



JOINT TRAUMA SYSTEM

JANUARY 2012

DEVELOPMENT, CONCEPTUAL FRAMEWORK, AND OPTIMAL ELEMENTS



AMERICAN COLLEGE OF SURGEONS

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COMMITTEE
ON TRAUMA





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EDITED BY:

Col Jeffrey Bailey, Director, Joint Trauma System
Ms. Mary Ann Spott, Deputy Director, Joint Trauma System
Col George P. Costanzo, Division Director, Performance Improvement, Joint Trauma System
CAPT James Dunne, Trauma Consultant, U.S. Navy
Col Warren Dorlac, Trauma Consultant, U.S. Air Force
Col Brian Eastridge, Trauma Consultant, U.S. Army

U.S. Army Institute of Surgical Research
3698 Chambers Pass
Fort Sam Houston, TX 78234-6315

In collaboration with the American College of Surgeons Committee on Trauma

PREFERRED CITATION: Bailey, J., Spott, M. A., Costanzo, G. P., Dunne, J.R., Dorlac, W., & Eastridge, B. *Joint Trauma System: Development, Conceptual Framework, and Optimal Elements, U.S. Department of Defense, U.S. Army Institute for Surgical Research, 2012.*

SECTION CONTRIBUTORS

Many sections of this document were prepared by the Joint Trauma System Leadership. Acknowledgement is given to the following individuals for their contribution to specific document sections and special assistance in preparation of the document.

Col Jeff Bailey

Disaster Preparedness

Col Greg Beilman and LtCol Alan Murdock

System Coordination and Patient Flow

Rose Bolenbaucher and Kathleen Martin

System-Wide Evaluation and Quality Assurance

Capt (ret) Frank Butler

Emergency Medical Services

Capt James Dunne

Definitive Care Facilities

Col Brian Eastridge

System Leadership
Education

Col Steve Flaherty

Indicators as a Tool for System Assessment

Col (ret) John Holcomb

Research

Col (ret) Don Jenkins

Coalition Building and Community Support

Capt Eric Kuncir

Injury Epidemiology

Maj Julio Lairet and Col Warren Dorlac

Aeromedical Evacuation Continuum

Dr. Steve Scott

Rehabilitation

Mary Ann Spott

Trauma Management Information Systems

AMERICAN COLLEGE OF SURGEONS CONTRIBUTORS

Michael F. Rotondo, MD, FACS

Chair, Committee on Trauma
American College of Surgeons
Secretary Treasurer, The Halsted Society
Professor and Chair, Department of Surgery
East Carolina University
Chief of Surgery, Director
Center of Excellence for Trauma
and Surgical Critical Care
Vidant Medical Center, Vidant Health

Robert J. Winchell, MD, FACS

Chair, Trauma Systems Evaluation
and Planning Committee
American College of Surgeons Committee on Trauma
Head, Division of Trauma and Burn Surgery
Maine Medical Center

Nels Sanddal, PhD, REMT

Manager, Trauma Systems and Trauma
Center Verification Programs
American College of Surgeons

Jane W. Ball, RN, DrPH

Consultant to the American College of Surgeons
Trauma Systems Evaluation and Planning Committee

Holly Michaels

Program Administrator, Trauma Systems Consultation
American College of Surgeons

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Preamble

The earliest organized civilian systems of trauma care had two components:

- ⊙ A concentration of services at acute care centers dedicated to the care of injured patients; and
- ⊙ Prehospital bypass such that severely injured patients were transported to trauma centers, not to the closest facility.

The initial focus on transport and definitive care facilities by these civilian trauma systems, although relatively simple, was associated with a significant reduction in preventable deaths and injury-related mortality within the region served. These trauma systems typically served population-dense urban areas such that the designation of relatively few Level I or II trauma centers was sufficient to address local needs. With an increasing recognition of the burden of injury associated with trauma outside of major metropolitan areas, including suburban and rural environments, it became evident that this exclusive approach to trauma center designation was inadequate. To better serve the needs of the entire population, trauma systems with an inclusive configuration were implemented. These trauma systems, in which all acute care facilities participate to the extent that their resources allow, served two purposes:

- ⊙ They provided all acute care facilities with a means to assess and stabilize the conditions of patients before transport to Level I or II trauma centers if indicated.
- ⊙ They allowed for less severely injured patients to be cared for within their community.

Recent evidence suggests that inclusive systems of trauma care are associated with a reduction in injury-related mortality within a region compared with exclusive systems.

Spurred by the events of September 11, 2001, and subsequent combat operations in Iraq and Afghanistan, a group of military clinicians recognized the need for a more structured approach to a system of trauma care for soldiers wounded in combat. In 2005, U.S. Central Command (CENTCOM) implemented an inclusive system of trauma care in support of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). This system

integrated care from point of injury through Level IV care. Subsequently, the system evolved to include Level V and Veterans Affairs (VA) facilities.

By necessity an ad hoc Joint Trauma System (JTS) was established at the U.S. Army Institute of Surgical Research (USAISR). Since that time, multiple investigators, including COL Brian Eastridge, COL John Kragh, and others, using data from the Department of Defense Trauma Registry, have demonstrated that this system has improved the process of care, minimized practice variability, and decreased morbidity and mortality in the U.S. CENTCOM theater of operations. The JTS became an official program of record under the USAISR within the U.S. Department of Defense (DoD) in 2010.

Because regional combatant command (COCOM) trauma systems are largely contingency based, they will expand, shrink or disappear depending on the political, strategic, operational, or tactical situations within a given COCOM at a given time.

