Termination of Resuscitation for Traumatic Cardiac Arrest

What guidelines have been established for terminating the resuscitation of a trauma patient in cardiac arrest? Are there differences for a prehospital arrest, such as a 28-year-old man who is unresponsive and pulseless after a motor vehicle crash and the emergency medical services have a 20-minute transport time, versus a patient who has been pulseless after a gunshot wound to the chest and is seen in the emergency department after having had cardiopulmonary resuscitation (CPR) for 10 minutes?

These scenarios represent the types of difficult decisions health care providers must make when caring for trauma patients in the prehospital and emergency department settings. Medical personnel seek the best care for their patients but must also make appropriate triage decisions and use available resources adequately. In the United States reimbursement and resources have become limited and made health care providers fiscally responsible for the patient care choices they make. Clinical decisions should be based on outcome data.

CLINICAL TRIALS

Multiple investigators have found that normothermic trauma patients who have prolonged cardiopulmonary arrest (i.e., longer than 30 minutes) and who do not show signs of a temporary return of a spontaneous pulse do not experience a normal recovery. Further research has shown that for patients who are pulseless for 10 to 15 minutes in association with no measurable end-tidal carbon dioxide further resuscitation efforts should be considered futile. Adding basic or advanced life support to the care of these patients does not change the outcome. The Emergency Cardiac Care Committee of the American Heart Association has stated:

Resuscitation may be discontinued in the prehospital setting when the patient is nonresuscitable after an adequate trial of advanced cardiac life support (ACLS).... Ambulance medical directors remain ultimately responsible for determination of death, and pronouncement of death in the field should have the concurrence of on-line medical control.... Return of spontaneous circulation for even a brief period is a positive prognostic sign and warrants consideration of transport to a hospital. Transport may also be warranted in special circumstances such as profound hypothermia.

Although the studies supporting this recommendation focused on patients with medical causes of cardiac arrest, other studies on trauma-related cardiac arrest patients have demonstrated similar findings.

In 1990 the National Association of Emergency Medical Services Physicians Committee on Rural Affairs developed guidelines for the delayed or prolonged transport of patients in cardiopulmonary arrest. The guidelines state that any normothermic patient who sustains cardiopulmonary arrest for longer than 30 minutes, without a temporary return of a spontaneous pulse, should have chest compressions, ventilatory support, and advanced life support measures discontinued. These guidelines do not differentiate between medical and traumatic causes of cardiopulmonary arrest.

TRAUMATIC CARDIAC ARREST

The outcomes of trauma patients in cardiopulmonary arrest have been studied. One study conducted over a 5-year period looked at resuscitation outcomes for 106 patients who sustained either blunt or penetrating mechanisms of injury and received prehospital CPR. Six patients had penetrating chest...
Table 1. Guidelines for the termination of prehospital resuscitation of traumatic cardiac arrest

1. For patients (>14 years old) who have sustained blunt trauma, pulseless at the scene, ground EMS should initiate advanced airway, CPR, and ALS interventions. After >5 minutes of CPR without return of pulse, transport to nearest facility or establish on-line medical control for orders to discontinue resuscitative efforts. Contact appropriate local authorities (police or coroner).
2. For patients (>14 years old) who have sustained penetrating trauma to abdomen, head, neck, or groin and are pulseless at scene, ground EMS should initiate advanced airway, CPR, and ALS. After >5 minutes of CPR without return of pulse, transport to nearest facility or establish on-line medical control for orders to discontinue resuscitative efforts. Contact appropriate local authorities (police or coroner).
3. For patients (>14 years old) who have sustained penetrating trauma to chest and are pulseless at scene, ground EMS should initiate advanced airway, CPR, and ALS. After >15 minutes of CPR without return of pulse, transport to nearest facility or establish on-line medical control for orders to discontinue resuscitative efforts. Contact appropriate local authorities (police or coroner).

