Tactical Emergency Casualty Care (TECC): Guidelines for the Provision of Prehospital Trauma Care in High Threat Environments

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Introduction

Civilian Tactical Emergency Medical Support (TEMS) has a long history in the United States. Enormous progress has been made during the past ten years in developing professional and operational standards within the field. However, to date, there still exists no standard of care within TEMS specifically, and more broadly for high threat prehospital trauma care. Current civilian first responder practices and principles do not adequately address the need for point of wounding care in atypical, high threat emergency response. The enclosed Tactical Emergency Casualty Care (TECC) guidelines are based upon the principles of Tactical Combat Casualty Care and specifically designed to address this operational gap.[1]

The "holy grail" of trauma care outcomes remains eliminating preventable deaths. In 1996, Butler and Hagmann's seminal paper on modern battlefield prehospital care examined the manner in which people die in combat, discussed the limitations of Advanced Trauma Life Support (ATLS) for combat medics and proposed a new set of principles for high threat trauma care: Tactical Combat Casualty Care (TCCC).[2] The initial TCCC guidelines focused on the three major preventable causes of death on the modern battlefield: isolated extremity hemorrhage, tension pneumothoraces and airway obstruction. Perhaps more importantly, TCCC initiated a paradigm shift in prehospital trauma care, emphasizing tactical constraints (e.g., incoming fire, light/noise discipline, and mission success) as a major determinant of trauma intervention.

During the past decade, the implementation of Tactical Combat Casualty Care (TCCC) has been one of the major factors in reducing preventable death on the modern battlefield.[3] TCCC guidelines are credited with reducing the case fatality rate (CFR) in current combat operations from approximately 14% in Vietnam to 7.4-9.4% during Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF).[4,5] In a memorandum dated 6 August 2009, the Defense Health Board (DHB) noted that in several Special Operations units in which all members were trained in TCCC, *no reported incidents of preventable battlefield fatalities* occurred during the entirety of their combat deployments. Given this high rate of efficacy, the DHB now recommends TCCC training for all deploying combatants and medical department personnel.

The proven success of TCCC on the battlefield, led the civilian medical community, both tactical and conventional, to examine closely the tenants of the TCCC doctrine and integrate portions into civilian trauma care. Many agencies have simply implemented TCCC as their standard of care. Others have resisted, citing semantic concerns about "military language" and operational concerns regarding difference in target populations, resource limitations, and legal constraints.

As a result, civilian tactical and emergency medical elements stand at the same crossroads where the Special Operations medical community stood in the 1990s. Rigid, *en bloc* application of TCCC guidelines in civilian protocols is as fundamentally flawed as utilizing civilian ATLS principles for battlefield trauma management. TCCC is written for the combat medic operating in a combat theater, not for the civilian tactical medic operating in a single-dwelling, small-scale urban tactical environment. Undoubtedly, weapons and wounds are similar between the two settings and federal and civilian tactical teams are indeed "in combat". Despite these similarities, just as ATLS did not address many of the unique factors specific to the military combat environment, TCCC does not address the differences between military and civilian environments (Figure 1).

Figure 1: Characteristics that distinguish civilian from military high threat prehospital environments.

- *Scope of practice and liability:* Federal and civilian medical responders must practice under State and local scope of practice and protocols, and are subject to both negligence and liability that the military provider is often not.
- *Patient population to include geriatrics and pediatrics*: TCCC data and research was heavily based off of an 18-30 year old population, not all age groups as represented in civilian operations. TCCC was written primary to address the wounded combatant and does not address high threat care for innocent non-combatants. Generally shorter distances and greater resources available for evacuation to definitive care.
- *Differences in barriers to evacuation and care*: Despite the threat of dynamic terrorist attacks, secondary attacks and armed resistance to evacuation is far less common in the civilian setting.
- *Baseline health of the population*: The TCCC combatant population is relatively healthy and physically fit without the high incidence of chronic medical illness that exists in the civilian population.
- *Wounding patterns*: Although the weapons are similar between military and civilian scenarios, the wounding patterns differ given the prevalence of and differences in protective ballistic gear, as well as the use of and strength of improvised explosive devices in the military setting.
- *Chronic medication use in the injured*: TCCC does not account for or address the effects of chronic medication use, such as beta- blockers and anti-coagulants.
- *Special populations:* Special populations (e.g. pregnant or physically disabled) are prevalent in the civilian setting and the required differences in their care are relevant in domestic counter- terrorism and anti- terrorism response.

The TECC guidelines are a set of best-practice recommendations for casualty management during high- threat civilian tactical and rescue operations.[6] The guidelines are based on the principles of Tactical Combat Casualty Care (TCCC), but account for differences in the civilian environment such as allocation and availability of resources, variances in patient populations, and scopes of practice. The goals of Tactical Emergency Casualty Care are to:

- Balance the threat, civilian scope of practice, differences in civilian populations, medical equipment limits, and variable resources for responses to atypical emergencies.
- Establish frameworks that balance risk - benefit ratios for all civilian operational medical response elements.
- Provide guidance on medical management of preventable deaths at or near the point of wounding.
- Minimize providers' risks while maximizing patients' benefits.

Tactical Emergency Casualty Care (TECC)

In conventional emergency medical services (EMS protocols, scene safety is the first priority. However, this algorithmic tenet does not account for unsecure scenes. Civilian first responders are increasingly required to operate in high-threat environments. Traditional care guidelines are inherently limited in that they are solely patient- focused, without acknowledgement of the surrounding operational or tactical constraints. The TECC principles are a sound compilation of trauma guidelines, integrating operational and medical requirements into a consolidated set of best practices specific to high-threat prehospital care. As with the battle-tested concepts of Tactical Combat Casualty Care (TCCC), the TECC principles are just that: *principles*, not inflexible or rigid protocols.

In Tactical Emergency Casualty Care, operational scenarios and relative threat levels drive clinical interventions. The three phases of TECC are modeled on TCCC, and represent translated "lessons learned" from combat and their application to high-threat, civilian pre- hospital care. The phases are dynamic, occasionally overlapping, and rarely linear. It is of utmost importance to recognize that the threat zones are *situational*, not *geographic*. This concept is a critical component of the application of TECC in real world settings. The three phases of TECC are:

- Direct Threat Care/Care Under Fire (DT/CUF)
- Indirect Threat Care/Tactical Field Care (ITC/TFC)
- Evacuation/Tactical Evacuation (EVAC/TACEVAC)

Direct Threat Care/ Care Under Fire

Direct Threat/Care Under Fire (DT/CUF) describes actions taken in response to a casualty where the external, ongoing threat to life is as dangerous, or more dangerous, than the injury sustained. Very minimal "medical" intervention is generally warranted. The risk of further injuries to the casualty and the rescuer is extremely high while under direct hostile threat in high-risk environments. Examples of DT/CUF include a law enforcement officer shot in the doorway of an apartment during a high-risk warrant search or a fire fighter rapid intervention team (RIT) member encountering an injured team mate during imminent structural compromise. Available medical equipment is often limited and the tactical scenario dictates medical interventions.

