TACTICAL COMBAT CASUALTY CARE: TRANSITIONING BATTLEFIELD LESSONS LEARNED TO OTHER AUSTERE ENVIRONMENTS

Prolonged Field Care: Beyond the “Golden Hour”

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Prolonged field care (PFC) has emerged as a recent area of focus for US military Special Operations Forces (SOF) medical experts. Focused on the current reality of providing medical care to military forces often deployed in remote and austere locations far from medical support or a robust casualty evacuation chain, PFC encompasses evolving operational situations not unlike many wilderness medicine practice environments. SOF currently operates in all areas of the world and on a variety of different missions, which finds these small teams far from the accustomed practice environment of robust deployed medical infrastructure commonly seen during the last 15 years of military conflicts. In light of this evolving operational situation, the Prolonged Field Care Working Group has undertaken a comprehensive approach to better define and tackle this challenge. The approach to training and educating SOF medics on PFC is based on defined capabilities and operational situations that incorporate best medical practices and seeks to place advance resuscitative capabilities into the hands of providers closest to the point of injury. By transitioning from an approach solely driven by acute trauma aide, incorporating the best practices of Tactical Combat Casualty Care (TCCC), PFC builds upon best practices for the continuing management of both medical and trauma patients in wilderness environments. PFC incorporates best practices in generally hospital-based management of serious and critical casualties to decrease both mortality and morbidity in austere, prehospital operational settings.

Keywords: prolonged field care, austere medicine, Special Operations Medicine, Tactical Combat Casualty Care, prolonged care

Introduction

When most people picture military medicine, they may imagine gunshots and explosions, heavily armored soldiers and vehicles, first aid administered as per the strict Tactical Combat Casualty Care (TCCC) protocols, and rapid movement through a well-established system to forward surgical teams and combat hospitals. This has been the common experience of most military medical providers since shortly after 2001. As a result, military medicine has substantially improved far-forward trauma care and stabilization in this operational setting. In 2008, then Secretary of Defense Robert Gates issued a mandate

that all military medical evacuation to a surgeon must occur in less than 60 minutes. This mandate resulted in reduced overall time to surgery and was heralded as a key paradigm shift for a military medical system that directly contributed to the lowest mortality rate of any conflict in history.¹ This operational situation, however, is changing. No longer can we solely focus on the “Golden Hour” of presurgical care; we must look beyond hours to maybe even days.

With the reduction of troops and decrease in true combat missions in defined theaters of operations in places like Iraq and Afghanistan, the US military, Special Operations Forces (SOF) in particular, continuously deploy on expanded missions into many other countries. SOF find themselves in remote and austere locations around the world. Often working in small teams, highly trained medics work without direct oversight and, in many settings, do not enjoy the support of robust, first-world medical infrastructure. Medical

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evacuation to surgical care or definitive medical care in many of these locales is measured in days, not hours. Places such as sub-Saharan Africa, Southeast Asia, former Soviet states in Eastern Europe, and remote areas in South America present challenging environments for the remote medical provider.

In light of these situations and the evolving need to broaden our medical perspective to once again concentrate casualty management on the treatment of serious and critical patients—both trauma and medical—US SOF has been directed to refocus on our more traditional missions. This task necessarily requires an expanded focus with regard to medical training and preparation. In light of these evolving operational realities, prolonged field care has emerged as a focus area in SOF medical training and education.

Discussion

Prolonged field care (PFC) is defined as “Field medical care, applied beyond ‘doctrinal planning time-lines’ by a SOCM [Special Operations Combat Medic] or higher, in order to decrease patient mortality and morbidity. Utilizes limited resources, and is sustained until the patient arrives at an appropriate level of care.” This definition was developed and adopted by a North Atlantic Treaty Organization (NATO) SOF medical expert panel and reflects the prolonged management of serious casualties in a field or austere setting with limited resources. This approach to complex medical problems mirrors wilderness medicine in its scope and application, and, in fact, has direct application to nonmilitary medical practice.

Management of all-causes morbidity and mortality in an austere setting requires advanced training and concepts, with departure from the typical protocol-driven prehospital algorithms. This approach instead relies upon patient assessment and complex medical decision making, combined with advanced surgical and medical treatment options and coupled throughout with sound nursing and reassessment skills. Advanced medics or austere providers must be trained to use skills traditionally thought to be beyond their scope, challenging the sole use of strict protocols of prehospital care. Advanced resuscitation techniques and the combination of emergency medicine and intensive care medicine best practices, shared in published guidelines and through the teachings of experienced providers, must be incorporated into the traditional training of these advanced “prehospital” providers. Classroom lectures, clinical rotations in treatment facilities, and field problems consisting of challenging operational settings

should be combined to maximize the educational experience.