Note: If a patient may be hypothermic or shows any sign of life (i.e., intermittent pulse or respirations), immediate transport to closest facility or trauma center is warranted (follow local protocol). If ground ALS is unavailable, requesting air medical assistance is appropriate.

EMS, Emergency medical services; ALS, advanced life support.

Table 2. Guidelines for termination of emergency department resuscitation of traumatic cardiac arrest

Patient should be pronounced DOA when any of the following criteria are met for patients ≥14 years old who are pulseless on arrival:
- Blunt trauma: prehospital CPR >15 minutes
- Penetrating trauma to abdomen, head, neck, or groin: prehospital CPR >5 minutes
- Penetrating trauma to chest: CPR >15 minutes

Trauma alert activation should NOT occur initially for patients meeting these prehospital criteria. Emergency department faculty will evaluate patient immediately and determine the following:
- Airway management is adequate.
- Patient does not have a pulse. If pulse or any signs of life are detected, a Trauma Alert should be activated immediately.
- Patient is normothermic (core body temperature ≥90°F (37°C)

After all above criteria have been assessed, patient will be pronounced DOA and no further resuscitative activity should ensue. Emergency department faculty should ensure entire completion of Trauma Admission Form. The following should be entered for diagnosis: "Patient pronounced DOA." Any injuries, such as femur fracture or penetrating head injury, that are recognized during gross physical examination should be listed. One copy of the Trauma Admission Form will be forwarded to Trauma Coordinator for entry into trauma registry, and original will become part of patient's permanent medical record.

DOA, Dead on arrival.
Adapted from University of Kentucky Hospital, Termination of Resuscitation Based on Prehospital Criterion, 1996.

To date, few studies have been published that report the costs of prehospital resuscitation for patients who do not survive. Forty-one of the 106 patients were transported by helicopter. The costs associated with in-hospital resuscitation efforts (minus flight costs) of these 106 patients who sustained traumatic cardiac arrest averaged $3454 per patient compared with $200 per patient for those pronounced dead on arrival in the emergency department.4

To date, few studies have been published that report the costs of prehospital resuscitation for patients who do not survive. One 10-year study of 328 trauma patients of all ages who required CPR found a survival rate of 0.0% and an approximate cost of $854,720 (United States) for flight and emergency department resuscitative efforts.11

CLINICAL CONSIDERATIONS

The termination of resuscitation is a difficult decision but is appropriate when multiple factors are considered. The financial burden generated by futile resuscitative efforts is shared by hospitals, insurance companies, government agencies, and families. The costs of resources include personnel from emergency medical services, air medical transport, emergency department, intensive care, and surgery; blood products; and bed space dedicated to these patients. Indirect costs are numerous but include...
increased exposure for the medical staff to communicable diseases, such as human immunodeficiency virus, hepatitis, and tuberculosis.

**PROTOCOLS FOR TERMINATION OF RESUSCITATION**

Many institutions and transport services have created policies or protocols for the trauma patient who is in cardiopulmonary arrest. Some protocols start at the scene, whereas others wait until the patient has been admitted to the emergency department. Patients are evaluated for specific criteria, transport time, or availability of advanced life support services to determine if CPR is initiated. The patient can be pronounced dead either at the scene by the paramedic or by on-line communication with medical control or at the time of admission to an emergency department. Table 1 provides an example of a protocol used in the prehospital setting of a traumatic cardiac arrest, and Table 2 is used at the time of admission to the hospital.

Protocols for termination of CPR for traumatic arrest should be able to assist health care providers in making decisions regarding appropriate care. Creating protocols for the care of the patient in cardiopulmonary arrest in the prehospital and emergency department settings may assist the staff in making the most appropriate resuscitation decisions. Multicenter evaluations of the protocols should be conducted to demonstrate the impact on health care costs, allocation of resources, and risk of exposure to health care workers. Termination of resuscitation does not mean termination of care to family members. The prehospital and emergency department staff may have more time and energy to devote to the surviving family members during their initial stages of grief.

**REFERENCES**