The military adage that "the best medicine on the battlefield is fire superiority" has caused significant concern in the application of TCCC to civilian high- threat environments. First, law enforcement personnel must deploy a broader spectrum of options to subdue threats than the military. For example, they are rarely able to conduct "recon by fire," are limited in the application of "suppressive fire," and even under direct threat, have wider responsibilities beyond their own protection and that of their team, including the protection of victims and preservation of the community. Second, TECC applies beyond Special Operations law enforcement; it is applicable to all high-risk prehospital providers. The concepts of TECC are salient to EMS personnel responding to an underground subway blast, a firefighter rapid intervention team (RIT) member in a structural collapse, or a medic responding to a dynamic school shooting. However, the concept of balancing the benefit of immediate trauma intervention with the threat posed by an ongoing direct threat applies across all of these disciplines.

While under direct threat, TECC priorities are to prevent the casualty and responder from sustaining additional injuries, keep the response team engaged in neutralizing the threat, minimize public harm, and control life- threatening extremity hemorrhage. If injured while under direct threat, casualties should attempt to remain in the fight, take cover, provide their own initial care, and control severe hemorrhage. They should then re-engage and assist their unit with neutralizing continued active threats. Team members and medics in this phase can assist casualties in seeking cover, and may render self-aid or buddy-aid to control severe hemorrhage while utilizing tactics that minimize the chance that other members of the team will sustain additional casualties.

Casualty extraction

Casualty extraction is a critical principle in TECC guidelines, from the point of wounding throughout various phases of care. When examining the evidence based treatment modalities, it is crucial to remember these should not be performed until the casualty and rescuer are behind cover. The adage "we don't treat in the street" is sometimes lost in the chaos of the moment; failure to adhere to this warning exposes casualties and rescuers to further harm. Effective point-of-wounding extraction techniques are critical links in the chain of survival for casualties injured in high-threat environments. In real world events, the need for unconventional extraction continues throughout all phases of care, to eventual casualty hand-off to higher echelons of care. This could include the capability of breaching into lockdown situations for casualty collection points (CCP) acquisition, breaching for casualty egress through restricted area (padlock systems, drywall, concrete block walls, etc), hasty mechanical advantage or lowering systems for casualty removal from multi-story structures, expedient confined space / structural collapse response, and rescue tactics, techniques, and procedures (TTPs) for chemical, biological, radiological, nuclear, and explosive (BRNE) events when operations dictate self-contained breathing apparatuses (SCBA) utilization. When creating these rescue guidelines, it is important to fully understand the relevance and shortcomings of civilian-based rescue capabilities, and if these elements are able to dynamically adapt to environmental variables with only organic assets.

Hemorrhage control

Early hemorrhage control is critical in operational medicine and trauma management. In the high-threat environment, this medical fact must be balanced with operational risk assessments. Accordingly, TECC recommends rapidly controlling potentially life-threatening extremity hemorrhage. Tourniquets are the most effective, rapid intervention available. Hemostatic dressings require 3-5 minutes of continuous pressure and should be deferred until the *Indirect Threat Care/ Tactical Field Care* phase.

Uncontrolled extremity hemorrhage was the leading cause of preventable death in Vietnam (9% of total casualties) and remains so in the current conflicts in Iraq and Afghanistan (2-3% of total casualties).[7-9] Extremity trauma and exsanguination is also a major cause of preventable death in civilian trauma.[10,11] Increasingly, civilian EMS and high-risk medical teams are deploying tourniquets for routine utilization in daily operations. There is strong evidence supporting the efficacy of tourniquets in controlling life-threatening hemorrhage,[12,13] the importance of tourniquet placement prior to progression to states of shock, and the safety of tourniquet use for periods less than 2-4 hours.[14]

The U.S. Army Institute of Surgical Research (USAISR) conducted an extensive series of laboratory and field tourniquet studies to identify the ideal characteristics for a field tourniquet as well as determine the most effective existing commercial options. The criteria for the tourniquets are described in Table 1.[15] Currently, the Combat Application Tourniquet (CAT) and the Special Operations Tactical Tourniquet (SOFT-T Wide) are the two most commonly utilized and demonstrably effective options for high-risk prehospital environments. Both can be applied with one or two hands and have shown 100% efficacy in abolishing radial and femoral pulses.[16] Other commercial tourniquets are available, but should be utilized with caution and after thorough investigation.

During the DT/CUF phase of CTECC, the tourniquet should be applied as proximal as possible on the limb to facilitate speed and efficacy. It may be placed over the uniform, but caution should be exercised to insure no objects obstruct the compression band (e.g., knives in pockets or drop holster). The time of tourniquet application should be clearly marked on the casualty and communicated to accepting providers during transfer.

Table 1: Characteristics of tourniquets utilized in tactical and high-threat environments (adapted from the U.S. Army Institute of Surgical Research)

1. Complete occlusion of arterial blood flow in thigh
2. Capable of easy release and re-application
3. Application time = 60 seconds
4. Cost: < $20-30
5. Weight: <8oz (250g)
6. Simplicity of application
7. Easy application in the tactical environment (dark, cold, hot, wet, sand, mud, or ice)
8. Minimal familiarization
9. No assembly; No batteries
10. Width: >1.5 – 2.0"
11. Shelf life of 10yr

Airway management

In TCCC, airway management is deferred until Tactical Field Care. However, several Operators and medics felt that placing the casualty in the recovery position (i.e., on right or left side) to reduce likelihood of airway obstruction was a rapid intervention that should be considered *if judged necessary and if tactically feasible.* An illustrative example would be a combined shooting and blast incident with ongoing active shooter response. Victims may be suffering from facial trauma and airway obstruction or be unconscious from blast injury. As the contact team moves toward the target, rapidly placing the casualties in the recovery position *may* be a worthwhile intervention that quickly saves lives by preventing airway obstruction.

Spinal Immobilization

In isolated penetrating injuries of the neck, spinal immobilization is rarely useful.[17] However, the rescuer should be cognizant of cervical spine protection during extraction if there is a significant blunt mechanism injury such as blast, fall, or structural collapse. The tactical situation should dictate rescuer actions, and the risk of immediate death to the rescuer should be weighed against the risk of further spinal cord injury from non- stabilized extraction of casualties.

Indirect Threat Care/ Tactical Field Care (ITC/TFC)

The ITC/TFC articulates a set of trauma care priorities relevant during high-risk operations during periods when the casualty and the provider are in an area of higher security, such as a casualty collection point (CCP) with cover and/or concealment. Assessment and treatment priorities are similar to those under TCCC TFC: Major Hemorrhage control, Airway, Breathing/Respirations, Circulation, Head & Hypothermia, and Everything Else (MARCHE). Although the higher degree of security for the casualty and the responder generally allow for a more deliberate approach to providing casualty care, the first responder must remain cognizant that a tactical operation represents a dynamic process and scene security can change instantly. First responders must weigh the potential benefits of providing medical care against the risks of the ongoing tactical operation and/or delaying opportunity to evacuate the casualty from the scene.

Disarm the Casualty

An important aspect of conducting a casualty assessment is ensuring that the casualty does not pose a threat to himself or the rescuer. If the casualty has any degree of altered mental status, ensure casualty and rescuer safety by clearing their weapons in an approved method, or removing their weapon from their person entirely. Responders should maintain high vigilance for safety when distraction devices or other explosive devices are present on the casualty's kit.

