in a home with loved ones looking on or on the roadside with frightened bystanders (and possibly the media) witnessing the events, will affect how these actions are undertaken. Likewise, the complicated, interdependent effects of termination practices on available local EMS resources, jurisdictional police policies, applicable local medical examiner protocols, and any unique local or state code and legislation, all make this concept a complex and extraordinary practice not applicable to emergency department (ED) or in-hospital circumstances.

Finally, medical criteria are affected by logistics and resources (e.g., distance from a trauma center or portability of specialized medical equipment) not applicable to other venues. As a result, development of EMS policies and procedures for termination of resuscitation requires development of truly specialized competency in this particular area of EMS medical practice. Accordingly, this special body of knowledge for the EMS physician will be discussed in the following text in great detail.

NEED FOR SCIENTIFIC DATA

Since the inception of professional emergency care and 9-1-1 response systems several decades ago, there has been an a priori societal assumption that most attempts at resuscitation are beneficial to the community and that rapid transport of the critically ill and injured to definitive care facilities is the appropriate strategy. However, the death process for many persons to whom such responses have been requested has already become irreversible, particularly in terms of their permanent loss of neurologic functions. In such cases, resuscitation efforts are not only futile, but they may also be wasteful in terms of societal resources. Moreover, they may even endanger both the rescue personnel and the public at large in terms of unnecessary rapid transport through traffic.1

Recognizing the futility and potential hazards of these circumstances, medical leaders have long recommended the development of policies for appropriate initiation and termination of resuscitation efforts. The two NAEMSP position papers on this topic (the position paper on traumatic arrest was coauthored by the American College of Surgeons Committee on Trauma), summarized in the Appendix, provide some guidance on these issues. However, as previously stated, resuscitation decisions made by EMS practitioners in the out-of-hospital setting, including on-scene determination of irreversibility, often are complicated by medical, legal, ethical, and sociologic considerations.2–8

DEFINING ACCEPTABLE CRITERIA

The Uniform Determination of Death Act,9 which has been adopted by many states and endorsed by both the American Bar Association and the American Medical Association, states that “an individual who has sustained either: 1) irreversible cessation of circulatory and respiratory functions; or 2) irreversible cessation of all functions of the entire brain, including brain stem, is dead. A determination of death must be made in accordance with accepted medical standards.” Although this statement attempts to define death, it still leaves the determination of the condition to the vague criterion of “accepted medical standards,” as well as the provider’s definition of “irreversibility.” Therefore, the concepts of accepted medical standards and irreversibility will be examined thoroughly in the following discussion using an evidence-based medicine approach by evaluation of the current scientific evidence for the out-of-hospital setting. Specifically, three fundamental medical questions regarding on-scene determination of irreversibility of the death process will be addressed: 1. When should we attempt out-of-hospital resuscitation? 2. How long should we continue resuscitation efforts? 3. Where and when it is appropriate to terminate those efforts?

For the most part, the primary discussion will maintain a medical futility focus in terms of when resuscitation efforts can be aborted and not directly address the legal issues associated with “do not resuscitate” (DNR) orders and other advanced care directives as discussed in other chapters. Specifically, the three categorical situations of: 1. adult nontraumatic cardiac arrest; 2. pediatric cardiac arrest; and 3. posttraumatic circulatory arrest will be discussed using the results of available published scientific studies to formulate the medical criteria for initiating and terminating resuscitation efforts in the out-of-hospital setting.
ADULT NONTRAUMATIC CARDIOPULMONARY ARREST

When, Medically, to Start Resuscitation

Despite attempts to develop other objective criteria, the available scientific evidence still suggests that irreversible “clinical death” is difficult to determine with complete certainty except in cases of dependent lividity, putrefaction, or rigor mortis. Therefore, with these exceptions (along with valid legal directives), attempts at resuscitation are generally recommended in nontraumatic arrest, in essence to prove the futility of resuscitation and the irreversibility of the loss of circulatory and respiratory functions.

Again, this conclusion recommending universal attempts at resuscitation has withstood several investigational challenges, including studies regarding age limits. In many in-hospital situations, resuscitation attempts for the elderly often are limited. However, in the out-of-hospital setting, age does not appear to be a absolute criterion for resuscitation efforts. Results from multiple studies in the United States and Belgium support the recommendation that, when called to respond, aggressive efforts should still be provided for the elderly in the out-of-hospital setting, particularly for older adults with ventricular dysrhythmia.