There may also be a departure from the NATO doctrinal “Roles” of medical care, in which capabilities are tied to facilities, treatment sites, or clearly defined provider categories. For trauma patients in particular, a paradigm shift to conceptualize treatment in terms of presurgical care is warranted. Presurgical care incorporates all aspects of doctrinal care prior to Role II surgical care, from first aid/nonmedical responder, to combat medic/paramedic, to aid station/Role I levels of care. In many PFC situations, the availability of hospital or surgical care is not practically available during the critical first phases of disease or injury. The operational context incorporates the concept of delayed or prolonged patient evacuation with advanced en-route care, acknowledging that the goal of managing patients is to ultimately deliver them to a robust, fixed medical facility as soon as practical. The reality forces the discussion to focus on best practices to improve survival and reduce morbidity by pushing capability forward, even if that capability has traditionally been “hospital-based.” Divorcing capabilities from the traditional practice settings, whether it be the administration of blood and blood products or advanced diagnostic techniques such as point of care ultrasound or rapid laboratory testing, is an essential element in the PFC analytical approach.

The problem of “medical economics”—the supply-demand mismatch of critical medical assets—is another key critical consideration for PFC. There are simply more small military units deployed to more austere locations than ever before. There are too few field surgical teams and remote advanced medical capabilities to adequately support each individual unit or austere location per current military doctrine. In anticipation of ongoing limited war with global terror networks, for example, the US Department of Defense (DoD) faces a unique, unprecedented challenge. How will the DoD medically support numerous small teams operating in remote locations scattered around the globe? Even in a post-Iraq/Afghanistan military medical system well equipped with combat experience and resources, there are clearly not enough surgical or critical care resources to support global operations for such diverse teams and missions. Global evacuation, another lifesaving capability provided traditionally by the US Air Force, is frightfully constrained by landing strips, weather, prolonged flight times, and unreliable political permissions in unstable countries. Even if the plan is to “fly your casualty out” on any aircraft available, the field medical provider must consider adequate preparation and training to provide ongoing resuscitation and care for many hours or days.

In light of these observed needs and emerging challenges, the United States Special Operations Command and the Special Operations Medical Association formed the Prolonged Field Care Working Group (PFC WG) to tackle this operational problem set. In late 2013, SOF medics recognized their current practice did not focus on skills required for managing complex patients over time. The reason for this degradation was simple—the previous 12 years of combat had robust medical and evacuation support structures. At the height of the Iraq conflict, some experienced providers claimed that a combat-wounded patient could be delivered to a surgeon and be on the table in the operating room in under 7 minutes. With the development and fielding of a robust evacuation and forward surgical system, SOF medics had little occasion to use their more advanced surgical/medical skills, resulting in a system-wide de-emphasis of advanced prolonged care for the sake of lifesaving point-of-injury trauma care. Trauma skills and TCCC will always be foundational for the SOF medic, but medics' other unique medical capabilities, although taught in initial certification programs, often went unused due to the ready availability of definitive care in this robust trauma system. This subsequently led to an analysis of and resultant effort to refocus training on certain aspects and skills, specifically concentrating on aspects of emergency medicine and critical care that eventually yielded a list of core capabilities. The 10 Core Capabilities were defined as a means of characterizing areas of training and focus for education, as well as mission analysis and logistics (see [Table](#)).

The operational context of care is inherent in any SOF mission, wilderness setting, or austere practice environment. Taking into account various practice environments, to include limitations in equipment and transportation, the Operational Context of PFC was defined in general categories of “Ruck, Truck, House, Plane.” By applying needed capabilities in the specific operational context of a mission, a tailored advanced medical support plan can be developed. Operational context is a familiar concept to austere or wilderness medicine providers, who inherently understand the constraints of backpack-carried medical equipment, base camps, and rotary-wing evacuation. As a popular example of applying operational context of PFC, consider that Everest Base Camp would serve as an example of “house” and a remote search and rescue vehicle, perhaps a snow machine or all-terrain vehicle, as “truck.” The operational context and the PFC Core Capabilities are captured in PFC WG position papers recently published in the *Journal of Special Operations Medicine*.^{2,3}

PFC training and education in SOF goes beyond the mechanics of treating defined conditions in a

protocol-driven method and focuses on the pathophysiology of disease. Recognizing the broad range of presentations of serious disease or complications of trauma, PFC education and training emphasizes patient care skills, surgical skills, advanced diagnostics, and nursing skills. Increased emphasis on pain management and basic anesthesia techniques is an example of the expanded recommendations beyond the protocol-driven aspects of TCCC. Incorporating best practices of algorithms and checklists, coupled with a holistic approach toward the patient, PFC management aims to arm the medical provider with tools to manage both his team (as medical enablers) and the patient's care, while enhancing his critical thinking for complex situational problems.

Unique in prehospital medicine, PFC training gives special emphasis to teleconsultation with appropriate specialists. By engaging the greater medical consultation network to provide critical care far forward, we seek to use best practices of in-hospital multispecialty care for critical care management of patients. Teleconsultation, preferably live time (synchronous), represents yet another paradigm shift for military medicine. Instead of bringing the patient to the surgeon or intensive care unit (ICU), bring the ICU or surgeon to the patient, virtually. Wilderness medicine has already proven the validity of this concept. Consider the success of real-time ultrasound image transmission from a ski patroller on the mountain to a physician in the hospital many miles away, guiding the patroller's use of the probe and virtually guiding the examination and treatment.