Major Hemorrhage Control

Massive hemorrhage is the primary threat to life in most trauma patients, and gaining rapid hemorrhage control is the first priority. Aggressively apply firm direct pressure to a wound site while the injury is exposed, as direct pressure is the most effective method for controlling bleeding. If the rescuer cannot hold direct pressure for an extended period of time, other measures of hemorrhage control should be applied. As discussed under the DT/CUF section, appropriate tourniquet devices represent the most rapid and effective option for controlling extremity hemorrhage. If a tourniquet was applied during the DT/CUF phase, it should be re-assessed during the ITC/TFC phase for effectiveness or necessity. Tourniquets applied hastily over uniform clothing may not achieve adequate pressure to occlude arterial blood flow. A hastily conducted aggressive casualty movement from the point of injury to a more secure location may dislodge an otherwise adequate tourniquet. Additionally, as tourniquets are applied more liberally in tactical situations for wounds with apparent significant hemorrhage, some will be applied to wounds that do not actually require tourniquets for definitive hemorrhage control. If the trained medic examines the wound under more secure conditions and determines a tourniquet is not required, he or she should apply an appropriate pressure dressing and release the tourniquet slowly, and carefully assess the extremity for appropriate reperfusion and/or signs of compartment syndrome or vascular compromise.

For ongoing extremity hemorrhage not addressed during the DT/CUF phase that is amenable to tourniquet application, apply the tourniquet directly over the skin proximal to the injury and tighten until a distal pulse is no longer palpable. Eliminating as much distal blood flow as possible is important to prevent (or at least minimize potential for) development of compartment syndrome.[18-20]

Soft tissue injuries can appear more severe, but are rarely life-threatening if expeditiously treated. Without major vascular disruption, many bleeding soft tissue injuries can be adequately managed through applying appropriate pressure dressings. Medical directors should strongly consider incorporating wound packing into these protocols, as packing with sterile gauze in addition to compressive bandages provides more significant hemorrhage- control capabilities than topically applied dressings alone.

Major vascular injuries within the neck, axilla, and groin (i.e., junctional zones) are not amenable to tourniquet application and effective pressure dressings are often extremely difficult to apply. Hemostatic dressings used by military forces demonstrate successful bleeding control in these types of injuries. Combat Gauze®, a kaolin-impregnated gauze packing agent, is the primary hemostatic agent recommended by the Committee on Tactical Combat Casualty Care. Many units are utilizing one of two chitosan-based gauze products (Chitogauze® and Celox Gauze®) with equally successful results. Medical directors must ensure that appropriate tactical protocols incorporating wound packing are in place when considering the addition of these hemostatic agents, as they are not intended for simple topical applications.

Some vascular injuries within these junctional zones cannot be controlled with tourniquets, pressure dressings, or hemostatic agents. When tactical situations preclude rescuers from maintaining prolonged direct manual pressure, con-

sider using mechanical devices to achieve prolonged direct pressure. When considering adding these mechanical devices to existing protocols, we recommend selecting devices that have been clinically evaluated and received Food and Drug Administration (FDA) approval.

Breathing

Combat data, as well as civilian police data, indicates that tension pneumothorax, although relatively simple to treat, remains a significant cause of preventable death.[21] As part of the initial assessment in ITC/TFC, the chest should be exposed and examined thoroughly for any open chest wound not previously addressed. In ITC/TFC, operational limitations often make it difficult to properly monitor for developing tension pneumothorax using the traditional physical signs of hypoxia, narrowing pulse pressure, tachycardia, and tracheal deviation. Instead, in ITC/TFC and other high-risk prehospital settings, any patient with penetrating chest trauma that has progressive respiratory distress should be assumed to have a developing tension pneumothorax and should be treated with needle decompression. Leaving the catheter in place versus removing it after 1-2 minutes is a matter of local protocol and preference. In most cases the catheter will clot off in a few minutes making it no longer effective in evacuating air. The argument for removing the needle is to prevent providers from assuming that a tension pneumothorax cannot develop because the catheter is continuously venting the space. The argument against removing the catheter is that it is a quick visual landmark to allow for subsequent needle decompressions. There is no need to place a flutter valve on the catheter if left in place, as it will not create an open pneumothorax. The resistance created by the small internal diameter of the 14-gauge catheter is such that air will move in and out of the larger diameter mouth and trachea instead of the 14-gauge catheter. The patient with a penetrating chest wound needs to be closely monitored for development of tension pneumothorax, especially if he/she required needle decompression. The TECC guideline appendix describes two different techniques for needle decompression.

Circulation/ Resuscitation

Intravenous fluid resuscitation remains controversial, despite growing evidence that using non-blood products as primary resuscitation fluids for hemorrhagic hypovolemia contributes to increased morbidity and mortality.[22-25] The decision to initiate IV resuscitation should be based upon the casualty's degree of blood loss and shock, as well as other factors such as evacuation time to a definitive care facility. In general, young, healthy adult trauma patients with a palpable radial pulse and normal mentation after hemorrhage control do not require emergent IV fluid therapy. Permissive hypovolemic IV fluid resuscitation protocols have been used with great success by several military forces throughout ongoing multiple global conflicts. A risk- versus- benefit analysis prior to administering IV fluids should be conducted for any trauma casualty. The current CoTCCC guidelines are included as an example of a hypovolemic protocol only. The U.S. military recommends Hextend as their IV fluid of choice as primarily for logistical advantages. For military forces lacking immediate resupply capability who may experience delays in casualty evacuation ranging from multiples of hours to days, the benefit of the duration of the intravascular volume expansion seen with that hetastarch-based fluid enables their personnel to optimize carried medical supplies[26-28] In the civilian setting, the significantly higher cost of colloid solutions must be balanced against the limited medical benefits.

Hypothermia prevention and casualty packaging

Hypothermia in trauma patients results in dysfunctional clotting cascades, acidosis and subsequent increased mortality. Hypothermia prevention begins during ITC/TFC. Casualties should be moved to a warmed location if possible. If possible, the casualty should be packaged utilizing a heat retention system at minimum. In cold environments, the use of active external rewarming may be beneficial. There are several commercial heat-producing hypothermia kits available and in use currently by the military that can be considered. If unavailable, anything that will retain heat (e.g., dry blankets, body bags, spare gortex jacket, etc.) should be applied.

In mass casualty scenarios, once the patient has been moved to an area where there is no direct or indirect external life threat, primary triage can occur to identify critical patients and sort patients into groups according to their need for immediate resources. This may occur during the ITC/TFC or during early stages of the EVAC/TACEVAC depending upon the tactical scenario.

Evacuation Care / Tactical Evacuation Care (EVAC/TACEVAC)

Evacuation Care/Tactical Evacuation Care (EVAC/TACEVAC) describes actions taken to continue providing appropriate trauma care during transport to definitive medical care when there is generally reduced threat to the patient and medical provider. An example of EVAC/TACEVAC Care would be the care provided in the Triage/Treatment area or a secure CCP during a mass casualty event while the patients are waiting for transport to a higher level of care.

In many civilian scenarios, this phase of care may be limited in the prehospital setting. A large percentage of civilian high-risk scenarios will have resources and circumstances that allow for the patient to be rapidly transferred without

scene delay directly to a high level fixed medical center. In these cases, the patient essentially moves from ITC/TFC directly into the trauma bay. However, if there is any delay in transfer due to the tactical scenario, logistics, or sheer volume of patients (e.g., mass-casualty incidents (MCI) or if the actual transfer requires a long transit time, then the application of the guidelines of EVAC/TACEVAC become even more important

Providers in emergency departments and trauma centers should be familiar with the EVAC/TACEVAC guidelines. There are anecdotal published case reports of pre-hospital providers using appropriate equipment and interventions, such as a commercial tourniquet, that are met with disbelief and confusion on the part of the civilian clinical staff in the trauma bay. These providers must have baseline familiarity with the guidelines and procedures occurring outside of-their facility, and must have an understanding of how to assess and utilize prehospital interventions.

