Medical Direction and Practices Board

WHITE PAPER

Out of Hospital Traumatic Cardiac Arrest

OVERVIEW

Patients with traumatic cardiac arrest, regardless of the underlying etiology, have an essentially zero chance of survival. This makes sense since to get to a state of cardiac arrest from trauma a patient must suffer massive injuries or significant blood loss (excepting commotio cordis – or lethal rhythms resulting from direct trauma to the heart). If a patient is to survive, he or she must have an easily correctable insult that can be rapidly fixed in the immediate peri-arrest period, preferably in the prehospital environment. Even with the best care, these patients suffer poor outcomes. Therefore, EMS providers must rapidly make a decision about the survivability of a given patient, perform any appropriate interventions and, if those fail, recognize that there is no benefit to transport of that patient. Not initiating resuscitation is often the best choice, followed by early termination of resuscitation. The risks of injuring or killing an EMS provider or member of the public do not justify "heroic measures" or "high flow diesel" to perform what is best described as the rapid delivery of a dead body to an emergency department.

TRAUMATIC CARDIAC ARREST

Many patients suffer prehospital cardiac arrest. It is important for providers to figure out early on if the patient has suffered a medical cardiac arrest or a traumatic cardiac arrest. Patients suffering medical cardiac arrest should be treated in the standard fashion as described in the MEMS protocols. Patients suffering from traumatic cardiac arrest, however, have a much different pathophysiology and prognosis.

Many injuries can cause traumatic cardiac arrest. Injuries such as decapitation, massive head trauma, or incineration are clearly not survivable and no EMS provider would consider resuscitation of these patients. Other injuries can be much more subtle. It can be very difficult to tell the difference between the patient in traumatic cardiac arrest from a tension pneumothorax, an aortic transection, or a massive hemothorax. Nonetheless, while two of these three cardiac arrest patients (aortic transection and massive hemothorax) will remain dead no matter what is done in the prehospital environment, even the patient with a tension pneumothorax has practically no chance of survival if the prehospital chest decompression does not restore a pulse. The same is true of the hypovolemic patient in cardiac arrest who does not regain a pulse after a fluid bolus. Further resuscitation and transport will not change the outcome. Knowing this, the EMS provider must accept that patients who do not respond to EMS interventions will get no benefit from transport and ED care.

Regardless of cause, traumatic cardiac arrest has a grave prognosis with survival rates typically less than 0.5 %.

PREDICTIVE FACTORS FOR FAILURE

While patients in traumatic cardiac arrest rarely recover, there are some situations in which survival never occurs. Patients in traumatic cardiac arrest with cardiac rhythms of asystole, bradycardic PEA (less than 40 beats per minute), or idoventricular rhythm do not recover. Patients with blunt traumatic cardiac arrest and transport times longer than 15 minutes are essentially nonsalvagable as are patients whose cardiac arrests are not witnessed, particularly those with signs of prolonged arrest (decomposition, rigor mortis, or lividty). Traumatic cardiac arrest patients with EMS witnessed cardiac arrest who undergo 15 minutes of CPR do not survive. Finally, patients with penetrating trauma cardiac arrest who have no signs of life and no organized electrical cardiac activity on EMS arrival do not survive.

PREDICTIVE FACTORS FOR SUCCESS

There are some factors surrounding a traumatic event that predict a successful outcome. First off, patients in cardiac arrest whose mechanism of injury should not result in significant trauma are likely medical cardiac arrest patients. Victims of lightning strike, hypothermia, and drowning also have a significantly higher chance of survival and therefore should be resuscitated as appropriate for those circumstances.

POTENTIAL INTERVENTIONS

The concept of Pulseless Electrical Activity (PEA) cardiac arrest is one of perspective. Pulselessness is not defined by specific medical criteria regarding tissue perfusion but rather is simply a state in which you can't feel a pulse. A patient with invasive arterial blood pressure monitoring may have a blood pressure that is marginally perfusing the brain even if you can't feel a pulse. In these "pseudo arrest" states, the patient has an organized electrical rhythm, the heart is contracting, and volume is moving but not to a degree that can produce a palpable pulse. Two causes of these types of traumatic cardiac arrest have the potential to be reversed in the prehospital environment. Both of these create a "pseudo arrest" state.