Trauma care within the DoD is a continuous and enduring mission in peacetime or wartime. Even in peacetime operations, the utility of a trauma system could be manifested through efforts to optimize injury care in the military garrison environment, such as a training or off-duty injury. In parallel, trauma care is continuously improving both in the civilian and military realms.

The DoD requires a fulltime doctrinal Joint Trauma System that keeps pace with or sets the pace for new standards of improved trauma care with its civilian counterparts, specifically the American College of Surgeons Committee of Trauma (ACS-COT).

The Joint Trauma System may also expand/contract based on political, strategic, and operational needs of the President, the Secretary of Defense, and the COCOMS, but it should never disappear. It should be the enduring organization in the DoD that promotes improved trauma care to U.S. wounded warriors and other DoD eligible trauma victims. It should also exist as the chief organization for consultation on the care of the injured for the Services, COCOMS and entire DoD, to include its senior leadership. The JTS should be optimally resourced to completely fulfill this mission, to include human resources, information technology (IT), equipment, physical space, and others as needed.

The organized system of trauma care is more than definitive care facilities and a means to transport patients. The system must be grounded in doctrine, with policies and procedures to ensure the system continues to meet regional needs. Thus,

there must be a means to ensure adequate funds and personnel to support systems operations, continuing quality improvement, and injury surveillance to identify emergent new threats. As the trauma system's role in reducing mortality and reintegrating the injured back into the military or civilian society is increasingly understood, the trauma system's expanded role in postacute care and rehabilitation continues to be recognized.

NOTE: The Joint Trauma System uses Levels IV and V as the highest levels of definitive trauma care while the American College of Surgeons Committee on Trauma uses Level I as the highest level of definitive trauma care.

Vision and Mission

U.S. CENTCOM Joint Theater Trauma System (JTTS), the Ad Hoc Joint Trauma System (JTS) and the Department of Defense Trauma Registry (DoDTR) Process

The vision for the military trauma system was developed on the premise that every soldier, marine, sailor, and airman injured on the battlefield or in the theater of operations has the optimal chance for survival and maximal potential for functional recovery.

The Joint Theater Trauma System mission provides for the right care to the right casualty at the right location and right time. The development of a trauma registry supports the system needs, such as performance improvement and research to reduce morbidity and mortality.

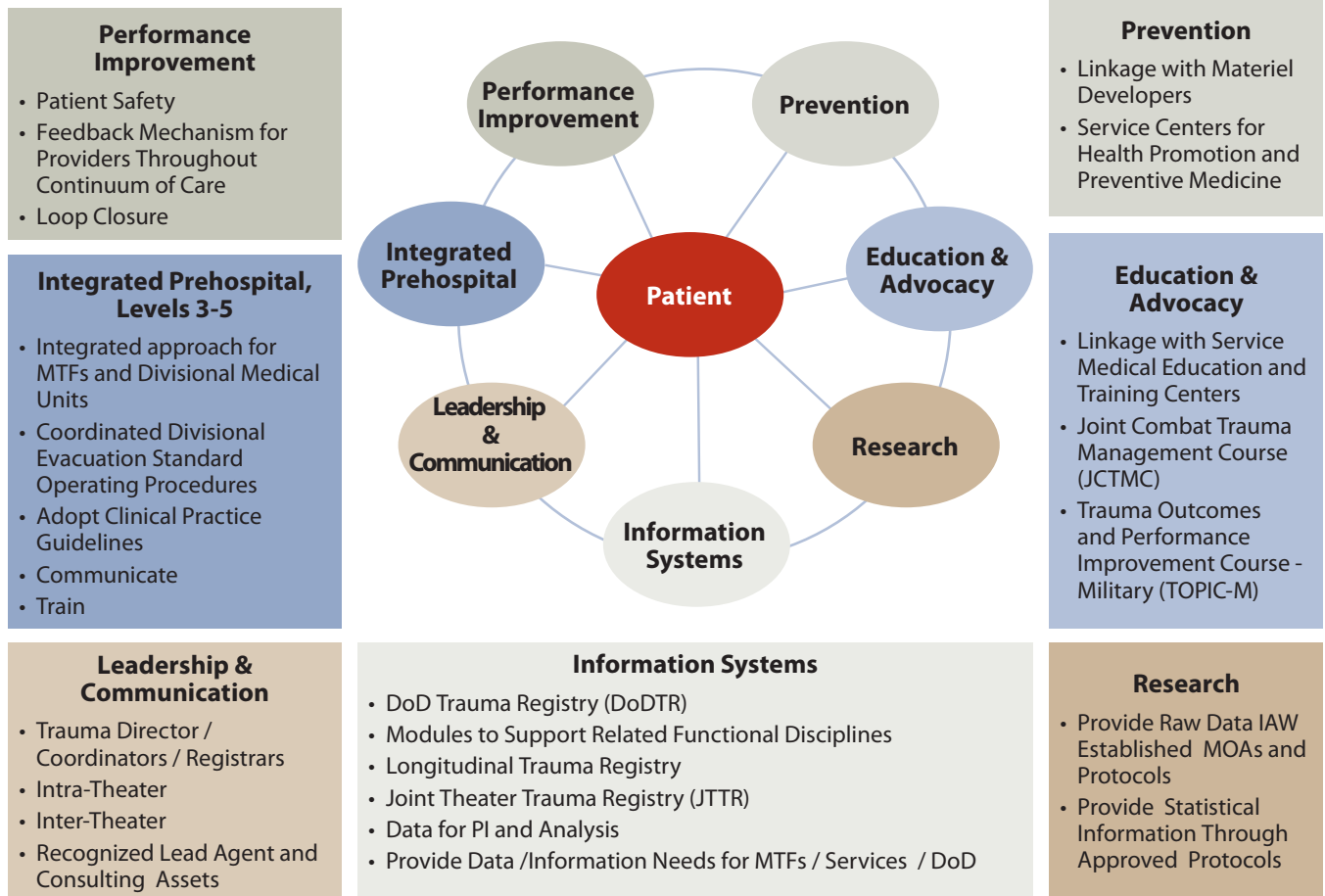
The mission of the Joint Trauma System is to improve trauma care delivery and patient outcomes across the continuum of care utilizing continuous performance improvement (PI) and evidence-based medicine driven by the concurrent collection and analysis of data maintained in the Joint Theater Trauma Registry, renamed the Department of Defense Trauma Registry (DoDTR) in 2011. The DoDTR mission elements include the following:

