

Operation Enduring Freedom: The 48th Combat Support Hospital in Afghanistan

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Objective: To examine the experience of the 48th Combat Support Hospital (CSH) while deployed to Afghanistan, with an emphasis on trauma care. **Materials and Methods:** Before re-deployment, a retrospective review was performed on the medical records of all patients treated at the 48th CSH from December 6, 2002 through June 7, 2003. **Results:** During the 6-month period, 10,679 patients were evaluated and/or treated. There were 477 hospital admissions (adults, 387; children, 90; trauma, 204) and 634 operating room procedures. The most common mechanisms of injury were land mines/unexploded ordinance (74 = 36%) and gunshot wounds (41 = 20%). Extremities were the most common site. A total of 358 cases was performed on 168 trauma patients (mean, 2 cases per patient; range, 1–12). There were 63 complications in 40 trauma patients and 11 patients died. **Conclusions:** The 48th CSH supported military and humanitarian operations with an ongoing process of re-evaluation, adaptation, and medical education that resulted in low morbidity and mortality rates.

Introduction

In response to the attacks on the World Trade Center and Pentagon, the United States deployed forces to Afghanistan. Health care for U.S. and coalition forces was initially provided by organic medical elements with limited surgical capabilities. This was followed by the introduction of forward surgical teams consisting of 20 individuals, including surgeons, nurses, and technicians. As the theater matured, a combat support hospital (CSH) was moved into the region to provide a wider spectrum of sustained medical and surgical care. The 86th CSH was positioned to the north in Uzbekistan and served as the first hospital in theater. The 339th CSH, a reserve unit from Pennsylvania, was deployed as the first U.S. hospital in Afghanistan. After 6 months, they were replaced by the 48th CSH on December 6, 2003.

The 48th CSH was the first multicomponent hospital deployed to a combat zone in the history of the U.S. military (Fig. 1). The unit consisted of personnel from the active and reserve components working side-by-side to provide health care to U.S., coalition, and Afghan patients. The unit had a rich history dating back to World War II. The hospital was activated as the 48th

Portable Surgical Hospital on June 7, 1943. It provided direct tactical support to the Chinese Expeditionary Force during World War II and was inactivated on December 20, 1945. The hospital was reborn when the 8228th Mobile Army Surgical Hospital (MASH) was redesignated as the 48th MASH in 1951. During the Korean War, the unit received and treated all hemorrhagic fever cases, earning a reputation for excellence in the theater. Long after the war ended, the MASH was inactivated in Korea on May 1, 1964.

The 48th CSH was reactivated at Fort Meade, Maryland on October 16, 2000 as the Army's first multicomponent CSH. With a history of service during times of conflict, the hospital was mobilized on October 21, 2002 for movement to Afghanistan in support of Operation Enduring Freedom. This article recounts the experiences of the 48th CSH while deployed to Southwest Asia, with an emphasis on trauma care.

Materials and Methods

The hospital staff arrived in Afghanistan in two groups on December 3 and 5, respectively, and started caring for patients on December 6, 2002. The deployed element consisted of 124 personnel, comprising approximately 23% of the parent unit. There were 92 (74%) men, 32 women, 77 (62%) enlisted soldiers, and 47 officers. Seventy-three (59%) individuals were assigned to the unit and the remaining 51 were active duty professional fillers assigned from hospitals belonging to the Army's North Atlantic and Southeast Regional Medical Commands. The professional staff included six surgeons (general, one; general/vascular, one; general/surgical oncology, one; orthopedic, two; oral maxillofacial, one), four anesthesia providers (a combination of anesthesiologists and certified registered nurse anesthetists), one emergency medicine physician, two family physicians, one internist (initially a gastroenterologist and later an infectious disease specialist), one pediatrician, one radiologist, and one physician's assistant. The nursing staff consisted of 16 registered nurses. Radiology capabilities included computed tomography, ultrasound, and plain films while the laboratory contained a blood bank, microbiology section, and hematology and chemistry elements. An active three-man pharmacy was also an integral part of the unit.