In the civilian setting, evacuation is generally via ground or helicopter- based EMS/ critical care platforms. Despite the usual methods, EVAC/TACEVAC must account for hasty evacuation with vehicles of opportunity (e.g., police car, sport utility vehicle (SUV), armored vehicle, etc.). This section primarily discusses options for care on platforms with either secure space or additional capabilities. Individual units should evaluate their evacuation assets and customize their TTPs to account for mission- specific limitations.

Re-assess the casualty

Immediately assess the patient and re-assess all interventions that were applied in previous phases of care. The interventions were likely applied in a hasty fashion, may have loosened during movement of the patient, and may no longer be effective. The provider in EVAC/TACEVAC should take the time to look at all interventions and immediately address any that appear to be ineffective and creating a life-threatening situation, or a situation that can lead to re-injury or denigration in clinical condition.

Airway

In EVAC/TACEVAC, if all major life threatening hemorrhage has been controlled in ITC/TFC, the provider should move directly to controlling and maintaining the airway. With decreased external risk to the provider and patient, this phase of care can be approached in a more traditional sense of Airway-Breathing-Circulation. The basic airway interventions remain the same here as in previous phases, with the additional consideration for rapid sequence intubation (RSI). The use of RSI and endotracheal intubation are time and resource intensive. The process requires that the provider concentrates on the procedure and airway, sacrificing situational awareness. Thus, it is only introduced as a treatment consideration in this phase when the external threat risk is mitigated. This intervention is most likely to only be available if the casualty is transported on a platform staffed with advanced providers (i.e., physicians, critical care nurse, or paramedics).

Spinal immobilization may have a more important role in EVAC/TACEVAC. In EVAC/TACEVAC, the risk-benefit ratio for spinal immobilization leans toward benefit; thus, if available immobilization should be implemented for any patient with hard physical signs of neurologic injury and for any patient with a high-risk mechanism. In this phase, consideration should be given to clearing the c-spine clinically using either the NEXUS or Canadian c-spine criteria. This easily applied criterion has become standard of care in emergency departments and can identify patients that do not need immobilization with almost 100% sensitivity. Caution should be used when applying the criteria to patients over the age of 65 years, as there is a higher risk of occult injury in this age group. While treatment will be guided by local protocols, delaying evacuation for patients in extremis with penetrating neck injures while performing meticulous spinal immobilization must be balanced against getting the patient to definitive care.

Breathing

The interventions from ITC/TFC are continued into EVAC/TACEVAC. During evacuation, additional monitoring such as pulse oximetry are more routinely available. These adjuncts should be used to provide additional information on the respiratory status of the casualty. Note that oxygen desaturation is a relatively late sign of respiratory compromise, and newer techniques such as nasal end tidal CO_2 may provide more timely information.

Although many trauma patients, such as those with isolated musculoskeletal injury, do not require supplemental oxygen, in this phase oxygen should be readily available in almost all civilian operational settings and should be liberally applied. In mass casualty settings where resources are scarce, supplemental oxygen can be reserved for patients with injuries to the respiratory system causing impaired oxygenation, casualties in shock, casualties with head injury, unconscious casualties, and any casualty with low oxygen saturation by pulse oximetry.

Chest tube placement should be considered on any patient who requires repeated needle decompressions, is being air evacuated, or if there is a long delay in transport to definitive care. This is an advanced surgical procedure that requires proper training, medical oversight and appropriate local protocols. Chest tubes always require a one-way valve.

Bleeding

In EVAC/TACEVAC phase, all wounds should be fully exposed and evaluated to assess for efficacy of interventions applied in prior phases of care. The patient should be exposed, including removal of protective gear if present, to allow thorough evaluation for missed wounds. The gear should be examined for signs of damage and kept with the patient. Attention must be paid to prevent hypothermia. Any untreated major extremity wound or any extremity wound with bleeding uncontrolled by prior interventions should be treated using a tourniquet applied 2-3 inches above the wound or by using an appropriate pressure dressing with deep wound packing.

All tourniquets should be re-evaluated both for efficacy and for necessity. The complications of tourniquets are all directly related to length of time in place; thus, the sooner they can be removed, the lower the complication rates. Several studies show no complications in tourniquets left in place up to 120 minutes.[29] Although there are certainly mass casualty and austere scenarios in which there may be a delay to definitive care of greater than 120 minutes, in high risk scenarios with a limited number of casualties, the patient *should* be in definitive care at a fixed facility well within the two hour window. The decision in this phase thus becomes whether to attempt to downgrade/remove the tourniquet or to leave well enough alone until definitive care. If the tourniquet is necessary and effective, and the casualty will be quickly evacuated to a definitive care facility, it should remain in place. However, if there is an anticipated significant delay in transfer to definitive care, consider transitioning the tourniquet to a pressure dressing.

Before any effective tourniquet is removed on a patient who has received IV fluid for shock, the patient must be assessed clinically for positive responses to interventions. To move a tourniquet distally to a site 2-3 inches above the wound, a new tourniquet should be placed in the new location. Once properly applied, the prior tourniquet can be loosened. To downgrade a tourniquet to a pressure dressing, an appropriate pressure dressing with hemostatic or non-hemostatic deep wound pack should be applied to the wound. Once applied, the tourniquet should be loosened and the wound should be examined for signs of bleeding. If bleeding, the tourniquet is re-tightened and the pressure dressing is reinforced. If bleeding occurs when the tourniquet is loosened after reinforcement, the tourniquet is reapplied and left in place. If there is no bleeding once the tourniquet is loosened, it is left in place.

Any distal pulse noted in a limb with a needed tourniquet in place should be addressed by additional tightening or by application of a second tourniquet side-by-side (ideally proximal to the first tourniquet) to the first in order to apply a wider base of pressure to the supplying vasculature. All tourniquets need to be clearly marked with indelible marker showing the time of application.

Hemostatic agents should be utilized as in prior phases for any significant bleeding in wounds located in anatomic areas not amenable to tourniquet placement, or for downgrading of tourniquets. The current, recommended fourth-generation hemostatic agents are primarily in the form of impregnated gauze.

Intravenous access and resuscitation

All patients with truncal injury, shock or signs of impending shock should have an 18-gauge IV saline lock placed. The flow rates through an 18-gauge are not significantly lower than the 16- or 14-gauge IV needles and are easier to place in the hypotensive casualty in the uncontrolled field setting. The casualty should be assessed for hemorrhagic shock, either with blood pressure monitoring or, if unavailable, with assessment of mental status and peripheral pulses. Mental status, in the absence of traumatic head injury, is the most effective marker of perfusion and shock; this, along with the presence and character of peripheral pulses provides the caregiver with an excellent method to monitor for hemorrhagic shock.

If the patient is not in shock, no IV fluids are immediately necessary. Oral fluids may be considered in casualties who are conscious, can swallow, and has no injury that would require emergent surgery. Oral fluids should also be considered if there is a significant delay in evacuation to care, as they will help comfort the patient.

