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Military Trauma Training Performed in a Civilian Trauma Center

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Background. **In 1996, Congress passed legislation requiring the Department of Defense to conduct trauma training in civilian hospitals. In September of 1998 an Army team composed of surgeons, nurses, emergency medical technicians (EMTs), and operating room technicians (OR techs) trained in a civilian level 1 trauma center. This study analyzes the quality of the training.**

Methods. **The training period was 30 days. Before and after training all members completed a questionnaire of their individual and team ability to perform at their home station, at the civilian hospital, and in the combat setting. Surgeons maintained an operative log, which was compared with their prior year's experience. Primary trauma cases (PTCs) met Residency Review Committee criteria as defined category cases and were done acutely. Other personnel tracked the percentage of supporting soldier tasks (SSTs) they performed or were exposed to during the training period.**

Results. **Review of the questionnaires revealed a significant increase in confidence levels in all areas tested ($P < 0.005$). The three general surgeons performed a total of 42 PTCs during the 28 call periods, or 1.5 PTCs per call period. During the prior year, the same three general surgeons performed 20 PTCs during 114 call periods for 0.175 cases per call period ($P = 0.003$). The maximum number of PTCs performed during one call period at the civilian center was 4, compared with 5 PTCs performed by one Army surgeon during the Somalia 1993 mass casualty event. Performance of or exposure to SSTs was 71% for the EMTs, 94% for the nurses, and 79% for the OR techs.**

Conclusions. **A 1-month training experience at a civilian trauma center provided military general surgeons with a greater trauma experience than they receive in 1 year at their home station. Other personnel on the team benefited by performing or being exposed to their SSTs. Further training of military teams in civilian trauma centers should be investigated.**

Key Words: **forward surgical team; trauma training; supporting soldier tasks.**

INTRODUCTION

The primary mission of the medical component of the Department of Defense is the care of the injured soldier. To be effective at completing this mission, members of the military trauma team must train on a routine basis during peacetime. Unfortunately, personnel practicing at military institutions have minimal exposure to trauma patients. There are currently three American College of Surgeons-verified Level 1 and 2 trauma centers in the military which together admit approximately 2000 patients per year. Outside of these centers, caregivers infrequently manage seriously injured trauma patients.

A survey study published in 1996 revealed that the average Army general surgeon performed 1.3 trauma laparotomies, 0.3 thoracotomies, and 0.3 vascular repairs for trauma per year [1]. Eighty-four percent of the procedures were performed by 13% of the responding surgeons. Experiences during the Gulf War highlighted that many medical personnel had little to no experience in taking care of severely injured patients. For example, of the 16 surgeons on the Navy hospital ship USNS Mercy, only 2 had recent trauma surgical experience. Also, none of the more than 100 corpsmen at a surgical support company had ever seen Advanced Trauma Life Support performed on an actual trauma patient [2]. Trauma patient outcome has been shown to correlate with volume and the presence of a mature trauma system and is not dependent on an individual's

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TABLE 1

Composition of the Forward Surgical Team

Number of personnel	Military occupational specialty (MOS)
3	General surgeons
1	Orthopedic surgeon
2	Nurse anesthetists
1	Critical care nurse
1	Operating room nurse
1	Emergency room nurse
3	Licensed vocational nurses
3	Operating room technicians
4	Emergency medical technicians
1	Field medical assistant (administrator)

performance [3–5]. This emphasizes the need for training the entire military trauma team.

Based on these realities, Congress passed legislation in February of 1996 requiring the Department of Defense to conduct a demonstration project of trauma training in a civilian hospital [6]. In response to this directive, an Army Forward Surgical Team (FST) was assigned to the Ben Taub General Hospital (BTGH) for a 1-month period of training. Ben Taub was chosen as the training site because it is a busy urban trauma center with a large volume of penetrating injury victims. FSTs are the U.S. Army's rapidly deployable, mobile units designed to surgically stabilize critically injured soldiers during conflicts. The team consists of surgeons, nurses, and technicians and it has austere operative and intensive care capabilities. A FST was chosen for this pilot project due to the nature of its wartime mission and to emphasize the importance of team training. This study was performed to assess the success of the training mission.