The 48th CSH was envisioned to be a 44-bed hospital. One 16-bed intermediate care ward was not used and the CSH functioned as a 28-bed hospital with 12 intensive care unit (ICU) and 16 intermediate care ward beds. Patients initially underwent evaluation in the emergency medical treatment section where care was delivered in a sick call area for routine problems and an emergency treatment section for more urgent medical, surgical, and psychiatric needs. There were two operating rooms, equipped and staffed

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Figure 1. Aerial view of the 48th CSH.

to perform a total of three simultaneous procedures. Initial post-anesthesia care was performed in the ICU by the staff of that unit.

The hospital provided care to military personnel, including U.S. and coalition forces, civilian contractors, and Afghan military. Afghan civilians received care in accordance with the rules of entitlement directed by the U.S. commander in Afghanistan. These guidelines included the delivery of care to save life, limb, or eyesight. Medical commanders had the authority to make final decisions regarding eligibility for care. Patients came from a variety of sources. Two forward surgical teams (FSTs) provided emergency surgical care and transferred patients to the CSH for further evaluation and/or treatment. Medical personnel, most commonly Special Forces medics, evacuated patients to the FSTs or the CSH from throughout the country. Patients in the Bagram area came directly to the CSH. Finally, patients were occasionally transferred from the International Stabilization and Assistance Force Hospital or Afghan facilities in Kabul.

The patient administration division reported monthly statistics and maintained medical records after discharge. Before redeployment, a retrospective review was performed on all records. The data from these two sources formed the basis for this article. The 48th CSH handed over operation of the hospital on June 8, 2003. Accordingly, this review covers the 6-month period from December 6, 2002 through June 7, 2003.

Results

During the 6 months the 48th CSH was deployed, 10,679 patients were evaluated and/or treated. The majority of the individuals (9,230) were seen for routine problems in sick call while the remainder (1,449) underwent evaluation in the emergency medical treatment section. There were 477 hospital admissions as follows: U.S. and coalition forces, 208 (44%) and Afghans, 269 (56%). Of these patients, 387 were adults and 90

were children. Trauma admissions numbered 204. There were 634 operating room procedures performed for a variety of indications, including trauma and nontrauma cases. There were 199 ICU admissions (trauma, 143; nontrauma, 56; average length of stay, 4 days) and ward admissions numbered 353 (trauma, 190; nontrauma, 163; average length of stay, 5 days). The pharmacy issued a total of 22,026 inpatient and outpatient prescriptions while the laboratory processed 7,806 tests. Finally, the radiology department performed 2,647 studies including 2,263 plain films, 298 computed tomography scans, and 86 ultrasound examinations.

The mean age of the 204 patients admitted for trauma was 25 years (range, 1–70). There were 58 pediatric trauma admissions, with a mean age of 9 years (range, 1–16). The average length of stay for all trauma patients was 8.5 days while pediatric trauma patients stayed slightly longer (mean, 10 days). The five most common mechanisms of injury are depicted in Figure 2. Other mechanisms included falls (seven), explosions other than mines/unexploded ordinance (UXO) and grenades (nine), stab

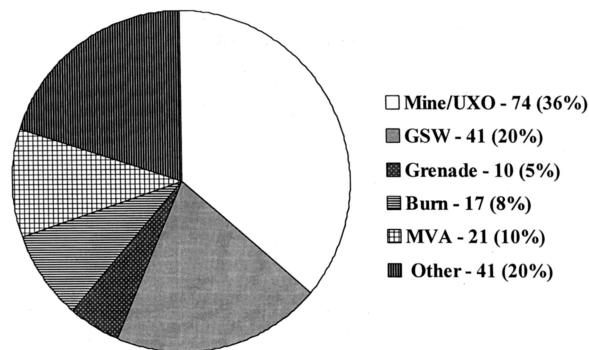


Figure 2. Mechanisms of injury. GSW, gunshot wound(s); MVA, motor vehicle accident.

wounds (two), sports injuries (two), and a variety of blunt and penetrating sources. In four cases, the mechanism was unknown. The distribution of injuries by site is detailed in Table I. Extremity trauma was the most common, with the lower limbs ranking as the most common anatomical location of injury. Multiple trauma was present in 124 patients, while only 80 individuals had single sites of injury. Of the latter, 51 had extremity trauma (upper extremity, 14; lower extremity, 37) and 9 sustained head injuries.