- ⊙ Establish and maintain a trauma registry to capture data and provide information on care and outcomes of military and civilian trauma patients.
- ⊙ Provide the DoD and other authorized interests with timely and relevant information about care and outcomes of military and civilian injuries.
- ⊙ Create a research strategy that supports reduction of morbidity and mortality in military and civilian trauma patients.
- ⊙ Establish and maintain a trauma outcomes database to analyze and evaluate clinical decision-making and measure subsequent outcomes for improving treatment modalities.
- ⊙ Provide activities of each of the Services with full and complete access to data in the DoDTR.
- ⊙ Provide a database that can generate reports for authorized government agencies.
- ⊙ Provide a database that can be queried for research studies after appropriate Institutional Review Board (IRB) approval.

See Figure 1, JTS Components Across Continuum of Care illustrates the interdependence of the Joint Trauma System components, which include leadership and communication, integrated prehospital levels, performance improvement, prevention, education and advocacy, research, and information systems.

FIGURE 1, JTS Components Across Continuum of Care

R4 - "Right Patient , Right Place, Right Time, Right Care"



Historical Perspective

In 1996 the U.S. General Accounting Office (GAO) report was intended to address shortfalls identified from Operation Desert Storm, including:

“...shortcomings in DoD’s ability to provide adequate, timely medical support during contingencies and problems with the planning and execution of these efforts. The Joint Staff also identified problems with the current design of DoD’s wartime medical system. In response to these problems, DoD and the Services embarked on initiatives to correct shortfalls in wartime medical capabilities and improve medical readiness”

“Health Affairs convened panels of both military and civilian experts to assess medical capability shortfalls in nine functional areas: planning; requirements, capabilities, and assessment; command, control, communications, computers, and information management; logistics; medical evacuation; personnel; training; blood supply; and readiness oversight”

“DoD is also trying to forecast the wartime medical demands in the year 2020 and design a military health services system (MHSS) that will be responsive to those demands (known as the MHSS 2020 Project)”

The Combat Trauma Surgery Committee, chartered under the Defense Medical Readiness and Training Institute (DMRTI), was gathered in 1996 to identify minimal essential task lists and to develop a joint Emergency War Surgery Course and a trauma registry/database.

2002–2003

In 2002 the Joint Theater Trauma Registry (JTTR) was approved by MG Kevin Kiley as a demonstration project. Limited data collection began at Landstuhl Regional Medical Center (LRMC), and the 3rd U.S. Army Medical Command (MEDCOM) supported data collection in-theater. On December 12, 2003, Ms. Ellen Embry, Assistant Secretary of Defense for Health Affairs (HA), approved the JTTR concept.

2004

In 2004, LTC Brian Eastridge was moved from his assignment as Chief of Surgery in Mosul, Iraq to Baghdad to become the first JTTS deployed Theater Trauma Medical Director. Activities also beginning at this time included data entry at the Center for Army Medical Department (AMEDD) Strategic Studies (CASS), approval of a JTTR Integrated Concept Team, and an accelerated abstraction effort. This included scanning of Level III inpatient charts by the Patient Administration Systems and Biostatistics Activity (PASBA).

Shortly thereafter Version 1.0 (a homegrown web-enabled JTTR) was released. On December 22, 2004 an HA letter identified the DoD requirement to use standardized trauma admission forms (theater trauma records) to include the Trauma Patient Care Physician History and Physical form and the Trauma Nursing Record form. The JTTR was intended to receive and store this data. This HA letter documented an expectation that JTTR data elements would be collected electronically through the Composite Health Care System (CHCS) II/IIT by calendar year (CY) 2008. The Army Surgeon General approved transition of the JTTR from demonstration to operations at this time.

The first fully tasked JTTS team consisting of Col Donald Jenkins and six nurses were sent to theater to replace COL Eastridge as the theater trauma director and begin collection of trauma registry data.

A Configuration Control Board (CCB) was developed with representation from all Services, and it met quarterly to oversee the JTTR. Additionally, a Configuration Control Board – Integrated Product Team (CCB-IPT) met monthly to track the progress of all IT changes.

2005

In a 2005 Army Medical Department Center and School (AMEDD C&S) Decision Memorandum, the JTTR authority/responsibility was assigned to the Commander of the USAISR, COL John B. Holcomb.

2006

As the program developed, Ms. Mary Ann Spott, a national expert in trauma systems and trauma registries, was consulted to perform an external assessment of the JTTR database and processes. Numerous software and process issues for improvement were identified, and an update to the original homegrown software was recommended.

COL Stephen Flaherty, as the next JTTS director, began collection of performance improvement (PI) indicators on Microsoft® Excel® spreadsheets to capture clinical outcomes.