For casualties exhibiting signs of hemorrhagic shock, blood products should be considered if readily available with an appropriate provider and approved medical protocol. Several studies on combat wounded have shown the superior effect of resuscitation with blood products in a 1:1 ratio of plasma to packed red blood cells and/or whole blood when compared to traditional resuscitation with intravenous fluids.[30,31] Plasma rapidly addresses the coagulopathy of trauma, essentially addressing one arm of the lethal triad of hypothermia-coagulopathy-acidosis. Although more studies are needed in the civilian pre-hospital setting, the military data is strong enough to endorse this recommendation.[32,33] If blood products are not available or not approved under local protocols, use of Hextend colloid or appropriate crystalloid in 500cc boluses every 30 minutes to maintain hypotensive resuscitation is recommended. The goal systolic is 80-90mmHg and improvement and mental status. Hextend should be limited to 1000cc total. Hypotensive resuscitation should be avoided in casualties with concomitant head injury. In TBI, resuscitative fluid blouses should be administered to maintain the goal systolic blood pressure of at least 90mmHg or palpable radial pulse. Any patient with a suspected traumatic brain injury who is not in shock should be positioned with the head elevated to 30 degrees.

Prevention of hypothermia

All efforts should be made in EVAC/TACEVAC phase to prevent the development of hypothermia while packaging casualties and during transport to definitive care. Wet clothing should be removed and replaced with dry clothing (if available), and the patient should be placed on a vapor barrier to prevent conductive heat loss to the ground or other surfaces. Warmed IV fluids are preferred for resuscitation. It is important for providers to maintain this vigilance against hypothermia while en route to definitive care, especially during air transport where cabin temperatures are often lower than the temperature at the point of casualty collection.

Monitoring

Available monitoring including end-tidal CO2 for intubated patients should be instituted while waiting and during transport to definitive care. All vital signs should be recorded for trending and continuity of care. With multiple casualties or noisy environments, pulse oximetry can be a useful adjunct to give a continuous visual reporting of pulse (as well as oxygen saturation). Providers should ensure that pulse oximetry is measured on unaffected or uninjured limbs to gain accurate readings.

Re-assess and re-triage

As time permits, a proper head-to-toe, front-to-back secondary survey should be performed. Any significant injuries not previously addressed should be treated including splinting of long bone or joint injuries and application of pelvic binding techniques. A secondary triage of the patient should be preformed to determine mode and destination for evacuation to definitive care.

Analgesia and antibiotics

In EVAC/TACEVAC, considerations for the casualty to continue the mission are less significant. However, in certain scenarios, it may be necessary for the casualty to maintain mental faculties and remain operationally active. In these scenarios and in cases where the casualty is experiencing only mild to moderate pain, oral or IV non-narcotic medications are appropriate.

In cases of moderate to severe pain, in addition to oral and IV non-narcotic analgesics, narcotics are appropriate and should be administered in any form and then titrated to effect. It is important to note that the onset of action for intramuscular (IM) injection of narcotics can be up to 45-60 minutes so the medic should exercise caution and avoid stacking. If utilizing narcotics, the provider must monitor closely for adverse effects and should have naloxone available. Additionally, consideration should be given to having anti-emetics available when using narcotics for pain control. During evacuation, it is prudent utilize available electronic non-invasive monitoring if delivering narcotic analgesia.

The administration of antibiotics is not a traditional pre-hospital intervention. However, in high-risk operational settings such as wilderness rescue or austere scenarios where there may be a very significant delay in evacuation to care, early administration of antibiotics for penetrating wounds and eye injuries may be beneficial to outcomes. In these specific cases, the potential need should be anticipated and appropriate medical oversight should be involved.

Burns

Burn care in EVAC/TACEVAC phase is a continuation of care initiated in ITC/TFC phase. Early aggressive airway control and/or RSI should be initiated for any casualty with signs of inhalational injury. Total Body Surface Area (TBSA) should be calculated and the patient should be covered with dry, sterile dressings. If possible, dressings and concerted efforts to prevent hypothermia should be initiated. In mass casualty situations where delay to evacuation may be significant, consideration may be given to utilizing commercial burn dressings for pain control in casualties with burns less than 20% TBSA. The risk of induced hypothermia from commercial burn dressings increases with larger burns and thus should be avoided. Burn resuscitation should be initiated according to local protocol. Although burn patients will eventually require significant amounts of fluids, the calculated requirements are for the first 8 and 24 hours and can be easily made up using high volume infusers once the patient has reached definitive care; thus, excessive fluids do not need to be immediately initiated in the EVAC/TACEVAC phase. Prevention of hypothermia and hypotensive resuscitation for hemorrhagic shock takes clear precedence over burn fluid resuscitation in the field. Aggressive analgesic use for burn casualties is appropriate.

Additional priorities

The rescuer must prepare casualties for movement with considerations given to environmental factors and other evacuation procedures such as vertical lifts. At all points throughout the care of the patient in the EVAC/TACEVAC phase, the casualty should be encouraged and reassured, even if they are unconscious. All information and procedures should be explained in real time, and emphasis should be placed on keeping the casualty fully informed.

Documentation of care needs to be completed in accordance to local protocols, ideally in the form of an approved standardized local casualty care card for consistency. All assessments, treatments and medications rendered, trends and changes in patient status need to be accurately documented and passed to the definitive care facility to provide effective continuity of care.

Cardiopulmonary resuscitation (CPR) may have a larger role during the evacuation phase especially for patients with electrocution, hypothermia, non- traumatic arrest or near drowning. If resources are available and transit time is short, CPR may be appropriate in the above settings.

Conclusion

The Tactical Emergency Casualty Care (TECC) guidelines offer a set of principles for trauma management in high-threat prehospital environments based upon the hard lessons learned from a decade of war. TECC defines what should be done and when it should be done to stabilize the casualty in the civilian arena until the risk can be eliminated and the casualty can be treated at a definitive care facility. The TECC guidelines represent a treatment framework that accepts mitigated risk while providing a significant life saving benefit.

Based upon the hard work of the Committee for TCCC and the sacrifices of American war fighters, the indications and applications for TECC extend well beyond tactical law enforcement. 'Tactical' should not imply that the guidelines are only for Law Enforcement operations. Tactical in this sense means operational, as tactics are performed on the fire ground and in other operational settings every day. The Law Enforcement (LE) and special weapons and tactics (SWAT) operations are a critical area for implementation. But, they are not the only end-users. TECC should be utilized in any high risk and/or austere operational setting where the risk-benefit ratio to providers and patients drives decision- making, including, but not limited to: active shooter response, improvised explosive device (IED) and blast response, CBRNE and terrorism-related events, any mass casualty, wilderness and austere settings and rescue, and even in traditional trauma response.

The initial TECC guidelines are based upon anecdotal experience from warriors, best-practice recommendations from combat medics, input from physicians, discussions with domestic first responders and scientific evaluation from our academic institutions. As with TCCC, the TECC guidelines will evolve. The Committee for Tactical Emergency Casualty Care will continue to update the guidelines through Journal of Special Operations Medicine, the C-TECC website and in collaboration with the Special Operations Medical Association (SOMA).