In one large prospective study of an urban population that examined survival by age group in out-of-hospital cardiac arrests, 15% of patients aged 70 years or older presenting with ventricular fibrillation (VF) or ventricular tachycardia (VT) survived. Other studies, however, have shown no survival potential for patients older than age 90. Therefore, although both overall rates and eventual duration of survival may be somewhat lower for the elderly because of comorbidities, evidence indicates that resuscitation efforts are still worthwhile, at least for those younger than 90 years of age. At the same time, few calls are made for those over 90 years of age, thus the impact on the EMS system may not be significant and so the practical decision may be made to ignore age as a criterion altogether.

Another attempt at finding objective criteria for futility involved the combined criteria of using ECG tracings (confirmed electrical flat line) and a readily discerned clinical scenario in which the cardiac arrest was not witnessed (person found later) and a lack of bystander CPR before EMS arrival. Specifically, some of the available literature has strongly supported the recommendation for not initiating resuscitation efforts when these three criteria are present upon arrival at the scene. Therefore, many EMS systems have adopted these criteria for waiving resuscitation, whereas others continue to resuscitate all nontraumatic arrests. There are several variables that must be considered prior to adopting guidelines or policies to waive efforts at resuscitation. (Table 43-1)

When to Stop Resuscitation

Clinical criteria for the appropriate duration of resuscitation procedures (termination criteria) have now evolved from a number of well-designed studies reported within the last decade. These studies demonstrate that, in cases of unmonitored adult primary cardiac arrest, inability to restore a spontaneous pulse

<p>| TABLE 43.1 |</p>
<table>
<thead>
<tr>
<th>Issues to Consider in Guideline Development for On-Scene Termination of Resuscitation Efforts for Nontraumatic and Traumatic Circulatory and Cardiac Arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Criteria for medical futility.</td>
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<tr>
<td>• Consideration of the public good and public safety.</td>
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<tr>
<td>• Protection of forensic evidence and other medical examiner issues.</td>
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<tr>
<td>• Addressing psychosocial concerns of the family, bystanders, and EMS providers.</td>
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<tr>
<td>• Compliance with legal issues, local ordinances, and state laws and regulations.</td>
</tr>
<tr>
<td>• Financial costs and resource use for EMS agencies, patients, and the health care system at large.</td>
</tr>
<tr>
<td>• Who will provide on-scene pronouncement: standing orders, direct medical oversight physician, or personal physician.</td>
</tr>
<tr>
<td>• Postpronouncement procedures including how and when various personnel are released back to service and the various interactions with police, funeral homes, medical examiner staff, and private (personal) physicians.</td>
</tr>
<tr>
<td>• Who will sign death certificate (direct medical oversight physician, personal physician, or medical examiner).</td>
</tr>
<tr>
<td>• How will education for all of the aforementioned be provided and budgeted.</td>
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</tbody>
</table>
within 20 to 25 minutes of initiating ACLS is a uniform determinant of mortality (30 minutes for monitored cases). The only exceptions to these time frames are cases involving hypothermia or those with refractory or persistently-recurring VF. The 20- to 25-minute criterion also has been strongly supported in a study of end-tidal carbon dioxide (ETCO₂) measurements. In patients with cardiac arrest, a persistent ETCO₂ level of 10 mm Hg or less, measured by digital capnography 20 minutes after the start of ACLS, uniformly predicts death, and in turn, can also be used as an objective determinant to halt CPR efforts.8

Despite these data, a prospective study from Los Angeles showed that of approximately 1,700 out-of-hospital cardiac arrests over a 1-year period, only 151 (9%) had termination of resuscitative efforts on scene. This study also found variation in the frequency (0% to 37%) of online termination of efforts among medical oversight physicians contacted at various base stations to terminate resuscitation. The findings suggested that there is not only a need for uniform criteria for termination of resuscitation in the field, but also appropriate education among EMS physicians and those participating in base station activities. A recent large Canadian study prospectively evaluated a clinical prediction rule to be used by defibrillator-equipped EMTs. This rule recommended termination of resuscitation when there was no return of spontaneous circulation (ROSC), no shocks administered, and the arrest was not witnessed by EMS personnel. This study found that, out of the 776 patients for whom the rule recommended termination, only 4 (0.5%) survived. The rule had a positive predictive value for death of 99.5%, and it was determined that implementation of the rule would decrease the rate of transportation from 100% of patients to 37.4%. Nevertheless, general experience elsewhere often has shown that many family members would object to termination of efforts if there was any chance of survival at all, even if that chance was remote.