Two FSTs were positioned in outlying areas of Afghanistan based on operational considerations. These teams treated 91 patients who were subsequently sent to the CSH. Of those, 7 were brought to the FSTs following evaluation and/or treatment at a local Afghan hospital. Eight individuals came to the CSH directly from other hospitals, either local Afghan or coalition military facilities. The remaining 105 patients came directly to the CSH. Of the 99 individuals evaluated at FSTs or other hospitals, 68 underwent procedures beyond basic resuscitation.

A total of 358 procedures was performed on 168 trauma patients (mean, 2 cases per patient; range, 1–12). Eighty-two individuals underwent a single procedure. Irrigation and debridement of wounds were the most common procedures, comprising all or part of 219 cases. Other common procedures are detailed in Table II. Sixty-two amputations were performed on 48 individuals (Table III). Transfusions of packed red blood cells were administered to 53 patients, with a mean of 4 units per patient (range, 1–32 units). Fresh frozen plasma was given to 6 patients (mean, 4 units; range, 1–8 units). There were 63 complications in 40 trauma patients (Table IV) and 11 patients died (Table V).

U.S. service members and American contractors with significant medical and/or surgical problems were evacuated to Landstuhl Regional Medical Center in Germany within 3 to 5 days of admission. Critically injured U.S. soldiers were transferred to Germany with the assistance of Air Force critical care air transport teams. One of these teams was colocated with the 48th CSH in Bagram. Of the trauma patients, 25 were evacuated to Germany. Two additional coalition soldiers were returned to their home countries after sustaining injuries. In most cases, Afghan patients remained in the hospital until they were ready for discharge. A total of 14 individuals were transferred to Kabul Military Hospital. These patients were sent when medical conditions required prolonged treatment and/or when the CSH was full and beds were needed for more acute care.

TABLE I
INJURY DISTRIBUTION BY SITE

Site	All Trauma	Single Site Trauma
Lower extremities	114 (25%)	37 (46%)
Upper extremities	79 (17%)	14 (18%)
Face	52 (11%)	5 (6%)
Head	40 (9%)	9 (11%)
Eyes	39 (8%)	4 (5%)
Abdomen	34 (7%)	5 (6%)
Chest	33 (7%)	2 (3%)
Pelvis	25 (5%)	2 (3%)
Burns	17 (4%)	0
Neck	16 (3%)	0
Ears	10 (2%)	1 (1%)
Back	7 (1%)	1 (1%)

TABLE II
COMMON SURGICAL PROCEDURES

Procedure	Number
Irrigation and debridement	219
Facial procedure	65
Amputation	62
Wound closure	45
Skin graft	30
Dressing change	29
Exploratory laparotomy	17
Tracheostomy	12
Ocular evisceration/enucleation/repair	10
Jejunostomy tube placement	8
Gastrostomy tube placement	7
Neck exploration	7
Vascular repair/reconstruction	4
Craniotomy	4

TABLE III
AMPUTATIONS

Type	Number
Below the knee	22 (35%)
Upper extremities	10 (16%)
Hand(s)/digit(s)	10 (16%)
Above the knee	6 (10%)
Multiple extremities	6 (10%)
Knee disarticulation	4 (7%)
Lower extremity NOS	4 (7%)
Total amputations	62
Total patients	48

NOS, not otherwise specified.