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Tactical Emergency Casualty Care (TECC) Guidelines

Direct Threat Care/ Care Under Fire (DT/CUF)

Goals:
1. Accomplish the mission with minimal casualties
2. Prevent the casualty from sustaining additional injuries
3. Keep response team maximally engaged in neutralizing the existing threat (e.g. active shooter, unstable building, confined space HAZMAT, etc.)
4. Minimize public harm

Principles:
1. Establish *tactical supremacy* and defer in depth medical interventions if engaged in *ongoing direct threat* (e.g., active fire fight, unstable building collapse, dynamic explosive scenario, etc.).
2. *Threat mitigation* techniques will minimize risk to casualty and to provider.
3. Minimal trauma interventions are warranted.
4. *Consider* hemorrhage control
    a. TQ application is the primary "medical" intervention to be *considered* in CUF/ Direct Threat.
    b. Consider instructing casualty to apply direct pressure to the wound if no tourniquet available or application is not tactically feasible.
5. *Consider* quickly placing or directing casualty to be placed in position to protect airway.

Guidelines:
1. Mitigate the threat and take cover (e.g. Return fire, utilize less lethal technology, assume an overwhelming force posture, extraction from immediate structural collapse, etc.).
2. Direct the casualty to *stay engaged* in operation if appropriate.
3. Direct the casualty to *move to cover* and apply self aid if able.
4. *Casualty Extraction*
    a. If a casualty can move to safety, they should be instructed to do so.
    b. If a casualty is *unresponsive*, the scene commander or team leader should weigh the risks and benefits of a rescue attempt in terms of manpower and likelihood of success. Remote medical assessment techniques should be considered.
    c. If the casualty is *responsive* but cannot move, a tactically feasible rescue plan should be devised.
    d. Recognize that threats are dynamic and may be ongoing, requiring continuous threat assessments.
5. *Stop life threatening external hemorrhage* if tactically feasible:
    a. Direct casualty to apply effective tourniquet if able
    b. Apply the tourniquet over the clothing as proximal—high on the limb—as possible.
    c. Tighten until cessation of bleeding and move to safety. Consider moving to safety prior to application of the TQ if the situation warrants.
    d. Tourniquet should be readily available and accessible with either hand
    e. Consider instructing casualty to apply direct pressure to the wound if no tourniquet available or applica tion is not tactically feasible
    f. Consider quickly placing casualty, or directing the casualty to be placed, in position to protect airway if tactically feasible

Skill Sets:
1. Tourniquet application
    a. Consider PACE Methodology- Primary, Alternative, Contingency, Emergency
    b. Commercially available tourniquets
    c. Field expedient tourniquets
2. Tactical casualty extraction
3. Rapid placement in recover position

Indirect Threat Care/Tactical Field Care (ITC/TFC)

Goals:
1. Goals 1-4 as with DT/CUF care
2. Stabilize the casualty as required to permit safe extraction to dedicated treatment sector or medical evacuation assets.

Principles:
1. Maintain tactical supremacy and complete the overall mission.
2. As applicable, ensure safety of both first responders and casualties by rendering weapons safe and/or rendering any adjunct tactical gear safe for handling (flash bangs, gas canisters, etc).
3. Conduct dedicated patient assessment and initiate appropriate life-saving interventions as outlined in the ITC/TFC guidelines. DO NOT DELAY casualty extraction/evacuation for non-lifesaving interventions.
4. Consider establishing a casualty collection point if multiple casualties are encountered.
5. Establish communication with the tactical and/or command element and request or verify initiation of casualty extraction/evacuation.
6. Prepare casualties for extraction and document care rendered for continuity of care purposes.

Guidelines:
1. Law Enforcement Casualties should have weapons made safe once the threat is neutralized or if mental status is altered.
2. *Bleeding:*
    a. Assess for unrecognized hemorrhage and control all sources of major bleeding:
        i. If not already done, use a tourniquet or an appropriate pressure dressing with deep wound packing to control life-threatening external hemorrhage that is anatomically amenable to such treatment.
            - Apply the tourniquet over the clothing as proximal— high on the limb— as possible, or if able to fully expose and evaluate the wound, apply directly to the skin 2-3 inches above wound.
            - For any traumatic total or partial amputation, a tourniquet should be applied regardless of bleeding.
    b. For compressible hemorrhage not amenable to tourniquet use, or as an adjunct to tourniquet removal (if evacuation time is anticipated to be longer than two hours), apply a hemostatic agent in accordance with the directions for its use and an appropriate pressure bandage. Before releasing any tourniquet on a casualty who has received IV fluid resuscitation for hemorrhagic shock, ensure a positive response to resuscitation efforts (i.e., a peripheral pulse normal in character and normal mentation).
    c. Reassess all tourniquets that were applied during previous phases of care. Consider exposing the injury and determining if a tourniquet is needed. Tourniquets applied hastily during DT/CUF phase that are determined to be both necessary and effective in controlling hemorrhage should remain in place if the casualty can be rapidly evacuated to definitive medical care. If ineffective in controlling hemorrhage or if there is any potential delay in evacuation to care, expose the wound fully, identify an appropriate location 2-3 inches above the injury, and apply a new tourniquet directly to the skin. Once properly applied, the prior tourniquet can be loosened. If a tourniquet is not needed, use other techniques to control bleeding and remove the tourniquet.
    d. When time and the tactical situation permit, a distal pulse check should be accomplished on any limb where a tourniquet is applied. If a distal pulse is still present, consider additional tightening of the tourniquet or the use of a second tourniquet, side by side and proximal to the first, to eliminate the distal pulse.
    e. Expose and clearly mark all tourniquet sites with the time of tourniquet application.
3. *Airway Management:*
    a. Unconscious casualty without airway obstruction:
        i. Chin lift or jaw thrust maneuver
        ii. Nasopharyngeal airway
        iii. Place casualty in the recovery position
    b. Casualty with airway obstruction or impending airway obstruction:
        i. Chin lift or jaw thrust maneuver
        ii. Nasopharyngeal airway
        iii. Allow casualty to assume position that best protects the airway- including sitting up
        iv. Place unconscious casualty in the recovery position

c. If previous measures unsuccessful:
    i. Surgical cricothyroidotomy (with lidocaine if conscious)
    ii. Oro/nasotracheal intubation
    iii. Consider Supraglottic Devices (e.g. King LT, CombiTube, or LMA) per protocol.
d. Consider applying oxygen if available

4. *Breathing*:
    a. All open and/or sucking chest wounds should be treated by immediately applying an occlusive material to cover the defect and securing it in place. Monitor the casualty for the potential development of a subsequent tension pneumothorax.
    b. In a casualty with progressive respiratory distress and known or suspected torso trauma, consider a tension pneumothorax and decompress the chest on the side of the injury with a 14-gauge, 3.25 inch needle/catheter unit inserted:
        i. In the second intercostal space at the midclavicular line. Ensure that the needle entry into the chest is *lateral to the nipple line* and is *not* directed towards the heart.
        ii. If properly trained, consider a lateral decompression, inserting the needle in the 2-4th inter costals space, anterior to the mid- axillary line on the injured side.
5. Intravenous (IV) access:
    a. Start an 18-gauge IV saline lock if indicated
    b. If resuscitation is required and IV access is not obtainable, use the intraosseous (IO) route (per agency protocol).
6. *Fluid resuscitation*: Assess for hemorrhagic shock; altered mental status (in the absence of head injury) and weak or absent peripheral pulses are the best field indicators of shock.
    a. If not in shock:
        i. No IV fluids necessary
        ii. PO fluids permissible if:
            a. Conscious, can swallow, and has no injury requiring potential surgical intervention
            b. If confirmed long delay in evacuation to care
    b. If in shock:
        i. Administer appropriate IV fluid bolus (500cc NS/LR/Hextend) and re-assess casualty. Repeat bolus once after 30 minutes if still in shock.
        ii. If a casualty with an altered mental status due to suspected TBI has a weak or absent peripheral pulse, resuscitate as necessary to maintain a desired systolic blood pressure of 90mmHg or a palpable radial pulse.
7. *Prevention of hypothermia*:
    a. Minimize casualty's exposure to the elements. Keep protective gear on or with the casualty if feasible.
    b. Replace wet clothing with dry if possible. Place the casualty onto an insulated surface as soon as possible.
    c. Cover the casualty with commercial warming device, dry blankets, poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry.
    d. Warm fluids are preferred if IV fluids are required.
8. *Penetrating Eye Trauma*: If a penetrating eye injury is noted or suspected:
    a. Perform a rapid field test of visual acuity.
    b. Cover the eye with a rigid eye shield (NOT a pressure patch). If a commercial eye shield is not available, use casualty's eye protection device or anything that will prevent external pressure from being applied to the injured eye.
9. *Reassess casualty*:
    a. Complete secondary survey checking for additional injuries. Inspect and dress known wounds that were previously deferred.
    b. Consider splinting known/suspected fracture to include applying pelvic binding techniques for suspected pelvic fractures.
10. Provide *analgesia* as necessary.
    a. Able to continue mission:
        i. Consider oral non-narcotic medications such as Tylenol
    b. Unable to continue mission:
        i. Consider oral non-narcotic medications for mild to moderate pain