Further examination of this Canadian clinical prediction rule for both ALS and BLS providers demonstrated that if there was no ROSC before transport, no shock delivered, no bystander CPR, and the arrest was not witnessed, the “rule” was 100% sensitive for survival and had a 100% negative predictive value for death.

It must be cautioned that all of these criteria were developed using standard ACLS techniques used in the 1990s and that with the advent of new advances in resuscitation such as new devices or other therapeutic modalities, the time limits or other criteria may change.

To summarize these data regarding non-traumatic cardiac arrest, with the traditional exceptions of obvious death (dependent lividity, rigor mortis, putrefaction), the traditional conclusion is to attempt to resuscitate everyone. However, resuscitation can then be terminated in a presumably normothermic adult with unmonitored out-of-hospital cardiac arrest if there is a persistent ETCO₂ level less than 10 mm Hg or still no pulse (absence of spontaneous circulation) after 20 to 25 minutes of starting ACLS (or 30 minutes in monitored cases). In addition, cases of refractory or persistently recurring VF are exceptions to this rule. Again, all of these results are based on traditional ACLS techniques and acknowledge that future modalities may change these recommendations.

**PEDRIATRIC CARDIAC ARREST**

**When to Start Resuscitation**

In the case of children (aged 17 years or younger), decisions regarding when to resuscitate, how long to continue, and when to terminate resuscitation are based on fewer available data than we have for adults. Nevertheless, the available data do still indicate that, with the exception of posttraumatic arrest, EMS providers should attempt to resuscitate any pediatric patient who does not have clear signs of lividity or rigor.

As with adult patients, there are no clear-cut prospective criteria for waiving resuscitation. In fact, in many cases that were later found at the ED to have already involved development of lividity or rigor mortis, paramedics occasionally found it difficult to truly discern these conditions in the field and therefore always attempted resuscitation. Meta-analyses of published studies on pediatric out-of-hospital cardiac arrest have demonstrated that witnessed cardiac arrests and those with bystander CPR had higher survival rates, but, like adult patients, survival still remains low overall.

**When to Stop Resuscitation**

With regard to the decisions to terminate efforts in pediatric patients, again, the criterion of no pulse (absence of spontaneous circulation) within 20 to 25 minutes of ACLS initiation applies (unless there is hypothermia or persistently recurring VF). In a prospective study of about 300 consecutive
out-of-hospital cardiac arrests in pediatric patients, on-scene ROSC was never achieved in 267 children despite aggressive attempts at ACLS for more than a half hour, and none of these children survived.22

Still the concept of on-scene termination of resuscitation efforts for children has not been recommended universally, largely because of the psychological impact on the family and even because of the psychological discomfort of the EMS providers.5,6,24 For example, a blinded survey of EMS personnel regarding comfort levels with on-scene pronouncement was reported using a rating scale of 1 (not comfortable) to 10 (very comfortable).24 The study found that veteran paramedics (n = 201) are very comfortable (average score, 10) with the pronouncement of an adult on scene but not with pronouncement of a child (average score, 2). Accordingly, with the greater availability of in-hospital support services for the family of pediatric patients and the EMS providers’ potential concerns with on-scene pronouncement, termination of resuscitative efforts for children may be best performed in the hospital. However, it has also been emphasized that once medical futility is determined, EMS personnel should take care during transport not to create additional risks in traffic, and in-hospital personnel might adopt modified procedures that limit further resuscitation and resource use.6,24 In addition, in some cases of suspected sudden infant death syndrome (SIDS), unwarranted resuscitative efforts and hospital transport may compromise a potential crime scene investigation.

**TRAUMA**

In the discussion of termination of resuscitation efforts for severe injury, a critical point to consider is the differentiation between true posttraumatic “cardiac arrest” and posttraumatic “circulatory arrest”. The term, *posttraumatic cardiac arrest* is best applied to conditions of posttraumatic asystole and true cardiac standstill, whereas the term *posttraumatic circulatory arrest* best describes the precardiac arrest condition in which CPR might be implemented because of apnea or agonal breaths and imperceptible pulses, although a rhythm and heartbeat might still exist. Therefore, while traditional criteria for initiation of CPR (i.e., lifeless appearance, pulselessness, apnea, or agonal breathing) may be present, the heart itself might still be viable but simply failing to create adequate circulation because of factors such as severe hypovolemia (hemorrhage), cardiac tamponade, or tension pneumothorax. Though true cardiac arrest usually does ensue within minutes, there may still be opportunity for reversibility under certain circumstances. Such circumstances may be difficult to distinguish on initial clinical examination. Recognizing this concept, the following discussion includes guidelines to help determine these circumstances in trauma patients. (Table 43-2)