In October 2006, the Continental United States (CONUS) Joint Trauma System was formally stood up with the hiring of Ms. Spott as the first JTS Director, Mr. Dominique Greydanus as Administrative Officer, and Ms. Janis Rosin as Administrative Assistant. The Data Abstraction Branch was officially moved as a program from CASS to the USAISR, and the IT staff was physically moved from the U.S. Army Medical Information Technology Center (USAMITC) to the USAISR.

2007

During 2006 and 2007, the next version of the JTTR, JTTRv3, was developed. This new version eliminated the PI Excel spreadsheets in Iraq and Afghanistan, the LRMC Microsoft® Access® database, and the homegrown JTTR 1.1 in San Antonio, TX. Ongoing testing within the theater precluded an earlier release. During a U.S. CENTCOM meeting held in Kuwait in July 2007, Ms. Spott successfully sent the very first JTTRv3 transmission from Camp Arifjan back to the JTTS in San Antonio (13 July 2007).

Additional JTS staff members were hired in San Antonio to perform specialized data abstraction and analysis. A new capability to analyze classified and non-classified data was developed by the construction of a secure secret Internet protocol router (SIPR) room at the USAISR. Ten new JTS positions were created and hired in July 2007. A medical evacuation (MEDEVAC) analysis project was authorized by Mr. William Thresher, Chief of Staff (CoS), to study time from injury to treatment of all MEDEVAC patients and evaluate outcomes. This required the hiring of a team of three staff members in June 2007.

Col Donald Jenkins was appointed as the military trauma director at the USAISR on 1 October 2007.

In July 2007, under the direction of COL Steven Flaherty, Col Warren Dorlac and Ms. Kathleen Martin, LRMC was granted the first outside CONUS Level II ACS verification as a trauma center.

Ms. Rose Bolenbaucher, a trauma nurse coordinator (TNC), filled a newly created position as the JTS Performance Improvement Coordinator in 2007.

2008

The JTTR was discussed at the Theater Functional Work Group (TFWG) meeting in January 2008 and deemed as a program of record under Defense Health Information Management System (DHIMS); formerly known as Theater Medical Information Program - Joint (TMIP-J). This formalized the Army as the lead JTTR developer and Health Affairs (HA) as the technical manager.

The Committee on Tactical Combat Casualty Care (TCCC) was officially integrated into the JTTS on 28 March 2008. Dr. Frank Butler, TCCC Chairman, Dr. Stephen Giebner, TCCC Vice Chairman/Developmental Editor, and Ms. Danielle Davis, a Senior Administrative Assistant, were added to the JTTS organization.

Col Donald Jenkins resigned from the military trauma director position at the USAISR on 30 April 2008, and he was replaced by COL Brian Eastridge on 1 May 2008.

COL John Holcomb (who had also been the Trauma Consultant to the Army Surgeon General) retired as the Commander of the USAISR on 22 July 2008. He was replaced by COL Lorne Blackbourne as the USAISR Commander and COL Stephen Flaherty as the Trauma Consultant.

Under CAPT Joseph Rappold, JTTS In-Theater Trauma Medical Director, the deployed JTTS team moved their base of operations from Camp Victory, Iraq to the Multi-National Corps - Iraq (MNC-I) Surgeon's office in the summer of 2008.

MG Bruce Green (AF) appointed Col George P. Costanzo (AF) to the JTS staff on 1 October 2008 as the JTS Deputy Director, Clinical Operations.

In October 2008, CAPT Joseph Rappold, JTTS In-Theater Trauma Medical Director, identified a potential site for a second JTTS in-theater team office at Bagram Air Base, Afghanistan in anticipation of increasing war operations in OEF. During this time CAPT Rappold standardized the Clinical Practice Guidelines (CPG) into a common format. The Camp Victory Headquarters was kept in operation and the leadership split time between theaters.

2009

In February 2009 COL Gregory Beilman officially opened the Bagram JTTS office. He further changed the locations of TNC placement to have more coverage in OEF with placement of the first U.S. TNC to be based in Kandahar for spring 2009, and he negotiated a temporary TNC position in Bastion.

Col Warren Dorlac arrived in spring 2009 and began travelling throughout both theaters with MAJ Kimberlie Bieber in an effort to begin data capture at several Level II sites (mostly Afghanistan) using a new Level II Access® database which mirrored the JTTR. Data were sent to the JTS in San Antonio. Additionally, the new TNC in Bastion was identified and arrived in-theater in mid June.

In April 2009 Secretary of Defense Robert Gates directed U.S. forces to decrease MEDEVAC times to less than one hour (from point of injury to surgical care) across the theater. A request for forces was submitted requesting additional JTTS members to support the expansion of MEDEVAC data collection and MEDEVAC PI. In the meantime, MAJ Bieber began collection of MEDEVAC data. These data were used in part to support weekly briefings to the Secretary of Defense highlighting MEDEVAC transports and improvements in transport times following injury.

In August 2009 a new CONUS JTS Noncommissioned Officer in Charge (NCOIC) position was created and filled by TSgt Shane Armstrong (AF) to enhance JTS operations in San Antonio. A new Education Branch was instituted in the organization for all JTS and JTTR training needs.

In November 2009 CAPT James Dunne became the new JTTS In-Theater Trauma Medical Director.

2010

On 13 January 2010, U.S. CENTCOM published the modification to the Joint Manning Document (JMD) with the new positions that were requested to augment the in-theater team with MEDEVAC staff and JTTS owned noncommissioned officer (NCO) staff. The modification listed one Army nurse, one Army E-7, three MEDEVAC positions, and one enlisted Air Force E-4 position. By May, one off-cycle MEDEVAC nurse was dedicated to the OEF portion of the MEDEVAC project. Also at this time, Captain Lisa Compton of the Canadian Force Health Services Group Headquarters was selected as the JTTS Deputy Nurse

Manager as a proof of concept. This trial position was instituted as a North Atlantic Treaty Organization (NATO) leadership support position for the JTTS.