ii. Consider use of oral/intra-nasal/IV/IO narcotic medications (hydrocodone, oxycodone, trans mucosal fentanyl citrate, etc.) for moderate to severe pain
iii. Consider adjunct administration of anti-emetic medicines
Note: Have naloxone readily available whenever administering opiates
iv. Monitor for adverse effects such as respiratory depression or hypotentension.

11. Antibiotics: Consider initiating antibiotic administration for casualties with open wounds and penetrating eye injury when evacuation to definitive care is significantly delayed or infeasible. This is generally determined in the mis sion planning phase and requires medical oversight.

12. Burns:

a. Facial burns, especially those that occur in closed spaces, may be associated with inhalation injury. Aggressively monitor airway status and oxygen saturation in such patients and consider early definitive airway management for respiratory distress or oxygen desaturation.
b. Estimate total body surface area (TBSA) burned to the nearest 10% using the appropriate locally approved burn calculation formula.
c. Cover the burn area with dry, sterile dressings and initiate measures to prevent heat loss and hypothermia.
d. If burns are greater than 20% of Total Body Surface Area, fluid resuscitation should be initiated under medical control as soon as IV/IO access is established. If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock as per the guidelines.
e. All previously described casualty care interventions can be performed on or through burned skin in a burn casualty.
f. Analgesia in accordance with TECC guidelines may be administered.
g. Aggressively act to prevent hypothermia for burns greater than 20% TBSA.

13. Monitoring: Apply appropriate monitoring devices and/or diagnostic equipment if available. Obtain and record vital signs.

14. Prepare casualty for movement: Consider environmental factors for safe and expeditious evacuation. Secure casualty to a movement assist device when available. If vertical extraction required, ensure casualty secured within appropriate harness, equipment assembled, and anchor points identified.

15. Communicate with the casualty if possible. Encourage, reassure and explain care.

16. *Cardiopulmonary resuscitation (CPR*) within a tactical environment for victims of blast or penetrating trauma who have no pulse, no ventilations, and no other signs of life will not be successful and should not be attempted. In certain circumstance, such as electrocution, drowning, atraumatic arrest, or hypothermia, performing CPR *may be* of benefit and should be considered in the context of the tactical situation.

17. Documentation of Care: Document clinical assessments, treatments rendered, and changes in the casualty's status in accordance with local protocol. Consider implementing a casualty care card that can be quickly and easily com pleted by non-medical first responders. Forward this information with the casualty to the next level of care.

Skill set:

1. Hemorrhage Control:

a. Apply Tourniquet
b.Apply Direct Pressure
c. Apply Pressure Dressing
d. Apply Wound Packing
e. Apply Hemostatic Agent

2. Airway:

a. Apply Manual Maneuvers (chin lift, jaw thrust, recovery position)
b. Insert Nasal pharyngeal airway
c. Insert Supraglottic Device (LMA, King-LT, Combitube, etc)
d. Perform Tracheal Intubation
e. Perform Surgical Cricothyrotomy

3. Breathing:

a. Application of effective occlusive chest seal
b. Assist Ventilations with Bag Valve Mask
c. Apply Oxygen

d. Apply Occlusive Dressing
e. Perform Needle Chest Decompression

4. Circulation:

a. Gain Intravascular Access
b. Gain Intraosseous Access
c. Apply saline lock
d. Administer IV/IO medications and IV/IO fluids
e. Administer blood products

5. Wound management:

a. Apply Eye Shield
b. Apply Dressing for evisceration
c. Apply Extremity Splint
d. Apply Pelvic Binder
e. Initiate Basic Burn Treatment
f. Initiate Treatment for Traumatic Brain Injury

6. Prepare Casualty for Evacuation:

a. Move Casualty (drags, carries, lifts)
b. Apply Spinal Immobilization Devices
c. Secure casualty to litter
d. Initiate Hypothermia Prevention

7. Other Skills:

a. Perform Hasty Decontamination
b. Initiate Casualty Monitoring
c. Establish Casualty Collection Point
d. Perform Triage

Note: The recommended skill sets are based upon 10 years of ongoing combat. Care provided within the ITC/TFC guidelines is based upon individual first responder training, available equipment, local medical protocols, and medical director approval.

Evacuation/Tactical Evacuation Care (EVAC/TACEVAC):

Goals:

1. Maintain any life saving interventions conducted during DTC/CUF and ITC/TFC phases
2. Provide rapid and secure extraction to a appropriate level of care
3. Avoid additional preventable causes of death

Principles:

1. Reassess the casualty or casualties
2. Utilize additional resources to maximize advanced care
3. Avoid hypothermia
4. Communication is critical, especially between tactical and non tactical EMS teams.

Guidelines:

1. Reassess all interventions applied in previous phases of care. If multiple wounded, perform primary triage.
2. *Airway Management:*
    a. The principles of airway management in Evacuation Care are similar to that in ITC/TFC with the addition of increased utility of supraglottic devices and endotracheal intubation.
    b. Unconscious casualty without airway obstruction: Same as ITC/TFC
    c. Casualty with airway obstruction or impending airway obstruction:
        i. Initially, same as ITC/TFC Naso/oropharyngeal airway
        ii. If previous measures unsuccessful, it is prudent to consider supraglottic Devices (King LT, CombiTube, LMA, etc), endotracheal intubation/Rapid Sequence Intubation or surgical cricothyroidotomy (with lidocaine if conscious).

d. If intubated and attached to a mechanical ventilator, consider lung protective strategies and reassess for respiratory decline in patients with potential pneumothoraces.

e. Consider the mechanism of injury and the need for spinal immobilization. Spinal immobilization is not necessary for casualties with penetrating trauma if the patient is neurologically intact. Maintain high clinical suspicion for casualties over age of 65yo with blunt mechanism. Additionally, patients may be clinically cleared from spinal immobilization under a locally approved protocol if they have none of the following:

- Midline c-spine tenderness
- Neurologic impairment
- Altered mental status
- Distracting injury
- Intoxication