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**TABLE 43.2**

Criteria for Termination of Resuscitation Efforts for Posttraumatic Cardiac and Circulatory Arrest*

<table>
<thead>
<tr>
<th>Trauma Type</th>
<th>Termination Criteria</th>
</tr>
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<tbody>
<tr>
<td>Blunt trauma</td>
<td>Terminate resuscitation for any apneic or pulseless patient with a clearly associated mechanism of injury*</td>
</tr>
<tr>
<td></td>
<td>Potential exceptions:</td>
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<tr>
<td></td>
<td>1. those found with VF.</td>
</tr>
<tr>
<td></td>
<td>2. those with simple blockage of the airway.</td>
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<tr>
<td></td>
<td>3. potentially survivable fetus (pregnancy).</td>
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<tr>
<td></td>
<td>4. patient who becomes pulseless/apneic 2–3 minutes prior to arrival at definitive care facility.</td>
</tr>
<tr>
<td></td>
<td>5. patient maintaining narrow electrocardiographic complexes at ≥80 per minute</td>
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<tr>
<td></td>
<td>6. potential confounding factors such as questions of hypothermia, drug overdose, etc.</td>
</tr>
<tr>
<td>Penetrating trauma</td>
<td>Terminate resuscitation or do not initiate resuscitation* for any patient who</td>
</tr>
<tr>
<td></td>
<td>• has no signs of life on scene.</td>
</tr>
<tr>
<td></td>
<td>• has become asystolic en route (confirmed flat line).</td>
</tr>
<tr>
<td>Thermal Injury</td>
<td>See blunt injury (for blasts)</td>
</tr>
<tr>
<td></td>
<td>• Rule out carbon monoxide poisoning and consider cyanide poisoning</td>
</tr>
<tr>
<td></td>
<td>for patients from structure fires (non-blast).</td>
</tr>
</tbody>
</table>

*Consider location of termination (on scene, en route, hospital) in terms of environment, social, and logistical issues.
Having made this distinction and based on the available scientific literature, three primary questions should be addressed before determining resuscitation pathways in posttraumatic circulatory arrest:

1. Is the injury primarily blunt or penetrating?
2. What is the initial ECG rhythm on scene?
3. Are there any signs of life?

Appendix B summarizes the NAEMSP position paper on this topic.

**Blunt Trauma**

In the clinical scenario involving blunt trauma and a clearly associated lethal mechanism of injury, available data indicate that there is virtually no survival chance for adults or children with an absence of perceptible pulse and respiration at the scene, regardless of the presence of a definitive airway (placement of an endotracheal tube) or duration of pulselessness. Therefore, medically speaking, any on-scene resuscitation could be waived or terminated under such circumstances.\(^22,25,26\) However, caution should be taken to first ensure that the lack of respiration is not due to a simple obstructed airway or the potentially reversible condition of VF, a condition that may have precipitated the circumstance that led to the injury.\(^3\)

As difficult as it is for care providers to accept, circulatory arrest after blunt trauma has a uniformly fatal outcome in pediatric patients (defined as age 17 years and younger).\(^22,25,28\) Therefore, under those circumstances, termination of resuscitation efforts is totally appropriate from a medical perspective.

Nevertheless, exceptions might be considered for the pediatric patient with obvious lethal injuries who still has agonal breathing and no palpable pulse. In these cases, initial ALS efforts might be encouraged if only for the potential of organ donation. For example, consistent with the other studies of pediatric posttraumatic arrest, a related investigation determined that there were no functional survivors among 38 pediatric victims of blunt trauma who presented to the ED in moribund conditions (pulseless cardiac arrest or extremely severe hypotension).\(^28\) Specifically, 11 of the 12 patients who did survive to admission to the pediatric intensive care unit eventually died, and the single long-term survivor still had profound neurologic impairment 6 years after hospitalization. Nevertheless, 6 of the 12 admitted patients became eligible organ donors, and thus the resuscitation efforts resulted in four multiorgan donors during the 7-year study.\(^28\) Organ donation specialists have entertained this type of protocol for adults as well.