In a memo received 28 April 2010, LTG Schoomaker and MG Gilman signed a 25 March 2010 Memorandum formally placing the JTS organizationally within the USAISR as a directorate.

In 2010 COL Brian Eastridge further institutionalized the Joint Trauma System (JTS) concept. The JTS organization would be a 'consulting' agency to each of the COCOMS. The intent being that whenever a war, natural disaster needing trauma oversight, or other event occurred, the COCOM would institute a JTTS team that would be trained and consult with the overarching JTS.

In April 2010 COL Susanne Clarke, Army Office of the Surgeon General, met with the JTS leadership and assisted in establishing a nurse leadership position, as well as a post-RAND Fellowship position, at the JTS in San Antonio. In August 2010 MAJ Keith Palm (post-RAND Fellow) came on board. COL Debra Spencer, one of the first TNCs to deploy with Col Jenkin's team in 2004, was selected to begin work with the JTS in September.

MAJ Robert Mabry was assigned to the JTS as the Branch Chief for Prehospital Care and the Prehospital Trauma Registry (PHTR).

On 1 July 2010 COL Eastridge officially transferred the director's position to Col Costanzo and became Director Emeritus. The staff was reorganized to accommodate the augmentation of new leadership positions.

Col George Costanzo and CAPT (ret) Frank Butler briefed the Defense Health Board (DHB) on the importance of the JTTS and the contributions to military medicine on 14 July 2010. The DHB fully supported the concepts and value of the JTTS and recommended support for the 12-16 Program Objective Memorandum (POM) submission to the Force Health Protection and Readiness (FHP&R) Council.

On 15 July 2010 the second TNC from Bagram was sent to assist in standing up JTTS operations at Dwyer, the newest Level III medical treatment facility (MTF).

Operation Iraqi Freedom officially ended 31 August 2010 and Operation New Dawn began on 1 September 2010.

The U.S. CENTCOM Joint Manning Document (JMD) was approved, and in September 2010 the first team to be placed against the JMD was established. This included four MEDEVAC positions (two nurses and two NCOs).

Documents for POM (Program Objective Memorandum), which is the financial process for acquiring stable funding, were submitted for fiscal years (FY) 2012–2017. A meeting was held on 1 September 2010 with LTG (ret) Peach Taylor at FHP&R on the POM process. LtCol Todd Rasmussen presented the briefing with Col George Costanzo, LTC Anthony Cooper, and Ms. Spott in attendance. LTG (ret) Peach Taylor supported the POM process and requested further analysis and justification of financials.

LTC Robert Mabry was identified as a prehospital consultant and deployed to theater in December 2010 to assist with MEDEVAC and prehospital documentation issues. The outcomes of that 90-day deployment resulted in the establishment of:

- ⊙ Higher training standards for medics which will bring them to the same standard as the civilian paramedic,
- ⊙ Regional MEDEVAC working groups, and
- ⊙ Critical care treatment protocols and documentation practices.

Under the direction of LtCol Ray Fang and Ms. Kathleen Martin, LRMC received Level 1 trauma center verification notice on 21 July 2011 from the ACS. LRMC is the only trauma center verified by the ACS outside CONUS.

2011

On 1 August 2011 word was received that JTS officially received POM funding beginning in FY2013. Staff developed a Concept of Operations (CONOPS) plan as a requirement that would establish the official way the organization operates as well as the identification of core staff.

The webJTTR was formally released to the trauma system for use on 7 October 2011. Level IV and V sites were all successfully converted to the new system after several months of training, Deputy Chief of Operations (DCO) sessions, and sites entering test records into a proxy server. In addition, the store and forward version was sent to the Level III sites, and all legacy data was converted to the new format.

On 3–12 October 2011 Col Jeffrey Bailey took a U.S. CENTCOM theater trauma system review team comprised of Michael Rotondo, MD, FACS; Thomas Scalea, MD, FACS; LtCol Ann Rizzo; and Ms. Kathleen Martin to OEF and LRMC to perform an evaluation of the theater trauma system. The team's observations and recommendations were submitted

in a formal report to the U.S. CENTCOM surgeon general (SG) in October 2011. Dr. Rotondo was invited by the DHB Trauma and Injury Subcommittee Chair, Col (ret) Donald Jenkins to brief the contents of this report. Dr. Rotondo made this presentation at the DHB and Tactical Combat Casualty Care (TCCC) meetings on 14–15 November 2011.

The JTS began discussing the formal change in the name of the JTTR to the DoDTR to more accurately reflect the true nature of its contents. This includes trauma patients admitted to the DoD MTFs worldwide regardless of peacetime or wartime conditions.

Soon after implementation of the webJTTR, LRMC began to experience difficulties with its use and subsequently made a unilateral decision to pull out of the DoDTR on 1 December 2011. An USAISR sponsored team including the JTS Director, JTS Deputy Director, a technical programmer, and an informatics nurse traveled to LRMC to identify the issues. It was determined quickly during the visit that LRMC information technology and systems, such as the use of wireless applications and a contingency local terminal server, significantly degraded their ability to interact with the web-based registry.

The visit resulted in important lessons learned, both locally and for the system. With some education, business process changes, and command support for local information technology and systems augmentation, LRMC returned to using the DoDTR on 9 December 2011 without apparent incident. This particular event highlighted the current fragility of the DoD trauma system and reinforced the need to establish JTS, by legislative authority, as the lead agency for trauma care in the DoD.

