

## Saving Officers' Lives: The X-ABC's (eXsanguinations-Airway, Breathing, Circulation)

In operational medicine, appropriate recognition and treatment of bleeding and airway issues differ in response to the changing environment. If there is an immediate threat of further harm to the casualty or responder (*care under fire*), one must respond differently than if there is minimal threat (*tactical field/evacuation care*). Knowledge of techniques to stop major blood loss first and subsequently address issues related to airway, breathing and circulation will buy officers time to get to definitive care of their injuries. When addressing medical needs of law enforcement personnel in the high risk environment, it makes sense to approach injuries as outlined by the Tactical Combat Care Committee (TCCC).<sup>1</sup> The committees' guidelines of *care under fire* versus *tactical field/evacuation care* provide responders with the mindset required to provide appropriate care in response to the immediate hazards of the environment.<sup>2</sup>

### Care Under Fire (eXsanguinations)

*Care under fire* is providing care to a casualty when rounds are still hitting in the immediate vicinity.<sup>3</sup> Response in this situation differs from that when there is minimal threat to the casualty and responder. The first step in stopping any large volume bleeding (exsanguinations) in *care under fire* is removing the threat from the casualty or removing the casualty from the threat. It is necessary to provide cover, thereby reducing the threat of sustaining more gunshot wounds and associated massive bleeding. Care providers may instinctively run to put their hands on a casualty instead of assuring that the casualty does not receive more gunshot wounds, thus putting both the responder and casualty at unnecessary risk. Instead, have the casualty crawl to cover, drag the casualty to cover or bring cover to the casualty (figure 1).

**Figure 1: Types of Cover**

<b>Bring cover to casualty:</b>	<b>Bring casualty to cover:</b>
Bullet blanket, Shields	Having casualty crawl to cover, suppressive fire
Vehicle, Ambulance, Firetruck	Dragging casualty to cover, ropes, harness systems
Eliminate the threat	

There is an exception to seeking immediate cover. The exception is quickly applying a tourniquet (figure 2a,b) if there is concern that the casualty is going to lose large amounts of blood before reaching sustained cover. The leading cause of preventable death in operations is exsanguination.<sup>4</sup> In this situation, it is appropriate to quickly place the tourniquet proximal (high between the body and the wound) and tight over the casualty's clothing.<sup>2</sup> Shock (leading to death) can begin within minutes after severance of an extremity's large artery or vein if the bleeding is not controlled.<sup>5,6</sup> The ability to quickly apply a tourniquet to oneself or a team member during operations is the most appropriate management of large volume-bleeding extremity wounds in *care under fire*.<sup>1</sup> The responder can place the tourniquet, or the responder can instruct the casualty to

place a tourniquet on his or her self. If the responder is unable to extract an unresponsive casualty from the immediate vicinity at that time, it is next important to check and clear the airway behind cover.

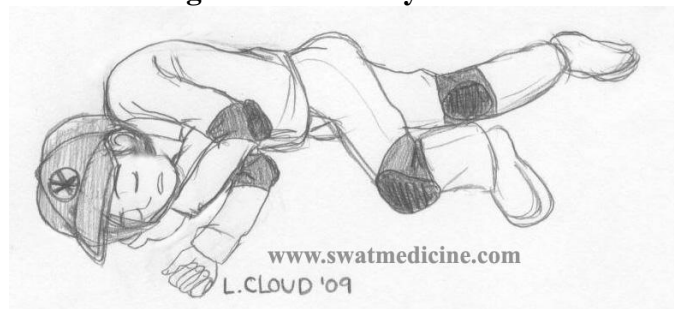
**Figure 2: Windlass type Tourniquets**



### Care Under Fire (**Defer** Airway)

If a casualty has the ability to talk, the airway is not an immediate concern. Furthermore, airway control is best deferred until the *tactical field/evacuation care* phase.<sup>2</sup> If, however, it is impossible to remove an unconscious casualty from the danger zone for an extended period of time, the airway should be addressed. The most common airway obstruction in adults is the tongue. Some other common foreign bodies are chewing tobacco and gum. When an officer is unconscious, the tongue easily shifts and obstructs the airway. If unable to evacuate the casualty for an extended time, a quick way to maintain an unconscious team member's airway is to place them behind cover into the recovery position (figure 3). The responder should place a team member in the recovery position behind cover, check that the casualties tongue or a foreign body is not blocking their airway, and then return to the fight. The recovery position will buy time, thus allowing the responder to remove the officer from the danger zone when there is reduced risk for sustaining additional wounds for both the responder and the casualty. Further medical interventions can wait until the threat has been reduced and the responder has entered into *tactical field/evacuation care*.