Experience has also shown that there are other potential exceptions to the termination criteria for the patient with blunt trauma such as the circumstance in which there is a loss of perceptible pulse or respiration 2 to 3 minutes before arrival at a trauma facility where the expanded opportunity for salvage (i.e., immediate rescue thoracotomy) is immediately available.\(^3\)

Generally, ED thoracotomy is not recommended in patients who develop cardiopulmonary arrest following blunt trauma because of uniformly negligible survival rates and poor neurologic outcomes. If this procedure is used in blunt trauma cases, it should be limited to those who arrive with vital signs at the trauma center and experience a witnessed circulatory arrest.\(^3,25,26\) Therefore, it is still recommended that on-scene apnea and pulselessness are still valid criteria for either waiving or terminating resuscitation efforts in patients with blunt injury who have a clearly associated mechanism of injury, no VF, and no readily reversible airway obstruction.

**Penetrating Injuries**

Although outcomes are generally poor in most venues, in patients with penetrating trauma who are without pulse and respiration on scene, there are a finite number of survivors under certain circumstances. Although an initial transient pulse can be restored after thoracotomy in some cases, no long-term survival is seen in cases in which CPR (chest compressions and assisted breathing) efforts last more than 5 minutes.\(^29\) Better outcomes (longer tolerance of CPR conditions) have been reported with successful endotracheal intubation (ETI), very low ventilation rates, and thoracotomy within 10 minutes.\(^3,29\) This criterion assumes rapid transport times and that during transport for these patients, care is not only taken to provide adequate lung inflation (10 ml/kg, no positive end-expiratory pressure [PEEP], 100% oxygen), but also to avoid overzealous respiratory rates (i.e., rates should be less than 6–8 per minute), which may further cause or exacerbate circulatory arrest.\(^30,31\) Based on available literature, the contributions of other traditional management strategies during transport such as fluid resuscitation and chest compressions currently are indeterminate. On the other hand, they may be detrimental if they delay patient transport to emergency thoracotomy.\(^31,32\)
In a recent retrospective study, patients with penetrating trauma who underwent ED thoracotomy following transport by EMS were compared with those transported by private or police vehicle. Although the groups were well matched with respect to demographic data, only 7 of 88 (8.0%) of the EMS-transported patients survived until hospital discharge versus 16 of 92 (17.4%) receiving police or private transportation. Overall, 137 prehospital procedures were performed in 78 of 88 (89%) of the EMS-transported patients, but no police- or private-transported patient underwent field procedures. Multivariate logistic regression analyses identified prehospital procedures as the sole independent predictor of mortality. For each procedure, patients were more than 2.6 times more likely to die before hospital discharge. Hence, these authors concluded that the performance of prehospital procedures in unstable penetrating trauma victims had a negative impact on survival, and they recommended that paramedics should adhere to a minimal or “scoop and run” approach to prehospital transportation in this circumstance.

At the same time, it should be noted that, in contrast to the study just mentioned, another study from Houston demonstrated that ETI has a positive correlation with survival in the ED thoracotomy patient. Correlations with survival included prehospital ETI, single organ injury (and particularly a single cardiac or other thoracic injury), electrical cardiac activity, and time to thoracotomy. Although time to thoracotomy was still the most critical variable, it should also be emphasized that ETI with very infrequent respiratory rates was a key feature as well. It has now become well recognized that overzealous ventilation may be an unrecognized confounding variable that could lead to a poor outcome and thus might hide the potential benefit of this ALS intervention.

Even with improved odds of survival with penetrating injuries (as compared with blunt trauma), once true cardiac arrest ensues (confirmed flat line on ECG), survival chances dissipate to irreversibility with a uniformly guaranteed futile outcome. Even when ETI is accomplished and proper ventilatory strategies are used (i.e., 100% oxygen, tidal volume of 10 ml/kg, and respiratory rates <6–8/min), survival will not occur once cardiac standstill (asystole) has occurred. Many clinical investigations have now documented that patients with penetrating injuries who become asystolic on scene (or en route) or those who will remain pulseless and apneic for 15 minutes (despite ETI) will not survive. Accordingly, in cases of asystole or cases with the longer transport periods, on-scene termination (or termination during transport, as applicable), is medically indicated. As such, these factors should be considered before activation of air medical services or proceeding with rapid transport through traffic.

In retrospect, ED thoracotomy is most useful for patients who have penetrating cardiac injuries and who arrive at trauma centers (after an extremely short scene and transport time) with some signs of life such as pupillary response, spontaneous ventilation, presence of carotid pulse, measurable or palpable blood pressure, extremity movement, and cardiac electrical activity.