MATERIALS AND METHODS

In September of 1998 an FST from the 41st Combat Support Hospital in San Antonio, Texas, reported to Ben Taub General Hospital for a 30-day training period. The constituency of the team is shown in Table 1. The training period was divided into three segments. During the first week, each of the providers reported to designated BTGH supervisors for orientation to the facility, job duties, procedures, and protocols. Each of the three general surgeons reported to one of the three inpatient surgery teams and the orthopedic surgeon was assigned to the orthopedic team. The nurse anesthetists were assigned to the Department of Anesthesia. The remaining nurses and providers were assigned to sections that were compatible with their specialties.

The next 2 weeks of the training period focused on team training and cross-training. Providers continued training within their specialties; however, they transitioned from working as individuals within established BTGH teams to working together under BTGH supervisors' monitoring and guidance. In addition to their routine duties, all members of the team participated in cross-training by working in the emergency center (EC), operating room, and surgical intensive care unit. The general surgeons participated in orthopedic and neurosurgical procedures and the orthopedic surgeon assisted with general surgical procedures and EC resuscitations. This portion of the training solidified team unity and satisfied the need for diverse education that is generally required during a conflict.

The final week represented the culmination of the training during which the FST functioned as a unit. It consisted of six consecutive 12-h night shifts. During these shifts, two emergency medical technicians (EMTs) were stationed with the Houston Emergency Medical System and they responded to major trauma calls. The EMTs provided prehospital stabilization and transport to the BTGH EC. The other members of the FST formed two military resuscitation teams to whom all major trauma cases were shunted. Patients who required surgical intervention were operated on by one of the military general surgeons who assisted the general surgical residents. Postoperative care was provided by a military critical care team consisting of a critical care nurse and two licensed vocational nurses. The orthopedic surgeon provided operative care for patients with orthopedic injuries, acted as an assistant for the general surgeons, and participated in trauma resuscitations.

Integration of the FST at BTGH was implemented recognizing the importance of maintaining the integrity of the surgical residency programs. Although fully licensed by the State of Texas, the surgeons acted as fellows and participated in the operative procedures as supervisors to the surgical residents. Senior BTGH attendings were available at all times.

All major trauma resuscitations performed by the FST during the final week were videotaped. These resuscitations were reviewed and critiqued by BTGH experts in the presence of the military team. Criteria for evaluation of the resuscitation included the presence of a leader, performance of the primary and secondary survey in a timely and orderly fashion, and outcome of the resuscitation. Standard TRISS evaluation was performed on each of the cases managed primarily by the FST. TRISS represents a method to predict trauma outcome based on age, physiologic, and anatomic criteria following injury. The Revised Trauma Score and the Injury Severity Score (ISS) form the basis for TRISS. The prediction is based on a multiple logistic regression model using a database of 80,544 trauma patients from the Major Trauma Outcome Study [7]. Patients who had a probability of survival greater than 50% and expired were evaluated further.

To conduct the training analysis multiple data collection tools were developed. The first tool was the volunteer agreement or informed consent for release of individual information obtained from the FST members. This enabled the authors to analyze, use, and publish the information obtained through the surveys. As part of the volunteer agreement, each FST member was randomly assigned a number. To facilitate data integrity and individual privacy, this number was used to identify the individual respondent. The number and individual identity were maintained in a secured log available only to the investigators.

The pre- and postrotation surveys were developed to determine if the FST members experienced any change in their level of confidence to perform their battlefield mission in the field, at their home Army trauma center, and at BTGH as a result of the training. The survey was built based on a general expectation of success model using a 5-point Likert scale. The respondents answered a variety of questions on a scale of 1 (strongly disagree) to 5 (strongly agree). The survey consisted of three component parts separated by military occupational specialty (MOS). The first component contained questions based on individual skills. The second component included questions based on team skills. All FST members answered the questions in the first and second components. The third component contained specific questions based on the individual MOS.

