



## Clinical Practice Guideline For Emergency Department Thoracotomy After Trauma

### Purpose

This practice guideline describes an initial approach to the trauma patient in cardiopulmonary arrest. It takes into account the current available literature and expert opinions from leaders in the field of trauma medicine. It is intended to direct the care of the patient who presents to the Emergency Department (ED) in traumatic cardiopulmonary arrest or who develops cardiopulmonary arrest shortly after arrival to the ED.

### Background

Patients presenting to the ED after traumatic cardiac arrest have been shown to have a very low survival rates, and many of those that do survive sustain significant anoxic brain injury. Because of this as well as continuing concern about blood exposure to ED personnel, financial costs, and depletion of banked blood products, the indications for ED thoracotomy have evolved over the past decades and become narrower. However, there continues to be role for ED thoracotomy in some severely injured patients.

The primary indication for the ED thoracotomy is an acute pericardial tamponade resulting from stab wound to the heart in which rapid evacuation of the hemopericardium will restore cardiac output and allow for suture control of the cardiac wound. Survival rate in these patients is the highest among all who undergo ED thoracotomy after traumatic arrest and averages 16.8 % in most published series. Conversely, victims of blunt injury who sustain arrest and then undergo an attempted resuscitation with ED thoracotomy have, on average, a probability of survival of only 1.4%. Patients sustaining penetrating abdominal or extremity trauma have reported survival rates somewhere between those of stab wounds to the heart and blunt mechanisms.

The duration of pre-thoracotomy CPR is also an important prognostic factor. Although no strict or precise consensus has ever been reached, the most frequently quoted time interval beyond which ED thoracotomy should **not** be performed is 15 minutes for penetrating mechanisms and 5 minutes for blunt mechanisms. Patients who exceed these limits are extremely unlikely to survive even after an ED thoracotomy, and those who do generally sustain devastating neurologic dysfunction.

### Definitions

**Traumatic cardiopulmonary arrest:** a condition characterized by absence of detectable vital signs, which include spontaneous respiratory effort, detectable arterial pressure, or organized cardiac rhythm.

**Cardiopulmonary resuscitation (CPR):** The standardized treatment by prehospital or ED personnel that includes *closed chest cardiac compressions* and usually one or more of the following:

1. assisted mechanical ventilation (either via endotracheal tube, tracheostomy, cricothyroidotomy, bag-valve mask or esophageal-tracheal “combitube,” laryngeal mask airway (LMA) or similar temporary airway devices);
2. administration of inotropic, chronotropic or vasopressor **drugs** (such as epinephrine, norepinephrine, atropine, etc).

**Signs of Life (S.O.L):** detectable blood pressure, respiratory or motor effort, cardiac electrical activity, pupillary light response.

## Guidelines

### **Initial Assessment**

The approach to a patient in traumatic cardiopulmonary arrest should be based on three clinical variables: the mechanism and anatomy of the injury, the physiologic status at the scene and during transport, and the physiologic status upon arrival to the ED. Therefore it is imperative that information exchange between prehospital personnel and the receiving Trauma Team be accurate and rapid.

Pre-hospital radio communication from the incoming EMS crew can be incomplete or inaccurate, and the patient's condition often changes prior to ED arrival. It is therefore important that the paramedics, upon delivering the patient to the ER, provide the assembled trauma team with a clear and concise report that includes:

1. mechanism of injury (blunt versus penetrating) and known/suspected anatomic location of injuries
2. estimated "down time" prior to EMS arrival on the scene (i.e. time without CPR)
3. presence or absences of specific signs of life and of vital signs at the scene including, whenever possible, the initial ECG rhythm
4. total estimated CPR time
5. changes in patient condition or new findings during transport

Closed chest compressions and administration of vasopressors, cardiac inotropes and chronotropes, etc. (i.e. "medical ATLS protocol") are of little to no benefit when the etiology of cardiopulmonary arrest is acute hypovolemic or acute cardiac compressive shock. Open cardiac massage (via thoracotomy), direct control of bleeding, and volume re-expansion with blood products are, in these cases, superior and should be the primary treatment modality when the patient is felt to be salvageable.