**The Issue of Normal-Appearing Electrical Activity**

Although development of brady-asystolic ECG activity bodes a bleak outcome for all trauma patients, those with posttraumatic circulatory arrest who present with persisting electrical activity (and particularly those with narrow ECG QRS complexes) but no signs of life still can pose difficult decisions for EMS personnel, even after blunt trauma. If the ECG tracing rate is bradycardic despite oxygenation, termination of efforts is recommended. Battistella et al. studied 604 victims of posttraumatic circulatory arrest, 304 as a result of blunt injury and 300 as a result of penetrating injury. The findings reconfirmed that no patient survived to leave the hospital if the initial electrical heart rate was less than 40 QRS complexes per minute. The clear conclusion was that blunt trauma victims who are pulseless and have asystole or bradycardic electrical cardiac activity (heart rate less than 40 beats per minute) are clear candidates for termination of resuscitation efforts.

Conversely, based on this same study, it could also be argued that those with heart rates greater than 80 per minute may be survivors, although rarely. Although chances for intact survival are negligible, considerations for initial attempts at resuscitation may be given under those circumstances, particularly with narrow QRS complexes on ECG. One consideration is that these studies did not document ventilation rates, a factor that may lead to pseudo-electromechanical dissociation (identifiable rhythm without a perceptible pulse), and so this factor may need to be taken into consideration in future studies.

Recently, NAEMSP collaborated with the American College of Surgeons (ACS) to establish guidelines for both withholding and terminating
resuscitative efforts in prehospital traumatic circulatory arrest. This joint position statement stated that resuscitation efforts may be withheld in:

1. Any blunt trauma patient who is found apneic, pulseless, and without organized ECG activity on EMS arrival;
2. Any penetrating trauma patient found apneic and pulseless without signs of life, including lack of pupillary responses, spontaneous movement, or organized ECG activity.

They further recommended that termination of resuscitative efforts should be considered in trauma patients with EMS-witnessed arrests with 15 minutes of unsuccessful resuscitation, including CPR, as well as traumatic cardiopulmonary arrest patients with more than 15 minutes of prehospital CPR. \(^{26}\) Previous consensus papers from EMS medical directors, writing on behalf of NAEMSP, have provided even more explicit guidelines for termination criteria. \(^{3}\) (Table 43-3)

### IMPLEMENTING TERMINATION OF RESUSCITATION PROCEDURES

Although scientific criteria for medical futility provide universal guidance for termination of resuscitation, each EMS system has its own nuances, resources, and limitations. Accordingly, successful implementation of policies for initiating or withholding resuscitation efforts is not as simple as writing a basic medical protocol. Before implementation, such policies require significant networking outside the EMS agency and vetting through the applicable local medical and legal authorities. Implementation must also be done with full and prospective cooperation of the EMS personnel. Local issues and resource concerns demand the need for local medical oversight so that on-scene termination is not only medically appropriate but also permissively, operationally, and sociologically.

In other words, concerns that need to be addressed in any guideline development include not only the clinical criteria of medical futility, but also considerations such as the maintenance of forensic evidence; consistency with statutory and legal issues; psychosocial concerns of families, witnesses, and care providers; and overall resource use effects on EMS agencies, hospitals, and the society at large.

Psychosocial concerns are of primary importance. Withholding or terminating resuscitation is, in effect, a de facto pronouncement of death. Surviving family members and loved ones are often in need of support from professionals such as clergy members. At the same time, the EMS providers themselves may also require psychosocial support in terms of resolving their own personal feelings about the incident itself (e.g., a child’s death) or their perceived responsibility for the death (i.e., “failure” to resuscitate). Fortunately, researchers who have evaluated the response of family members and EMS personnel to on-scene termination of resuscitation have shown that on-scene termination, at least in adults, is generally well

### TABLE 43.3

<table>
<thead>
<tr>
<th>Criteria for Termination of Resuscitation Efforts for Adults and Pediatric Patients with Nontraumatic Circulatory and Cardiac Arrest</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to start</td>
</tr>
<tr>
<td>Duration of efforts</td>
</tr>
<tr>
<td>Where to terminate</td>
</tr>
<tr>
<td>1. Refractory or persistently recurring VF, especially with spontaneous eye opening and other neurologic signs</td>
</tr>
<tr>
<td>2. Child involved*</td>
</tr>
<tr>
<td>3. Family not amenable (or other environmental concerns)*</td>
</tr>
</tbody>
</table>

*Social/public service reason (not medical futility).*
accepted. However, education of the EMS providers is still central in terms of how they begin to notify the family of the futility of the situation. Sequential, step-wise approaches should be taken to initiate the discussion of termination of the resuscitative efforts with on-scene family members. The proper choice of words and demeanor must be imparted prospectively to EMS personnel in training exercises.