Discussion

The deployment of the 48th CSH marked the first time a multicomponent hospital treated patients in a combat theater. The unit blended reserve and active component elements into one hospital. During a period when the United States is increasingly relying on National Guard and Reserve forces, this experiment deserves a brief critical review. The mixing of soldiers from the reserve and active components, elements with different cultures, necessitated an adjustment early in the deployment. This primarily occurred in areas of discipline and military readiness. With time, however, these differences melted away. Staffing of the organization did not account for the complexities of the mission. For example, a shortage of ward nurses was exacerbated by the requirement for protracted care for Afghan patients. A number of positions went unfilled and some rotating soldiers were not replaced, further reducing end-strength. This lean organization was further challenged by the need to regularly provide soldiers for a myriad of military details. Faced with ongoing requirements overseas, a precarious balance must be maintained to adequately staff units without necessitating repetitive, prolonged deployments that adversely impact morale and retention for medical personnel.

The CSH evaluated and cared for more than 10,000 patients, a significant volume over a 6-month period. Although the vast majority of patients were seen for minor conditions, the 477 patients admitted to the hospital included a large number of

TABLE IV
COMPLICATIONS

Type	Number	Type	Number
Wound infection	6	ARDS	1
Pneumonia	5	Cardiac arrest	1
Acute renal failure	5	Peritonitis	1
Urinary tract infection	4	Malreduced fracture	1
Wound complications (not infection)	4	DIC	1
Deep venous thrombosis	3	Esophagitis	1
Respiratory failure	3	Oral thrush	1
Pneumothorax	3	Traumatic A-V fistula	1
Aspiration	2	Small bowel obstruction	1
Pulmonary embolism	2	Thrombocytopenia	1
Depression	2	GI bleed	1
<i>Clostridium difficile</i> colitis	2	Necrotic posterior compartment (leg)	1
Postconcussive syndrome	2	Ileus	1
Sepsis	2	Ruptured pseudoaneurysm	1
Metabolic acidosis	2	Diabetes insipidus	1
		Atrial fibrillation	1

ARDS, acute respiratory distress syndrome; DIC, disseminated intravascular coagulation, A-V, arteriovenous; GI, gastrointestinal.

TABLE V
DEATHS

Age (years)	Mechanism	Lethal Injury	Surgery	LOS
40	GSW	Abdomen	FST/CSH	14
35	MVA	Head	None	2
22	GSW	Abdomen	FST/CSH	6
8	Mine	Head	None	1
35	Mine	Head	CSH	10
6	MVA	Head	FST	22
24	Mine	Perineum	FST/CSH	29
32	RPG	Abdomen	FST/CSH	7
19	GSW	Extremity/vascular	FST	2
50	Burn	Burn/inhalation	CSH	15
5	Mine	Multiple	CSH	1

GSW, gunshot wound(s); MVA, motor vehicle accident; Mine, land mine or UXO; RPG, rocket-propelled grenade.

severely ill or injured individuals. One of the great challenges for the 48th CSH was maintaining the balance between capabilities and requirements. The CSH was designed, equipped, and supplied to provide care to U.S. and coalition forces. The inclusion of Afghan patients and U.S. contractors added pediatric and more elderly individuals. In addition, an institution designed for short patient stays was compelled to provide care over protracted periods of time. These patients frequently required advanced ICU care followed by rehabilitation. Medical supply was problematic throughout the deployment and this necessitated ingenuity and resourcefulness to optimize patient care. Finally, patients were evacuated to the CSH from a variety of rural locations throughout the nation. Faced with limited local medical infrastructure, a steady influx of Afghan patients and paucity of resources for medical outreach, discharge planning, transport, and placement proved very challenging.

Despite these challenges, the treatment of Afghan patients was extremely beneficial on several levels. This care met the directives of the Coalition Forces commander and fulfilled humanitarian needs. The CSH remained sharp and well trained due to the volume of complex cases that regularly came into the

hospital. The professional staff was clinically engaged, improving morale and discipline. Educational initiatives were developed as by-products of the clinical milieu. With repeated exposure to trauma, the rapidity and quality of care improved. CSH members with limited trauma experience became well versed in the nuances of care as their time in theater lengthened. Finally, the vast majority of the clinical staff never worked together before the deployment and after 2 to 3 weeks of intense exposure, the organization functioned as a well-integrated team.