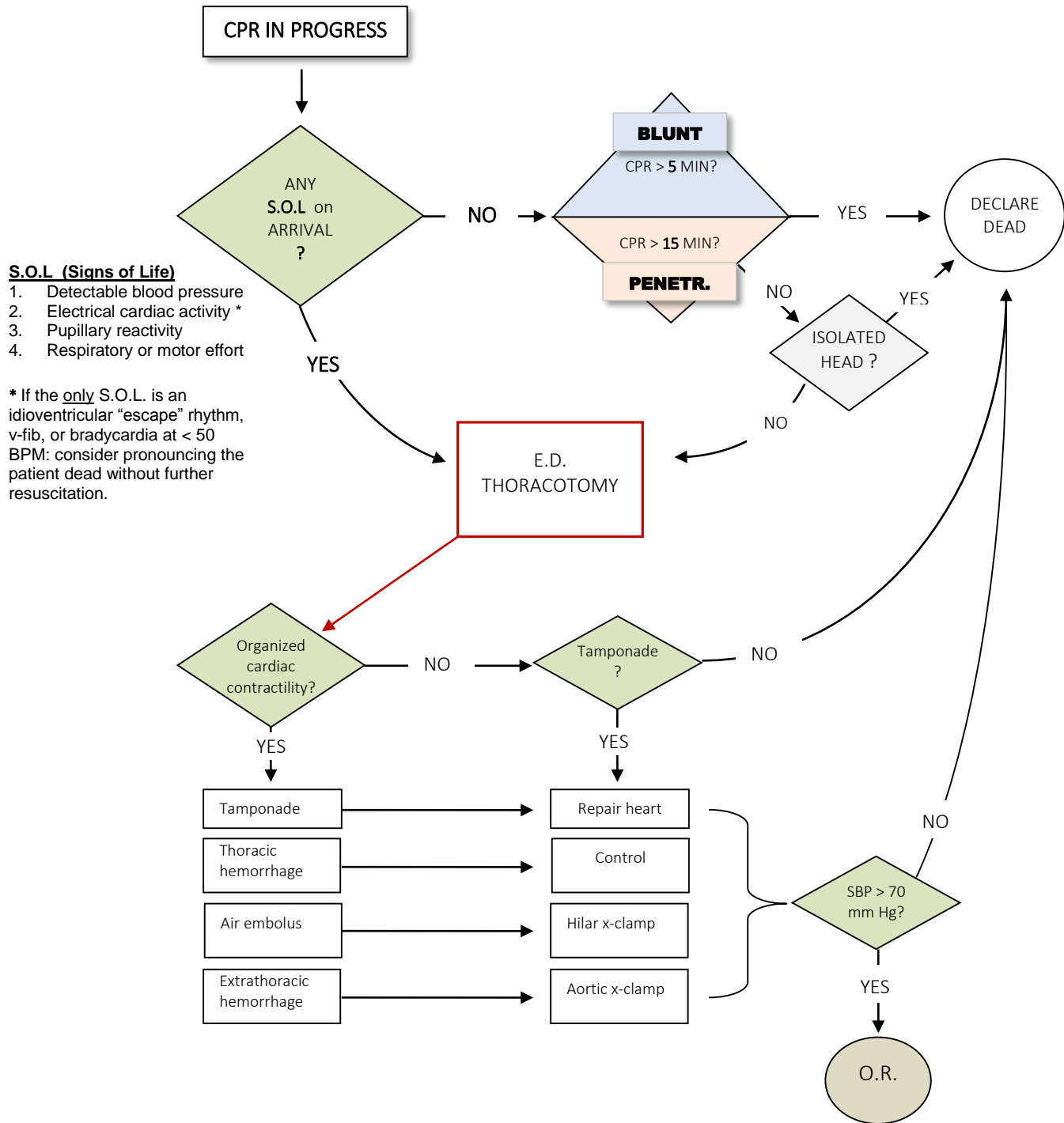
Taking the above into consideration, the Trauma Team should rapidly evaluate the patient upon arrival for signs of life and obtain an initial ECG rhythm on the overhead monitor. This should occur within the first minute of the evaluation.

### **ED Thoracotomy and Resuscitation**

Patients arriving to the ED who had *no signs of life at the scene and during transport* **and** who have *no signs of life upon ER arrival* should be declared dead on arrival without any further interventions.

Patients who had signs of life at the scene or during transport should be resuscitated according to the following algorithm.

## ALGORITHM for EMERGENCY DEPARTMENT THORACOTOMY after TRAUMATIC CARDIOPULMONARY ARREST



## Selected References

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