All participants maintained a log of cases performed and tasks completed. Primary trauma cases were defined as acute trauma cases meeting the index case criteria established by the residency review committee (RRC). The operative experience was compared with each surgeon's prior year experience. Tasks completed were compared with a standardized list of supporting soldier tasks (SSTs) for enlisted soldiers by MOS and the percentage of tasks completed

TABLE 2

Experience of the Three General Surgeons during the Training Period Compared with an Average Month at Their Home Trauma Center[a]

	Home trauma center	BTGH	-Fold increase
Calls	9.5	28	2.9
Primary trauma cases	1.7	42	25.2
Cases per call	0.175	1.5	8.6
Percent penetrating	55%	57%	1.0
Percent ISS > 15	40%	57%	1.4

[a] The average month was calculated based on a 1-year period.

was calculated. This standardized list is derived from the Army's training manual for FSTs [8]. An example of the log containing the list of SSTs for an emergency medical technician is included in the Appendix. Completion of a task was documented when the task was performed within the scope of practice of the provider and that performance met BTGH clinical standards.

All data were entered into the Statistical Package for the Social Sciences (SPSS), Version 8.0 for Windows. Student's *t* test was used to determine differences between means and one-way analysis of variance (ANOVA) was performed to compare changes over time within groups. A P value <0.05 was considered significant.

RESULTS

During the training period, the three general surgeons took 28 nights of call. They admitted 96 trauma patients. They performed 42 primary trauma cases as compared with 20 primary trauma cases performed by the same three surgeons during the prior year. The mean number of 14 primary trauma cases per surgeon at BTGH compares favorably to an RRC requirement of 16 trauma cases for a 5-year general surgery residency. Table 2 compares the general surgeons' experience at BTGH with their average monthly experience at their home Army trauma center during the year prior to training. As Table 2 reveals, the general surgeons performed 25 times more primary trauma cases per month at BTGH than at their home center and almost 9 times more cases per call night ($P = 0.003$). The percentages penetrating cases and injury severity were similar between the Army trauma center and BTGH ($P > 0.2$). The maximum number of cases performed in a single call period was 4, comparing favorably to the experience of general surgeons participating in actual mass casualty events during the Gulf War and Somalia.

The orthopedic surgeon performed or staffed 7 external fixations, 14 open reduction and internal fixations, 3 trauma reconstructions, and 1 above knee amputation. The experience of the two certified registered nurse anesthetists (CRNAs) is shown in Table 3. Table 3 shows the number of acute trauma cases and nontrauma cases for which they provided anesthesia. The numbers of trauma airways that they secured and resuscitations that they led are also shown. The CRNAs both stated that their trauma experience in a single month at BTGH exceeded the trauma training they had obtained in 10 combined years of CRNA staff assignments at peacetime military hospitals.

TABLE 3

Experience of the Two CRNAs

Procedure/case	CRNA A	CRNA B
Anesthesia provided for acute trauma case	12	14
Anesthesia provided for nontrauma case	3	3
Acute trauma airways managed	8	12
Trauma resuscitation leader	8	10

The percentages of performance of and exposure to SSTs by the enlisted personnel are summarized in Table 4. In a 1-month training period, all of the soldiers performed a minimum of 50% of their SSTs and were exposed to a maximum of 94% of their SSTs.

The FST primarily managed 42 patients during the training period. One unexpected death occurred as defined by a TRISS score greater than 50%. This case was evaluated by the standard BTGH trauma quality review committee and was found to be a nonpreventable death with no evidence of provider error or substandard care.

The results of the pre- and postsurveys are summarized in Table 5. Results of the surveys revealed that the confidence of the trainees to perform trauma care in the field, at their home Army trauma center, and at BTGH all increased ($P < 0.005$). This was true both for individuals and for the team as a unit.