The most common causes for injury were land mines and/or UXO. The Bagram Valley was heavily mined during the Soviet occupation and many of the Afghan patients evacuated directly to the CSH sustained mine or UXO injuries. Military encounters more commonly produced gunshot wounds or other injuries due to explosions. The most common sites of injury were the extremities, an observation in keeping with experience from previous conflicts, despite the mixing of military and civilian casualties.^{1,2} The benefits of body armor were clearly apparent when comparing coalition and Afghan patients. The protective equipment frequently prevented potentially lethal torso wounds. Land mine injuries provide a valuable case in point. Although Afghan pa-

tients often sustained multiple injuries, the wounds of soldiers wearing body armor were generally confined to the extremities.

The principles of surgery used by the CSH surgeons followed in the tradition of surgeons dating back to World War II.^{3,4} Wounds were aggressively debrided, often with multiple procedures before secondary closure. Single debridements followed by wound closure were performed when possible but significant contamination and extensive soft tissue injuries frequently necessitated follow-up debridements before the final procedure. Wide excision of necrotic tissue in concert with external fixation and the use of systemic antibiotics and antibiotic beads (when appropriate) were the mainstays of orthopedic treatment. Limb salvage was attempted when feasible and amputations were reserved for patients with severe open fractures and/or soft tissue injuries. Physicians were frequently required to treat conditions outside their primary area of expertise. General surgeons directed pediatric intensive care and performed craniotomies, urologic procedures, and reconstructive surgery. The oral-maxillofacial and general surgeons performed ophthalmologic procedures, including eviscerations. The Internet became a helpful resource in these endeavors. Digital camera images and case presentations were sent to consultants in the United States who provided observations and made timely and valuable treatment recommendations.

Infectious complications were relatively few given the gross contamination in many wounds. This was attributed to the aggressive wound care outlined above. Many of the complications were a consequence of the initial injuries and prolonged ICU care. In 10 of the 11 deaths, the lethal injury was identifiable. One 5-year-old child died from multiple, severe land mine injuries. The patients with abdominal and perineal wounds died from sepsis and multiple organ failure while the burn patient died from pulmonary complications.

The CSH instituted a multifaceted program for medical education. Daily teaching rounds were conducted 6 days a week and diagnostic and treatment plans were often modified based on these discussions. A continuing medical education (CME) lecture series, adhering to the strict guidelines mandated by the U.S. Army Medical Command CME program, conferred 18 hours of category 1 credit. CME lectures focused on conditions en-

countered in Afghanistan and, in many cases, the details were unfamiliar to those in attendance. Participation in the weekly morbidity and mortality (M&M) conference, covering all complications and deaths, was required for all physician providers. Information from M&M was used to modify practices and improve systems within the organization. The CSH sponsored two Advanced Cardiac Life Support courses and conducted a supervised rotation program that provided a diverse group of U.S. and coalition health care providers exposure to hospital care in a combat theater.

In addition to patient care and medical education, the CSH sponsored and participated in various cooperative medical assistance initiatives. These included primary care missions to remote and/or underserved areas, U.S. military inpatient care, an educational program with the Kabul Military Hospital, coordination with the International Committee of the Red Cross and consultation on a resource sharing program directed by the U.S. Office of Military Cooperation-Afghanistan. In May 2003, the CSH sponsored the first Coalition Forces Medical Symposium in Bagram. Attended by more than 100 health care providers from 13 coalition countries (including Afghanistan), the conference provided a venue for medical education and partnership.

In summary, the 48th CSH delivered a wide range of services to a large number of soldiers and civilians during its 6-month tenure. By treating Afghan patients, the staff met important humanitarian needs while maintaining critical skills in trauma evaluation and treatment. However, these efforts created significant challenges in providing prolonged care, rehabilitation, and outpatient placement in a nation with limited medical infrastructure. Despite the complexity of injuries and challenges of the deployed setting, an ongoing process of re-evaluation and adaptation combined with an aggressive program of medical education resulted in quality care with low M&M rates.

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