In turn, such training should take into consideration any local, cultural, or religious concerns, and it should include a discussion addressing these events that occur in dynamic settings with considerable variations in etiology, locations, logistics, patient ages, and often unpredictable interactions with the family, friends, police, and medical examiner staff members. All of these dynamics necessitate prospective planning with defined roles for the local EMS medical director, the EMS providers, and all other affected agencies.

**SUMMARY**

Guidelines for initiating and terminating resuscitation with nontraumatic cardiac arrest are similar for adults and children. Although resuscitation efforts have historically been attempted on everyone except for instances of rigor mortis, dependent lividity, and legal DNAR orders, emerging literature suggests withholding the initiation of resuscitation on patients with unwitnessed cardiac arrests found in asystole with no bystander CPR performed, and particularly with estimated arrest intervals exceeding 10 minutes.

Termination of resuscitation efforts on-scene is medically indicated for those with presumed normothermic, nontraumatic cardiac arrest who do not spontaneously regain a pulse (or who have a persistent ETCO$_2$ level less than 10 mm Hg) for 20 to 25 minutes after the start of ACLS (except in cases of refractory or persistently recurring VF). In most communities today, termination of resuscitation for children may best be deferred until arrival at the ED, where psychosocial support is more available for families and EMS providers alike.

After ruling out cases of VF or blocked airways, resuscitation efforts can be waived or terminated for any blunt trauma patient in circulatory arrest who has become apneic and pulseless after a clearly related mechanism of injury. For patients with penetrating trauma and intact airways, resuscitation can be waived or terminated in cases in which asystole has developed, either on scene or en route.

Termination of resuscitation protocols should always be revisited and reviewed, and they must be combined with applicable training, supervision, and constant review of new therapeutic advances. The practical issues associated with on-scene termination of resuscitation efforts and decisions to waive or terminate resuscitation efforts involve not only the clinical criteria of medical futility but also mechanisms and procedures for implementation that take into account societal concerns, the emotional effects on EMS responders, any legal limitations, and the impact on EMS agency and police resources. In addition to medical futility and on-scene management of such circumstances, one must also consider the potential for organ procurement.

Most importantly, although current guidelines for resuscitation and termination of resuscitative efforts for both traumatic and nontraumatic cardiac arrest are acceptable within the current state of knowledge and technologies that now exist, continued investigation will always be needed to further modify these guidelines as new medical advances are achieved.

**REFERENCES**


Appendix: NAEMSP Position Statements


The recommendations presented in this position are based on the (mostly retrospective) research present to date, and the system requirements necessary to best provide support for the patient, family, providers, the community. This position specifically does not address patients sustaining traumatic cardiac arrest; those with signs of obvious death such as rigor mortis, lividity, or decomposition (on whom resuscitation should clearly not be attempted); or pediatric patients (less than 18 years of age). While it may be appropriate to develop similar recommendations for pediatric patients, the literature is not as well developed and has not been reviewed here.

1. Patient Population: Termination of resuscitation may be considered for any patient who suffers sudden cardiac death that is likely to be medical. Patients who are likely suffering from hypothermia or cold water drowning should generally not be considered candidates for field termination of resuscitation.

2. Collapse-to-treatment Interval: Important intervals include the times from collapse to the times the patient is found, CPR is started, defibrillation is administered, and ACLS is initiated. Unwitnessed cardiac arrests with unknown downtimes, delayed initiation of CPR beyond 6 minutes, and delay to defibrillation of more than 8 minutes carry a poor prognosis. These intervals are often hard to define, and although they are associated with poor outcomes, should be used as considerations but not as criteria for termination of resuscitation.

3. Treatment Requirements: A full resuscitative effort is required prior to consideration for termination of resuscitation in the out-of-hospital setting. This includes definitive airway management, intravenous access, defibrillation/cardioversion if necessary, CPR, and 20 to 30 minutes of treatment following Advanced Cardiac Life Support guidelines and/or local protocols.

4. Response to Therapy: Patients without ROSC are candidates for termination of resuscitation. Those patients whose rhythm changes to, or remains in, VF or VT should have continued resuscitative efforts. Patients in asystole or PEA are considered to be in terminal rhythms, and termination of resuscitation should be considered.

5. Logistic Factors: Consideration should be given to family wishes. If the family wishes efforts be continued, or if the family’s wishes remain unclear, particularly if there is a communication barrier, it may be preferable to continue resuscitative efforts. Other logistic factors may be considered, including collapse in a public place, weather, and safety of the crew and public.