The first is the patient with a tension pneumothorax. While there are not studies to clearly demonstrate an improvement in outcome of traumatic cardiac arrest patients through the use of nonselective needle chest decompression, there is no risk to this group of patients from this procedure and, if done correctly, minimal risk for the EMS provider. Therefore, if there is evidence of chest trauma or suspicion that a tension pneumothorax may be contributing to a patient's cardiac arrest, the provider should perform bilateral needle chest decompression.

The second is the patient with a relative hypovolemia from blood loss. If the patient has a well-functioning pumping system, addition of a relatively small volume of fluid (1-2 L) may provide adequate circulatory volume to produce a palpable pulse. However, failure to improve strongly suggests that the patient either has additional non-survivable injuries or has such profound volume loss that no amount of fluid will change the outcome.

For these reasons, the EMS provider (if appropriately licensed) should consider bilateral needle chest decompression and a fluid bolus in the patient in traumatic cardiac arrest prior to terminating the resuscitation. If neither of these interventions appear to offer any hope of success, it is also reasonable for the EMS provider to withhold all resuscitation.

TREATMENT FOR PATIENTS (ADULT OR PEDIATRIC) IN TRAUMATIC CARDIAC ARREST

Do not initiate resuscitation in any patient in traumatic cardiac arrest if the patient has injuries not compatible with life (for example decapitation, incineration, or hemicorpectomy) or in a patient in whom there is evidence of a significant lapse of time from the cardiac arrest (decomposition, rigor mortis, or dependent lividity).

TREATMENT FOR PATIENTS (ADULT OR PEDIATRIC) WITH BLUNT TRAUMATIC CARDIAC ARREST

In the patient with blunt traumatic cardiac arrest and NO signs of life (no spontaneous respiration, pupillary responses, or spontaneous motor movement), all levels of provider should typically not initiate resuscitation. For those licensed to do so, consider only limited resuscitation (needle chest decompression and / or a fluid bolus) and, if these interventions are unsuccessful, terminate the resuscitation. Do not transport a patient in blunt cardiac arrest who never had signs of life during the EMS encounter. If the patient has vital signs or signs of life on EMS arrival and goes into cardiac arrest while being transferred to the ambulance / during transport AND transport time to the nearest emergency department in less than 15 minutes, the EMS crew may consider transporting the patient but must do so in a manner that does not endanger the EMS crew or members of the general public. If there are circumstances that do not allow the termination of resuscitation on scene due to safety or operational concerns, you may consider moving the patient to the ambulance and terminating resuscitation in the ambulance. Recognize that if you do so you may be disrupting a crime scene.

TREATMENT FOR PATIENTS (ADULT OR PEDIATRIC) WITH PENETRATING TRAUMATIC CARDIAC ARREST

In the patient with penetrating traumatic cardiac arrest and NO signs of life (no spontaneous respiration, pupillary responses, or spontaneous motor movement), all levels of provider should typically not initiate resuscitation. For those licensed to do so, consider only limited resuscitation (needle chest decompression and / or a fluid bolus) and, if these interventions are unsuccessful, terminate the resuscitation. If the patient has vital signs or signs of life on EMS arrival and goes into cardiac arrest while being transferred to the ambulance / transported AND transport time to the nearest emergency department in less than 15 minutes, the EMS crew may consider transporting the patient but must do so in a manner that does not endanger the EMS crew or members of the general public. In addition, if the total time from cardiac arrest to arrival at the emergency department is less than 15 minutes, consider transport of the penetrating cardiac arrest patient even if the EMS crew did not personally witness the cardiac arrest. If there are circumstances that do not allow the termination of resuscitation on scene due to safety or operational concerns, you may consider moving the patient to the ambulance and terminating resuscitation in the ambulance. Recognize that if you do so you may be disrupting a crime scene.

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