CONCLUSIONS

The lack of peacetime trauma training by military trauma teams has been identified as a problem by the U.S. Government. To address this problem, a pilot project performed at a major urban Level 1 trauma center was conceived. To emphasize the importance of the team concept, an FST was chosen for the training.

During the 1-month period, the three general surgeons performed more than twice as many trauma

TABLE 4

Rate of Task Performance and Exposure to Supporting Soldier Tasks (SSTs)

Military occupational specialty (MOS)	SSTs Performed	SSTs Exposure
Licensed vocational nurses	82%	94%
OR technicians	69%	79%
Emergency medical technicians	57%	71%

TABLE 5

Results of Pre- and Posttest Confidence Surveys Based on a General Expectation of Success Model using a 5-Point Likert Scale[a]

Question	Pretest mean	Posttest mean	*F*	*P*
Trauma care at BTGH	3.84	4.68	9.11	0.005
Team trauma care at BTGH	3.47	4.53	12.86	0.001
Resuscitation at BTGH	3.58	4.63	10.81	0.002
Team resuscitation at BTGH	3.89	4.63	10.19	0.003
Trauma care at FST	3.42	4.58	13.00	0.001
Team trauma care at FST	3.32	4.47	13.96	0.001
Resuscitation at FST	3.47	4.58	11.18	0.002
Team resuscitation at FST	3.68	4.53	11.64	0.002
Team trauma care at BAMC	3.74	4.68	12.90	0.001

[a] The table shows changes in confidence in the individual and in the team. BAMC, Brooke Army Medical Center, which is the home trauma center of the FST.

cases as they performed in an entire year at their home station. This difference is particularly significant in light of the fact that these surgeons were stationed at one of the military's only major trauma centers and future trainees would be less likely to be routinely exposed to trauma patients. However, due to the required trauma training in residency and their peacetime elective surgery practices, general and orthopedic surgeons are probably the best prepared of the military trauma team members for a conflict. Therefore, it was important to document adequate training by the other members of the team.

The CRNAs documented extensive experience with the management of acute trauma patients. They managed critical airways, led resuscitations, and provided anesthesia for severely injured patients. These opportunities are rarely available for CRNAs at military medical centers.

Similarly, the enlisted personnel documented performance of up to 82% of their SSTs at a level consistent with BTGH standards. The training of enlisted medical personnel in military centers can be problematic. They are prevented from performing their military scope of practice by current hospital procedures. Additionally, due to a decreasing eligible population and civilian insurance programs, these personnel are frequently required to perform duties outside of their MOS that do not contribute to their combat medical readiness mission.

Objective criteria consisting of TRISS methodology revealed that the FST provided standard of care to the patients for which it was primarily responsible. Subjectively, team members reported increased levels of confidence with individual and team trauma capabilities in the field, at their home station, and at BTGH.

Important to the success of the mission was the opportunity for both individual and team training. FST members were able to orient to the hospital and practice their individual skills during the first week. The second and third weeks permitted the opportunity for further individual training as well as cross-training and some team training. During the final week, the FST functioned as a unit and provided total care to severely injured patients. The entire training process was carefully supervised and enriched by the input of BTGH experts. This plan resulted in a documented increased level of confidence in both individual team members and the entire team.

Urban Level 1 trauma centers provide an ideal environment for the training of military teams. These centers are characterized by large volumes of critically injured patients, many of whom suffer penetrating trauma. This creates scenarios that are not dissimilar from those seen in military mass casualty situations. In addition, urban centers are generally poorly funded and benefit from the presence of additional trained personnel. This training can be performed without negatively impacting surgical residency programs.

In summary, a 1-month training mission in an urban Level 1 trauma center resulted in an extensive training experience for individual FST members as well as the entire FST. This training appeared to prepare the FST well for potential future military conflicts. Further training of military personnel in urban trauma centers should be conducted.