Col Jeffrey Bailey assumed the directorship of the JTS from Col Costanzo on 9 December 2011.

See Figure 2, Joint Trauma System Directorate, which illustrates the JTS organizational hierarchy.

See Figure 3, Tables Illustrating Data Requests *by Quarter*, which describe the requests for data that the JTS received and processed for performance improvement, Joint Trauma Analysis Prevention in Combats (JTAPIC), and others from 2010 through 2011

FIGURE 2, Joint Trauma System Directorate

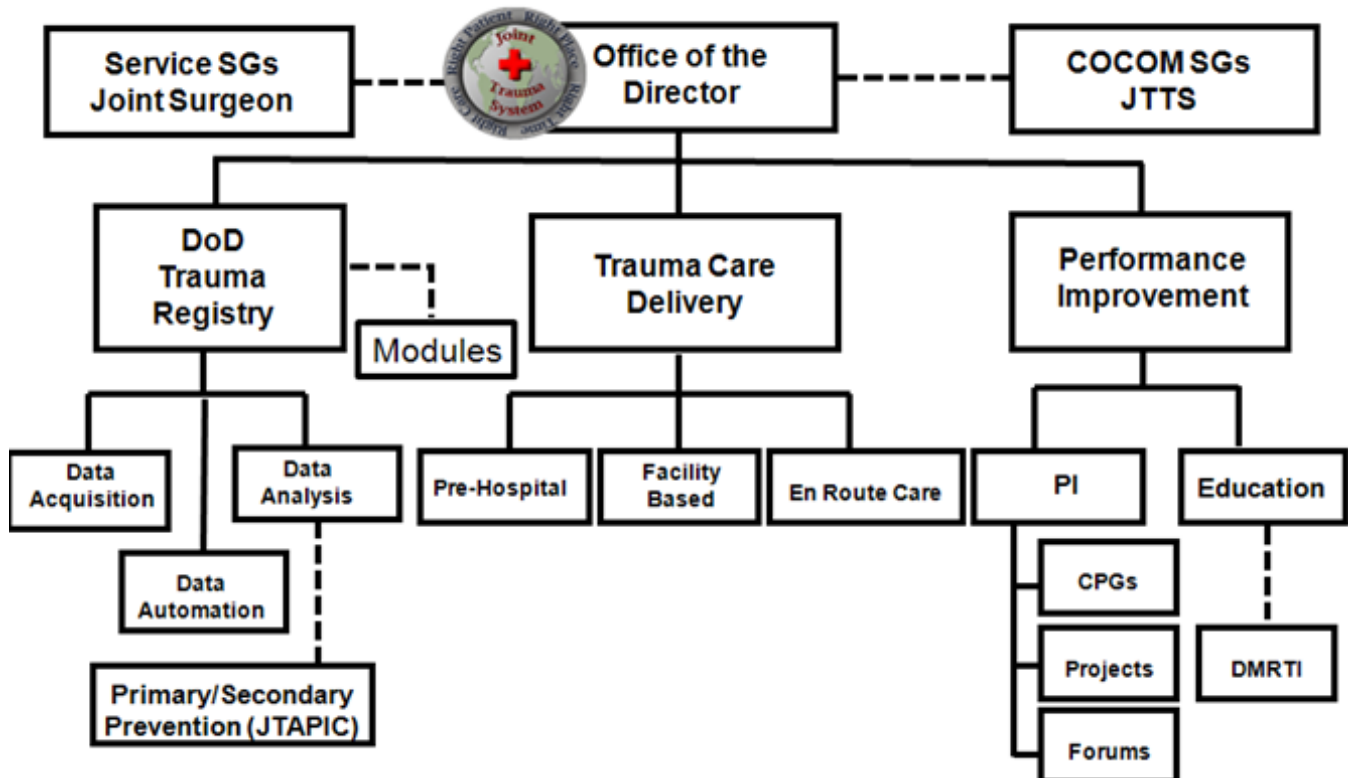
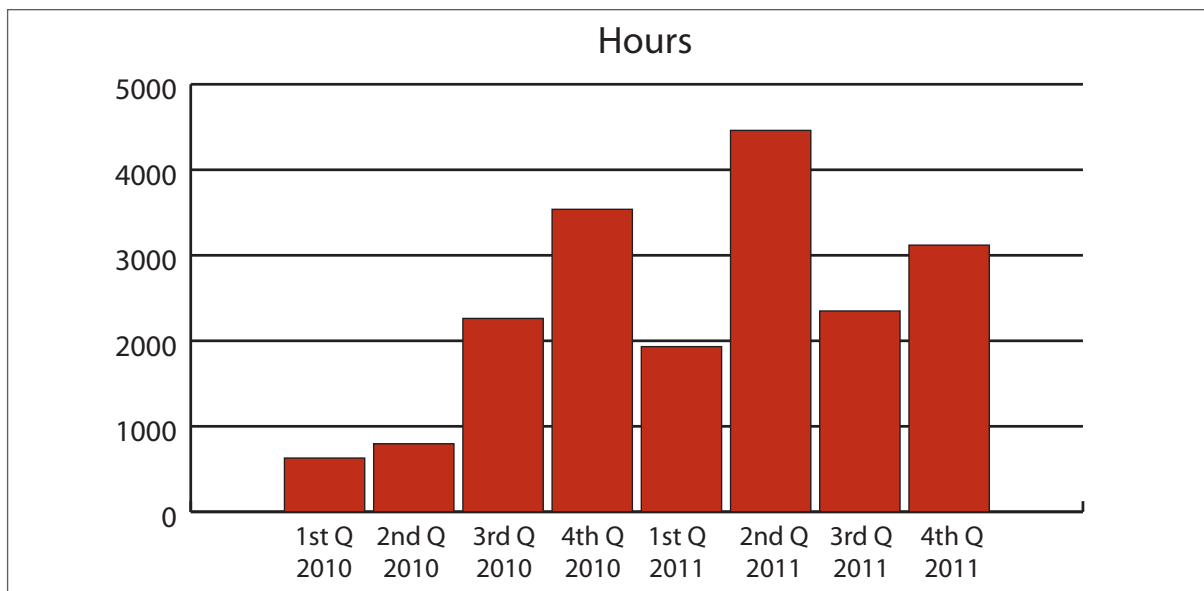
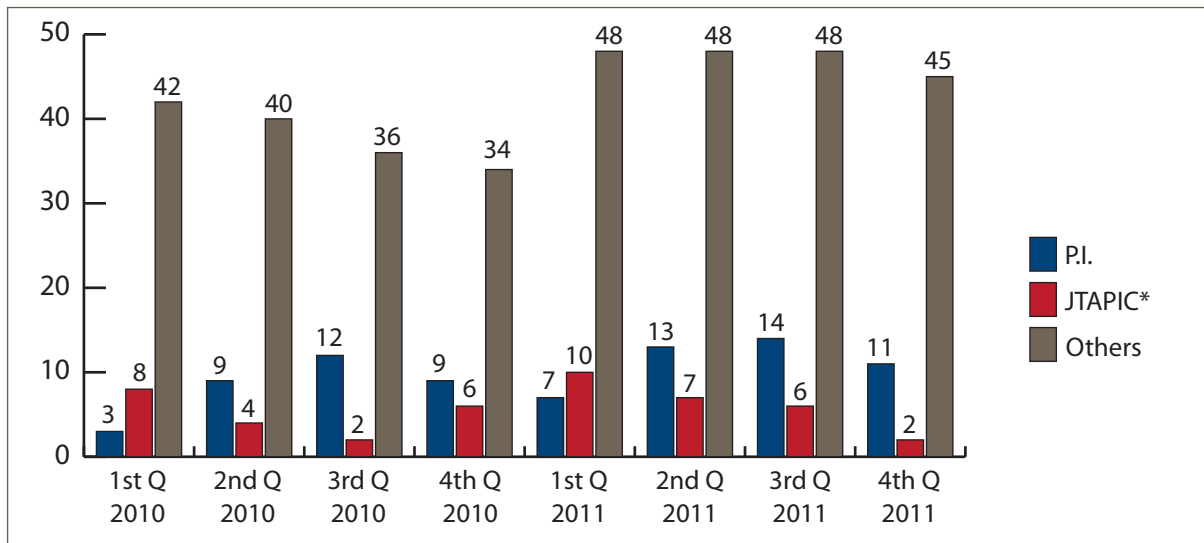


