Cardiac Arrest in Special Populations

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KEYWORDS

• Cardiac arrest • Traumatic injury • Asthma • Pregnancy
• Poisoning • Toxicology • Electrical injury • Submersion injury

The following situations present unique challenges in resuscitation of the patient in cardiac arrest. Specific situations were chosen for inclusion based on their likelihood of presentation to the emergency department. These situations not only require modifications to basic adult resuscitation, they house the potential for severe time and resource use. The decision to apply these modifications to standard care for the cardiac arrest patient may be obvious in some cases or may be applied due to suspicion from the presenting medical history, history of present illness, or physical examination. Some of the therapeutic interventions discussed here are applicable to the patient in a near arrest condition and may be considered to prevent progression to cardiovascular collapse in the gravely ill patient. With rare exception, general care of any cardiac arrest patient should include continuous high-quality chest compressions and appropriate airway and ventilatory management.

TRAUMATIC INJURY

Multiple pathologies can lead to cardiac arrest in the setting of traumatic injury and may occur individually or in combination. Etiologies include: severe head injury, hypoxia (airway obstruction or disruption, pulmonary contusion, hemothorax, or pneumothorax), distributive shock (spinal cord injury), or diminished cardiac output (exsanguination, tension pneumothorax, pericardial tamponade, or myocardial contusion).

In cases of traumatic arrest where a clear etiology is not readily apparent, an Airway-Breathing-Circulation (ABC) approach to heroic interventions may be reasonable.

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Unfortunately, the prognosis of out-of-hospital cardiac arrest due to trauma is poor, particularly in the setting of blunt injury. Cervical spinal immobilization should be maintained throughout resuscitation unless there is a clear mechanism of injury that excludes the potential for spinal injury.

The airway should be immediately assessed and stabilized. Conventional direct laryngoscopy and endotracheal intubation remain the standard of care for definitive airway control. Rates for successful endotracheal tube placement may be augmented with cricoid maneuvers such as Sellick; backward, upwards, rightwards pressure (BURP); or 2-handed laryngoscopy or with tube introducers like the gum elastic bougie.[1–4] Video or optical laryngoscopic modalities have shown promise for successful airway management with decreased times for tube placement and minimizing cervical spine manipulation.[1,5–7] Supraglottic blind insertion airway devices (King LT [King Systems, Noblesville, IN, USA] LMA [LMA North America, Inc, San Diego, CA, USA], and others) may also be useful in difficult airway or failed intubation.[8] These devices may also be in place as part of prehospital resuscitation efforts. In these cases, the decision to remove them and attempt endotracheal intubation should be guided by the ability to oxygenate, ventilate, and prevent aspiration. Surgical cricothyrotomy equipment should be readied at the earliest identification of a potentially difficult airway and should proceed if the previously described methods are ineffective at airway control.

Following trauma, ventilation difficulty may be the result of pneumothorax, hemothorax, or gastric distention. For patients in extremis, bilateral needle decompression or tube thoracostomies should be empirically performed. Orogastric tube placement should also be performed if gastric distension is suspected based on physical examination, poor ventilator compliance after pleural decompression, or if a history of prolonged or aggressive bag valve mask use was present before airway control.

External hemorrhage control should be performed to prevent additional volume depletion. This may occur through a combination of clamping visible vessels, tourniquet application to extremities with severe wounds, and pressure application with or without commercially available hemostatic agents. If used, nongranular, low heat-generating hemostatic products are recommended.[9,10] Large-bore peripheral venous access should be obtained with rapid infusion of 2 L of isotonic crystalloid followed by uncross-matched packed red blood cells if available. Peripheral access remains superior for infusion rates required in traumatic arrest; however, intraosseous and central lines should be placed if peripheral access is difficult to obtain. Needle pericardiocentesis may be therapeutic for pericardial tamponade; however, it will likely prove only to be a temporizing measure.

If definitive surgical intervention is readily available, a subset of patients may benefit from resuscitative thoracotomy. A proposed subset includes any witnessed posttraumatic arrest in the emergency department, arrest less than 5 minutes for penetrating cardiac injury, less than 15 minutes for penetrating thoracic injury, or any exsanguinating abdominal vascular injury where secondary signs of life are present (eg, pupillary reflexes, spontaneous movement, organized electrocardiographic (ECG) activity).[11] While these indications have not been universally accepted, subsequent literature affirms high mortality rates in patients who undergo emergency department thoracotomy, particularly for blunt trauma.[12,13] Internal cardiac massage and defibrillation, relief of pericardial tamponade, direct control of cardiac or thoracic hemorrhage, and cross-clamping of the aorta can be performed during the thoracotomy; however, these interventions require a high degree of technical skill, and should only be attempted by experienced providers.

Ventricular fibrillation (VF) and ventricular tachycardia (VT) should be defibrillated immediately upon their recognition. Advanced cardiac life support (ACLS) algorithms