APPENDIX

Example of Log Completed by FST Members Documenting the Completion of Supporting Soldier Tasks: Log for Emergency Medical Technicians

Codebook _____ **Date** _____

P=performed, A=assisted, O=observed and Time to complete procedure

Supporting Soldier Tasks	P	Time	A	Time	O
Pre-op Services					
(Triage)					
Assume command & control of triage					
Coordinate care with nursing OIC					
Identify hazardous patients (chem/bio/WP/ordinance)					
Establish triage categories					
Establish triage categories (per tactical situation)					
Prioritize resuscitation					
Prioritize surgery					
Prioritize resources (blood)					
Prioritize evacuation					
(Resuscitation)					
Lead resuscitation team					
Conduct ATLS primary survey					
Immobilize suspected spine injuries					
Assess airway					
Clear airway					
OP/NP airway					
OT/NT Intubation					
Cricothyroidotomy					
Assess ventilation					
Assess acute inhalation injury					
Mouth ventilation					
Mouth ventilation					
Bag ventilation					
Seal open chest wound					
Identification of pneumo/hemo thorax					
Needle decompression thoracentesis					
Chest tube thoracostomy					
Pericardiocentesis					
Manage chest tube drainage system					
Recognize pulmonary blast injury					
Differentiate shock etiologies					
Determine class of hemorrhagic shock					
Start large bore IV					
Use of Level I Infusor					
Perform fluid resuscitation					
Monitor blood transfusions					
Use tourniquet					
Assess neurologic status (Glascow coma scale)					
Recognize signs of epidural/subdural hematoma					
Conduct ATLS secondary survey					
Immobilize long bone fractures					
Immobilize unstable pelvic fracture					
Identify suspected major vascular injuries					
Identify suspected compartment syndromes					
Saline dress white phosphorus wounds					
Establish degree and percent body burns					
Dress burn wounds					
Treat cold injuries					
Treat hypothermia					
Identify and dress ocular injuries					
Acute pain control					
Assess and treat pain					

Codebook _____ **Date** _____

P=performed, A=assisted, O=observed and Time to complete procedure

Supporting Soldier Tasks	P	Time	A	Time	O
Pre-op Services (Resuscitation)					
Perform a patient care handwash					
Measure and record patients respirations					
Measure and record patients pulse					
Measure and record patients blood pressure					
Measure and record patients temperature					
Establish and maintain a sterile field					
Change a sterile dressing					
Perform wound irrigation					
Insert an oral pharyngeal airway					
Ventilate patient with a bag-valve-mask device					
Set up an oxygen tank					
administer oxygen therapy using a face mask or nasal prongs					
Perform oral and nasotracheal suctioning of a patient					
Obtain a blood specimen using a vacutainer					
Initiate an intravenous infusion					
Manage a patient with an intravenous infusion					
Initiate treatment for hypovolemic shock					
Irrigate an obstructed ear					
Apply restraining devices to patients					
Assemble needle and syringe and draw medications					
Administer an injection (IM, sub-q and ID)					
Administer blood					
Administer oral medications					
Administer medications by IV piggyback					
Obtain an electrocardiogram					
Maintain an indwelling urinary catheter					
Provide nursing care for a patient in a cast					
Insert a urinary catheter					
Provide special skin care					
Administer topical medication					
Administer rectal or vaginal medications					
Administer medicated eye drops or ointments					
Perform tracheotomy suctioning					
Perform tracheotomy care					
Post-op Services					
Coordinate care with team					
Provide nursing postoperative care					
Nursing care of postoperative ventilation					
Nursing care of spine injuries					
Nursing care of closed head injury					
Nursing care of cardiac contusion					
Nursing care of pulmonary contusion/flail chest					
Nursing care of inhalation injury					
Nursing care of severe burn injury					
Nursing care of primary blast injury					
Nursing care of closed pelvic/femur fracture					
Nursing care of profound hypothermia					
Manage central IV lines					
Acute pain control in the ICU patient					
General					
Document assessment and care					
Document emotional support to trauma patients					

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