Figure 3, Tables Illustrating Data Requests by Quarter

Quarter/FY	P.I.	JTAPIC*	Others	Total	Hours
4th Q 2011	11	2	45	58	3,119
3rd Q 2011	14	6	48	68	2,349
2nd Q 2011	13	7	48	68	4,461
1st Q 2011	7	10	48	65	1,932
4th Q 2010	9	6	34	49	3,538
3rd Q 2010	12	2	36	50	2,262
2nd Q 2010	9	4	40	53	796
1st Q 2010	3	8	42	53	629



Public Health Model

For the Joint Trauma System (JTS), the patient is the central focus of all activities as they relate to the system.

The traditional public health system provides a conceptual framework for trauma system development, management, and ongoing performance improvement. The three core functions of public health services are assessment, policy development, and assurance. These public health core functions have been adapted to military health as follows:

⊙ **Assessment** is the regular and systematic collection and analysis of trauma data from a variety of sources to determine the status and cause of a problem and to identify potential opportunities for interventions. The Department of Defense Trauma Registry (DoDTR) is the tri-service solution for capture of all trauma-related data meeting the inclusion criteria. These criteria include patients who are admitted to the medical treatment facility (MTF) as an inpatient as a result of their injuries. Only patients who incur an injury with an International Classification of Diseases, 9th edition, Clinical Modification (ICD-9-CM) diagnosis code between 800 and 959.99 are included in the DoDTR. Also included are patients who incur near-drowning/drowning if related to an injury and smoke inhalation injuries.

The collection and analysis of trauma data occurs in peacetime as well as wartime across all Services and across the globe.

⊙ **Policy Development** uses the results of the assessment in an organized manner to establish comprehensive policies intended to improve military health. The JTS has used the DoDTR data to develop Clinical Practice Guidelines (CPGs) and assists in developing each Service's policy decisions. The optimal policy development includes development of the military trauma system plan focused on prevention of injury, development of doctrine and strategic tri-service communication.

⊙ **Assurance**, agreed-on goals to improve military health, is achieved by providing trauma services directly, by requiring trauma services through regulation, or by encouraging the actions of others (public or

private). While there is no hospital regulatory authority, use of the CPGs and weekly patient performance improvement initiatives have guided optimal care for the combat casualties. The optimal approach to assurance is through military specific verification of military trauma facilities to evaluate sustained adherence to triage, transport and clinical care of the combat casualty.