**Figure 3: Recovery Position**



**Figure 4: Manual (hand) Airway Control**



### **Tactical *Field/Evacuation Care* (Airway)**

After any immediate threat to the casualty or responder has been minimized, the responder can move into the *tactical field/evacuation care* phase of treatment.<sup>3</sup> This can take place near the site of the initial insult, in an ambulance or aircraft in transport to definitive care, or at any location where the threat of additional trauma to the casualty has been minimized. Once all *massive* hemorrhage has been addressed, it is appropriate to address airway issues. In the *tactical field/evacuation care* setting, the responder will have time to access and utilize gear to manage the airway. The responder can keep the casualty in the rescue position while medical gear is accessed. If the responder has an assistant, the responder can maintain a manual airway while the assistant accesses the medical gear. The manual airway and recovery position are temporary methods. If they are utilized, it is then appropriate to advance to a nasopharyngeal airway (NPA). An NPA is an essential part of a responder kit. The nasopharyngeal airway is small, light, and inexpensive (Figure 5). Additionally, the NPA can arouse a previously unresponsive casualty. It takes minimal training or experience to successfully place an NPA. However, it is important to remember an NPA is not considered a definitive airway. Responders should consider options other than NPA if the casualty has maxillofacial trauma or if the casualty is actively gagging. If a casualty remains unconscious for an extended period of time after NPA placement, it may still be necessary for a trained medical provider to place an advanced airway. More advanced techniques that should only be attempted by trained personnel include supraglottic airway (e.g. King LTD), intubation and cricothyroidotomy (surgical airway). After an airway has been established, it should be reassessed frequently, especially after any movement of the casualty.

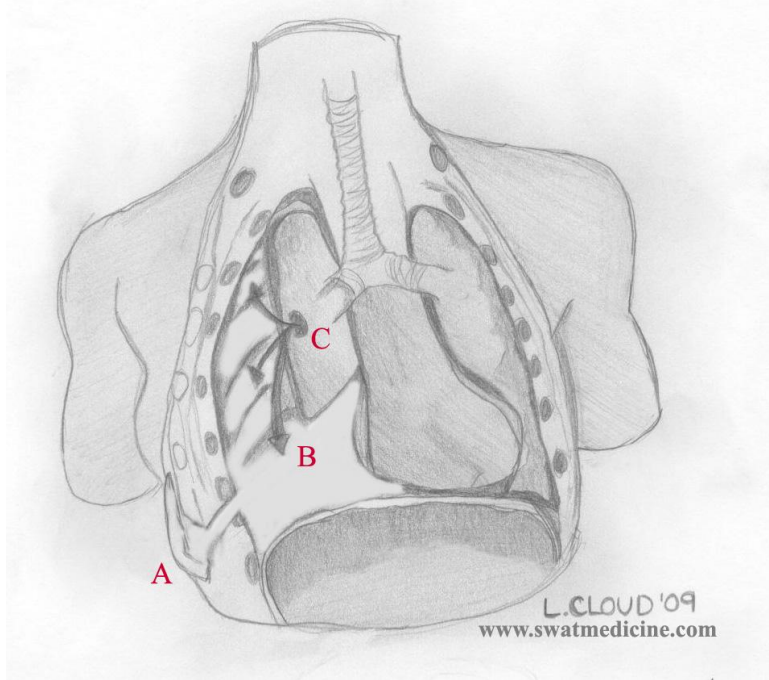
**Figure 5: Nasopharyngeal Airway**



### Tactical *Field/Evacuation Care* (Breathing and Circulation)

Difficulty breathing after sustaining a gunshot wound to the chest can be caused by a sucking chest wound and/or tension pneumothorax.<sup>3</sup> A sucking chest wound is a wound that allows air to pass into the pleural (linings of the chest) cavity and interferes with correct mechanical functioning of the lungs. These wounds are not always identifiable by site or sound; therefore all wounds from the neck to the belly button should be addressed as if they are potentially a sucking chest wound. This includes injuries to the back or the flank of a casualty. A sucking chest wound can develop into a tension pneumothorax (figure 6b) the second leading cause of preventable death in operations.<sup>4</sup> A sucking chest wound can be managed by placing a commercial chest seal or occlusive dressing (material not allowing air to pass through) taped on all 4 sides. This will prevent the accumulation of air sucked into the pleural space of the chest cavity. Taping only 3 sides of an occlusive dressing is often ineffective.<sup>2,7</sup> A tension pneumothorax develops approximately 45 minutes after sustaining chest trauma.<sup>3</sup> The air leaking into the pleural space can also be released from damaged lungs (figure 6c) or be sucked from the outside through the chest wall (figure 6a). A tension pneumothorax develops as air collects in the pleural space and is unable to escape. This air collection initially collapses the lung, but the air can continue to collect until it becomes an immediate life threatening-condition. A tension pneumothorax is a relatively easily treated but potentially life-threatening complication of chest trauma. In addition to causing shortness of breath, an unaddressed tension pneumothorax will eventually stop the circulatory system by squeezing the heart to the point where it can no longer circulate the blood. Progressive severe respiratory distress following penetrating chest trauma should be managed as a tension pneumothorax.<sup>5</sup> Do not wait for late signs such as hypotension (low blood pressure) or a deviated trachea.<sup>7</sup> Insertion of a large bore needle catheter (figure 7) to the 2<sup>nd</sup> midclavicular (figure 8) or 4<sup>th</sup>/5<sup>th</sup> anterior axillary (figure 9) intercostal space will decompress the lung and stabilize the casualty.<sup>7,8</sup> Unfortunately, unrecognized tension pneumothoraces are the second most common cause of preventable death in operational trauma.<sup>2,4</sup> Since a tension pneumothorax takes time to develop, it is important to reassess the casualty's breathing and circulation frequently.