3. Breathing:

a. All open and/or sucking chest wounds should be treated by immediately applying an occlusive material to cover the defect and securing it in place. Monitor the casualty for the potential development of a subsequent tension pneumothorax. Tension pneumothoraces should be treated as described in ITC/TFC.

b. Reassess casualties who have had chest seals applied or had needle decompression. If there are signs of continued or progressive respiratory distress:

i. Consider repeating the needle decompression. If this results in improved clinical status, the de compression can be repeated multiple times.

ii. If appropriate provider scope of practice and approved local protocol, consider placing a chest tube if no improvement of respiratory distress after decompression if long duration or air transport is anticipated.

c. Administration of oxygen may be of benefit for all traumatically injured patients, especially for the following types of casualties:

- Low oxygen saturation by pulse oximetry
- Injuries associated with impaired oxygenation
- Unconscious casualty
- Casualty with TBI (maintain oxygen saturation > 90%)
- Casualty in shock
- Casualty at altitude
- Casualties with pneumothoraces

4. Bleeding:

a. Fully expose wounds to reassess for unrecognized hemorrhage and control all sources of major bleeding.

b. If not already done, use a tourniquet or an appropriate pressure dressing with deep wound packing to control life-threatening external hemorrhage that is anatomically amenable to such treatment.

i. Apply the tourniquet directly to the skin 2-3 inches above wound.

ii. For any traumatic total or partial amputation, a tourniquet should be applied regardless of bleeding.

c. Reassess all tourniquets that were applied during previous phases of care. Expose the injury and determine if a tourniquet is needed.

i. Tourniquets applied in prior phases that are determined to be both necessary and effective in controlling hemorrhage should remain in place if the casualty can be rapidly evacuated to definitive medical care.

ii. If ineffective in controlling hemorrhage or if there is any potential delay in evacuation to care, identify an appropriate location 2-3 inches above the injury, and apply a new tourniquet directly to the skin. Once properly applied, the prior tourniquet can be loosened.

iii. If delay to definitive care longer than 2 hours is anticipated and wound for which tourniquet was applied is anatomically amenable, attempt a tourniquet downgrade as described in ITC/TFC.

d. A distal pulse check should be performed on any limb where a tourniquet is applied. If a distal pulse is still present, consider additional tightening of the tourniquet or the use of a second tourniquet, side-by-side and proximal to the first, to eliminate the distal pulse.

e. Expose and clearly mark all tourniquet sites with the time of tourniquet application. Use an indelible marker.

5. *Fluid resuscitation*: Reassess for hemorrhagic shock (altered mental status in the absence of brain injury, weak or absent peripheral pulses, and/or change in pulse character). If BP monitoring is available, maintain target systolic BP 80-90mmHg.
    a. Establish intravenous or intraosseous access if not performed in ITC/TFC phase
    b. Management of resuscitation as in ITC/TFC with the following additions:
        i. If in shock and blood products are not available or not approved under scope of practice/local protocols resuscitate as in ITC/TFC.
        ii. If in shock and blood products are available with an appropriate provider scope of practice under an approved medical protocol:
            - Resuscitate with 2 units of plasma (FFP) and 2 units of packed red blood cells (PRBCs) in a 1:1 ratio.
            - If blood component therapy is not available, and appropriate training, testing and protocols are in place, consider transfusing fresh whole blood.
            - Continue resuscitation as needed to maintain target BP or clinical improvement.
        iii. If a casualty with an altered mental status due to suspected TBI has a weak or absent periph eral pulse, resuscitate as necessary to maintain a desired systolic blood pressure of 90mmHg or a palpable radial pulse.
        iv. If suspected TBI and casualty not in shock, raise the casualty's head to 30 degrees.
6. *Prevention of hypothermia:*
    a. Minimize casualty's exposure to the elements. Move into a medic unit, vehicle, or warmed structure if possible. Keep protective gear on or with the casualty if feasible.
    b. Replace wet clothing with dry if possible. Place the casualty onto an insulated surface as soon as possible.
    c. Cover the casualty with commercial warming device, dry blankets, poncho liners, sleeping bags, or anything that will retain heat and keep the casualty dry.
    d. Warm fluids are preferred if IV fluids are required.
7. *Monitoring:*
    a. Institute electronic monitoring if available, including pulse oximetry, cardiac monitoring, etCO_2 (if intubated), and blood pressure.
    b. Obtain and record vital signs.
8. *Reassess casualty*:
    a. Complete secondary survey checking for additional injuries. Inspect and dress known wounds that were previously deferred.
    b. Determine mode and destination for evacuation to definitive care.
    c. Splint known/suspected fractures and recheck pulses.
    d. Apply pelvic binding techniques for suspected pelvic fractures.
9. *Provide analgesia as necessary*:
    a. Mild pain:
        i. Consider oral non-narcotic medications
    b. Moderate to severe pain:
        i. Consider use of oral/intra-nasal/IV/IO narcotic medications (hydrocodone, oxycodone, transmucosal fentanyl citrate, morphine, etc.)
        ii. Consider adjunct administration of anti-emetic medicines
        iii. Have naloxone readily available whenever administering opiates
        iv. Monitor for adverse effects such as respiratory depression, hypotentension
10. *Burns*:
    a. Burn care is consistent with the principles described in ITC/TFC.
    b. Be cautious of off-gassing from patient in the evacuation vehicle if there is suspected chemical exposure (e.g. cyanide) from the fire.
    c. Consider early airway management if there is a prolonged evacuation period and the patient has signs of significant airway thermal injury (e.g. singed facial hair, oral edema, carbonaceous material in the posterior pharynx and respiratory difficulty.)
11. *Prepare casualty for movement*: Consider environmental factors for safe and expeditious evacuation. Secure casualty to a movement assist device when available. If vertical extraction required, ensure casualty secured within appropriate harness, equipment assembled, and anchor points identified.
12. *Communicate* with the casualty if possible and with the accepting facility. Encourage, reassure and explain care.

13. *Cardiopulmonary resuscitation (CPR*) may have a *larger role* during the evacuation phase especially for patients with electrocution, hypothermia, non traumatic arrest or near drowning.
14. *Documentation of Care*: Continue or initiate documentation of clinical assessments, treatments rendered, and changes in the casualty's status in accordance with local protocol. Forward this information with the casualty to the next level of care.

Skills:

1. Familiarization with advanced monitoring techniques
2. Familiarization with transfusion protocols
3. Ventilator and advanced airway management

C-TECC Skill Sets Based on Provider Level

Provider Level	Tourniquets**	Pressure Bandage w/ packing	Hemostatic Agents	Tourniquet De-escalation	Needle Thoracentesis	Surgical Airway	NPA	Blind Airway Insertion Device
LEO*	X	X	X				X	
EMR or equivalent	X	X	X		X***		X	X
EMT	X	X	X	X	X***		X	X
Advanced EMT	X	X	X	X	X	X***	X	X
Paramedic	X	X	X	X	X	X	X	X

* Law Enforcement Officer; may have CPR/Basic First Aid Training.
** Already included in NREMT skill sheets.
*** Only with proper training, specialized protocol and OMD approval. Ideally, this is a skill that should be performed by all providers, but need to prove safety and efficacy prior to inclusion of additional provider levels.

Other EMS/medical related skills such as patient assessment, chest seal placement, splinting, and hypothermia management should be considered standard for all levels of providers. Additional skills can be considered with specific agency approval.