6. Education of EMS Personnel: Emergency medical services providers should be educated regarding the ramifications of termination protocols. This includes education regarding the natural history and pathophysiology of cardiac arrest, and the inherently poor prognosis it carries.

7. Medical Oversight: All termination protocols need to be developed and implemented under the guidance of the system medical director, with input from physicians responsible for providing online direction. Online medical direction should be established prior to termination of resuscitation in the field. The final decision to terminate resuscitative efforts should be a consensus between the paramedic and online physician.

8. Care of the Deceased: After the decision to terminate resuscitative efforts has occurred, many important steps need to occur. These include notification of local law enforcement, involvement of the medical examiner or coroner, and completion of the patient call report and online direction documentation. Policies and protocols for termination of resuscitative efforts in the field should outline the steps that are needed based on local practices, and must be in place.
before programs terminating resuscitation in the field are implemented.

9. Family Counseling and Support: Policies and procedures for termination of resuscitative efforts in the field should include social, psychological, and grief counseling. Field providers and their supervisors need to be trained in grief counseling and providing support to family members of the deceased. The EMS system and family should have access to resources, such as clergy, crisis workers, social workers, and other necessary personnel.

10. Support for EMS Personnel: Emergency medical services personnel will be taking on the new role of grief counselor and may need support as well. An anonymous method of provider support should exist to provide personnel with a means to talk about the stress they may encounter in dealing with the termination of resuscitation in the out-of-hospital setting.

11. Quality Assurance and Improvement: Some form of quality review is necessary to ensure appropriate application of the termination protocol, as well as law enforcement notification, medical examiner or coroner involvement, and family counseling. Emergency medical services provider mental health should also be routinely evaluated to ensure adequate resources for providers.


The National Association of EMS Physicians and the American College of Surgeons Committee on Trauma support out-of-hospital withholding or termination of resuscitation for adult traumatic cardiopulmonary arrest (TCPA) patients who meet specific criteria:

1. Resuscitation efforts may be withheld in any blunt trauma patient who, based on out-of-hospital personnel’s thorough primary patient assessment, is found apneic, pulseless, and without organized electrocardiographic (ECG) activity upon the arrival of emergency medical services (EMS) at the scene.

2. Victims of penetrating trauma found apneic and pulseless by EMS, based on their patient assessment, should be rapidly assessed for the presence of other signs of life, such as pupillary reflexes, spontaneous movement, or organized ECG activity. If any of these signs are present, the patient should have resuscitation performed and be transported to the nearest emergency department (ED) or trauma center. If these signs of life are absent, resuscitation efforts may be withheld.

3. Resuscitation efforts should be withheld in victims of penetrating or blunt trauma with injuries obviously incompatible with life, such as decapitation or hemicorporectomy.

4. Resuscitation efforts should be withheld in victims of penetrating or blunt trauma with evidence of a significance time lapse since pulselessness, including dependent lividity, rigor mortis, and decomposition.

5. Cardiopulmonary arrest patients in whom the mechanism of injury does not correlate with clinical condition, suggesting a nontraumatic cause of the arrest, should have standard resuscitation initiated.

6. Termination of resuscitation efforts should be considered in trauma patients with EMS—witnessed cardiopulmonary arrest and 15 minutes of unsuccessful resuscitation and cardiopulmonary resuscitation (CPR).

7. Traumatic cardiopulmonary arrest patients with a transport time to an ED or trauma center of more than 15 minutes after the arrest is identified may be considered nonsalvageable, and termination of resuscitation should be considered.

8. Guidelines and protocols for TCPA patients who should be transported must be individualized for each EMS system. Consideration should be given to factors such as the average transport time within the system, the scope of practice of the various EMS providers within the system, and the definitive care capabilities (that is, trauma centers) within the system. Airway management and intravenous (IV) line placement should be accomplished during transport when possible.

9. Special consideration must be given to victims of drowning and lightning strike and situations where significant hypothermia may alter the prognosis.
10. EMS providers should be thoroughly familiar with the guidelines and protocols affecting the decision to withhold or terminate resuscitative efforts.

11. All termination protocols should be developed and implemented under the guidance of the system EMS medical director. Online medical control may be necessary to determine the appropriateness of termination of resuscitation.

12. Policies and protocols for termination of resuscitation efforts must include notification of the appropriate law enforcement agencies and notification of the medical examiner or coroner for final disposition of the body.

13. Families of the deceased should have access to resources, including clergy, social workers, and other counseling personnel, as needed. EMS providers should have access to resources for debriefing and counseling as needed.

14. Adherence to policies and protocols governing termination of resuscitation should be monitored through a quality review system.