**Figure 6: Tension Pneumothorax/ Sucking chest wound.**



**Figure7: Large Bore Needle and Catheter**



**Figure 8:**  
2" Needle Decompression  
at Anterior Axillary Line



**Figure 9:**  
3.25" Needle Decompression  
at Mid-clavicular Line



## More On Circulation

Another circulatory issue is hypovolemia (low blood volume). Any massive hemorrhage is addressed in *care under fire*; however, in the tactical *field/evacuation* phase, there is time to complete a whole body *secondary assessment* to assure all wounds including the small bleeders have been addressed. Standard methods to improve bleeding control include using additional tourniquets placed directly onto the skin proximal (toward the body) to existing tourniquets.<sup>9</sup> Current guidelines allow a tourniquet to be placed for up to 2 hours with minimal concern for complications.<sup>10,11,12,13</sup> Some important points on tourniquets include making a mental note as to what time they are applied and remembering that they should not be placed directly over a wound or joint. When using improvised tourniquets, remember that increasing the width of the tourniquet and using a windlass (twisting lever) to tighten the tourniquet will improve the success of hemorrhage control.<sup>9,14</sup> Avoid placing the tourniquet distal (low) on the thigh near the knee, as that area (Distal Hunters Canal) is associated with tourniquet failure.<sup>9</sup> Training with tourniquets is essential for proper utilization during operations.<sup>9,14</sup>

At the center of controlling any hemorrhage, manual (hand) pressure placed directly over the wound (directly over the blood vessel if visible) provides acceptable initial bleeding control. In the *tactical field/evacuation care* setting, the provider may have time to pack a wound, apply a pressure dressing, keep the limb elevated, utilize pressure points, and use hemostatic agents (blood clotters). Application of pressure to bleeding wounds should be done with both hands for at least 5 minutes with the ground or solid surface placed on the opposite side of the casualty, especially after hemostatic agents have been used. When applying pressure dressings, one should first use gauze to pack any open wounds. Do not remove penetrating objects from wounds. If necessary, it is acceptable to pack around a penetrating object, being very careful not to displace the object. Displacing a penetrating object may lead to worsening of bleeding. It is important to remember that with penetrating trauma, the goal is stopping active bleeding to buy time for transport of the casualty to definitive care.

## Transport ASAP/ Prevent Hypothermia

Once all *massive* bleeding has been controlled, it is important not to delay transportation to the hospital for surgical correction of any penetrating trauma. It is important to maintain the casualty's temperature while treating and transporting the casualty. Preventing hypothermia also prevents blood loss. Keeping the casualty warm will prevent coagulopathy (inability to clot blood), thus preventing further blood loss.<sup>15</sup> The key with hypothermia is prevention. It is much easier to utilize a space blanket to prevent hypothermia than to attempt to warm a cold casualty. If there is any delay in transportation of the casualty, it is important to frequently reassess the temperature, all tourniquets and pressure bandages previously placed.

## Permissive Hypotension

Although preventing hypovolemic shock (low blood volume shock) in the casualty is the goal, not all casualties should have IV fluid administered. The goal of "permissive hypotension" is to keep the casualty's circulation delivering oxygen to the tissues without disturbing newly developed blood clots. In treating penetrating trauma, "permissive hypotension" is associated with improved casualty outcome. It is acceptable

to initiate IV access if there is time while transporting the casualty to definitive care. However, fluid should not be administered until active bleeding has been controlled in casualties with a radial pulse.<sup>16</sup> Blood or a crystalloid/colloid mixture (blood substitute) is the medication of choice for hemorrhagic shock.<sup>17</sup> However, if saline is the only resuscitative fluid available and the casualty has signs of developing shock, administration of saline is appropriate. Signs of shock that indicate a casualty needs IV saline administration include a blood pressure below 80 or when the casualty does not have a radial pulse.<sup>16,17</sup> Other indicators of casualties that should receive IV fluids include pts with changes in their mental status or loss of consciousness.<sup>17</sup> If IV fluids are given they should be limited to a 250ml bolus, followed by casualty reassessment.<sup>16</sup>

## Conclusion

This article briefly reviewed the management of the most common causes of preventable death during operations.<sup>4</sup> Delivering medical care in the tactical environment is not just about the medical intervention. It is also about knowing which interventions should be done immediately and which ones should wait until a more appropriate time. By staying within the guidelines of *care under fire vs. tactical field/evacuation care*, responders will know which interventions are appropriate for their current environment. Controlling blood loss is paramount. Reassessment of casualties is critical, as a tension pneumothorax takes time to develop and will require reassessment of the casualty to diagnose and treat. The skills of managing massive hemorrhage, maintaining patent airways, occluding all chest wounds, decompressing a tension pneumothorax, keeping casualties warm and using “permissive hypotension” when utilizing IV fluids will drastically increase casualties’ chances of survival.

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