SOF medicine, and the PFC WG in particular, have had a nonbiased approach to ensuring capability is provided at the correct location in a timely manner during the management of serious and critical casualties. TCCC has revolutionized and redefined the skills provided on the battlefield with the adaptation of surgical airways, needle thoracostomies, chest thoracotomies, and similar surgical techniques generally reserved for in-hospital patient treatment. PFC demands that most current best practice include these surgical skills and others, to include fresh whole blood transfusions, ventilator management, advanced pain management, and basic anesthesia skills. We anticipate that SOF medicine's continued exploration of patient management techniques and thoughtful analysis of ongoing case reports will inform the civilian medicine community, and, in particular, remote and austere providers.

Conclusions

With the realization that operational reality dictates that some patients will be managed in far-forward, austere settings, far from definitive surgical and ICU care, we

Table. PFC core capabilities as identified by the Special Operations Medical Association Prolonged Filed Care Working Group

<i>PFC tasks</i>	<i>Minimum</i>	<i>Better</i>	<i>Best</i>
1. Monitor the patient to create a useful vital sign trend	Blood pressure cuff, stethoscope, pulse oximetry, Foley catheter (measure urine output), mental status, and understanding of vital signs interpretation	Add capnometry	Vital signs monitor to provide hands-free vital signs data at regular intervals
2. Resuscitate the patient beyond crystalloid or colloid infusion	Field fresh whole-blood (FWB) transfusion kits	Maintenance crystalloids also prepared for a major burn and/or closed-head injury resuscitation (2 to 3 cases of lactated Ringer's solution or PlasmaLyte A; hypertonic saline); consider adding lyophilized plasma as available; fluid warmer	Maintain a stock of packed red blood cells and fresh frozen plasma and have type-specific donors identified for immediate FWB draw
3. Ventilate/Oxygenate the patient	Provide positive end-expiratory pressure (PEEP) via bag-valve mask (you cannot ventilate a patient in the PFC setting [prolonged ventilation] without PEEP or they will be at risk of developing acute respiratory distress syndrome)	Provide supplemental oxygen (O ₂) via an oxygen concentrator	Portable ventilator (eg, Eagle Impact ventilator, Zoll Medical Corp, http://www.impactinstrumentation.com ; or similar) with supplemental O ₂
4. Gain definitive control of the patient's airway with an inflated cuff in the trachea (and keep the patient comfortable)	Medic is prepared for a ketamine cricothyrotomy	Add ability to provide long-duration sedation	Add a responsible rapid-sequence intubation capability with subsequent airway maintenance skills, in addition to providing long-term sedation (to include suction and paralysis with adequate sedation)
5. Use sedation/pain control to accomplish the above tasks	Provide opiate analgesics titrated intravenously	Trained to sedate with ketamine (and adjunctive midazolam as needed)	Experienced with and maintains currency in long-term sedation practice using intravenous morphine, ketamine, midazolam, fentanyl, and so forth
6. Use physical examination/diagnostic measures to gain awareness of potential problems	Uses physical examination without advanced diagnostics, maintain awareness of potential unseen injuries (eg, abdominal bleed, head injury)	Trained to use advanced diagnostics such as ultrasound, point-of-care laboratory testing, and so forth	Experienced in both
7. Provide nursing, hygiene, and comfort measures	Ensure the patient is clean, warm, dry, padded, and catheterized and provide basic wound care	Elevate head of bed, debride wounds, perform washouts, wet-to-dry dressings, decompress stomach	Experienced in both
8. Perform advanced surgical interventions	Chest tube, cricothyrotomy	Fasciotomy, wound debridement, amputation, and so forth	Experienced in both
9. Perform telemedicine consult	Make reliable communications, present patient, pass trends of key vital signs	Add laboratory findings and ultrasound images	Video teleconference
10. Prepare the patient for flight	Be familiar with physiologic stressors of flight	Trained in critical care transport	Experienced in critical care transport

Minimum–better–best is a planning tool. Differences between levels may reflect medical training or experience or available resources.

recognize some patients will not be moved backward in the traditional sense of timely evacuation. The Golden Hour, the time from initial trauma to surgical intervention, will not be achieved as we have commonly come to expect in modern military medical doctrine. Given those constraints, we must accept situations where we are operationally unable to transport a patient back to the capabilities of a robust inpatient facility, and we therefore are charged with engineering a medical management paradigm that brings life-saving capabilities forward to the patient. In this sense, the PFC WG is leading the collection of science and best practice through focused empiricism to enable relevant medical education, training, and practice. The ultimate goal is to ensure that the same care we deliver to service members wounded in armed conflict in defined theaters of war is available in remote, austere, and wilderness settings around the world. We hope that best practices can be shared and incorporated into treatment guidelines, medical education, and research and development initiatives to benefit

all providers, both civilian and military, who serve in challenging practice settings.

For further information, see: PFCare.org and www.specialoperationsmedicine.org.

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