The core functions and essential services of the public health trauma system integrated with the military trauma system are illustrated in Figure 4, Core Functions and Essential Services. To make the core function concepts more clear, ten essential services that are key to providing military health are as follows:

1. Monitor health status to identify combat casualty health problems through description of injury patterns, morbidity and mortality.
2. Diagnose and investigate health problems and health hazards in the deployed setting.
3. Inform, educate, and empower the tri-service COCOM leadership and clinical providers regarding combat casualty health issues.
4. Mobilize tri-service leadership partners to identify and solve combat casualty specific health issues related to preventing devastating injury and enhancing patient safety, evidence-based medicine, transport, and rehabilitation.
5. Develop policies and CPGs that support individual and military community health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to needed personal health services and ensure the provision of health care when otherwise unavailable.
8. Ensure a competent military health and personal health care workforce.
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
10. Conduct research to attain new insights and innovative solutions to health problems.

INJURY EPIDEMIOLOGY

Purpose and Rationale

Injury epidemiology is concerned with evaluation of the frequency, rates, and pattern of injury events in a population. Injury pattern refers to the occurrence of injury-related events by time, place, and personal characteristics (for example, demographic factors such as age, gender, rank, and race), behavior, and environmental exposures, including combat and non-combat environments. Thus, it provides a relatively simple form of risk-factor assessment.

The descriptive epidemiology of injury among the combat casualty environment (whole geographic area served) within a trauma system should be studied and reported. Injury epidemiology provides the data for military health action and becomes an important link between injury prevention and control and subsequent trauma system design and development. Within the trauma system, injury epidemiology has an integral role in describing the root causes of injury and identifying patterns of injury in both combat and non-combat circumstances. This can lead to the implementation of operational policy, health policy, and preventive programs. Knowledge of injury epidemiology enables the identification of priorities for directing better allocation of resources including the nature and distribution of injury prevention activities, financing of the system, and supporting COCOMs and health policy initiatives within DOD.

The epidemiology of injury is obtained by analyzing data from multiple sources. These sources might include vital statistics, medical treatment facility (MTF) administrative discharge databases, and data from emergency medical services (EMS), emergency departments (ED), Armed Forces Institute of Pathology (autopsies) and the Department of Defense Trauma Registry. Combat injury data, some of which may be classified, is essential to assess the burden of injury within a theater of operation. It is critical to assess type, severity and rate of injury accurately in order to determine resource requirements and assess effectiveness of the system.

To establish injury policy and develop an injury prevention and control plan, the Joint Trauma System, in conjunction with the COCOM or other military staff, should complete and keep current a risk assessment and gap analysis using all available data. These data allow for an assessment of whether injury and prevention and casualty mitigation programs are available, accessible, effective, and efficient. The two primary modes of prevention are predeployment training and personal protective equipment.

Part of injury epidemiology is ongoing injury surveillance. In the case of injury surveillance, the Joint Trauma System should provide routine and systematic data collection and use the data to complete injury analysis, interpretation of data, and dissemination of information. Military health officials and military trauma leaders should use injury surveillance data to describe and monitor injury events and emerging injury trends in their areas of responsibility (AOR) in order to identify trends and emerging threats that will call for a reassessment of priorities, tactics, and/or reallocation of resources. This analysis will also assist in the planning, implementation, and evaluation of interventions and programs, in consultation with COCOMS, to facilitate decisions regarding the lay down and resourcing of trauma-related medical assets.

Optimal Elements

1. There is a thorough description of the epidemiology of injury in the military trauma system using population-based data and clinical databases
 - a. There is a thorough description of the epidemiology of injury mortality in the military trauma system using population-based data.
 - b. There is a description of injuries within the military trauma system, including the distribution by geographic area, high-risk populations (pediatric, elderly, host nation, military coalition, and others), incidence, prevalence, mechanism, manner, intent, mortality, contributing factors, determinants, morbidity, injury severity, and patient distribution using any or all the following: vital statistics, ED data, prehospital data, MTF discharge data, medical examiner data, Department of Defense Trauma Registry, and other data sources. The description is updated at regular intervals.

NOTE: Injury severity should be determined through the consistent and system-wide application of one of the existing injury scoring methods, for example, Injury Severity Score (ISS).

- c. There is comparison of injury mortality using pertinent regional and historical data.
 - d. Tri-service collaboration exists among all components of the JTS to ensure complete injury risk assessments.
 - e. The JTS works with all available prehospital data to identify special at-risk populations.
2. Collected data are used to evaluate system performance and to develop policy.
 - a. Injury prevention and casualty mitigation programs use trauma management information system/DoDTR data to develop intervention strategies.
 3. All components of the Joint Trauma System are closely linked.
 - a. The JTS and the military health system have established linkages, including programs with an emphasis on population-based military health surveillance and evaluation for acute and chronic traumatic injury and injury prevention as well as injury prevention/mitigation in combat.
 - b. The JTS, in cooperation with the Services, other agencies and organizations, uses analytic tools to monitor the performance of population-based prevention and trauma care services.
 - c. The JTS, along with the Services and other partner organizations, prepares annual reports on the status on injury prevention and trauma care in the COCOM, regional, or local areas.
 - d. The trauma system management information system database/DoDTR is available for routine surveillance. There is a process for concurrent access to the appropriate databases (MTF, trauma, prehospital, medical examiner, and military health epidemiology) for the purpose of routine surveillance and monitoring of health status that occurs regularly and is a shared responsibility.

INDICATORS AS A TOOL FOR SYSTEM ASSESSMENT

Purpose and Rationale

In the absence of validated national benchmarks, or norms, the benchmarks, indicators and scoring (BIS) process included in the Health Resources and Services Administration’s Model Trauma System Planning and Evaluation document provides a tool for each trauma system to define its system-specific health status benchmarks and performance indicators and to use a variety of Service health and public health interventions to improve the Service’s health status. The tool also addresses reducing the burden of injury as a Service-wide public health problem, not strictly as a trauma patient care issue.

This BIS tool provides the instrument and process for a relatively objective military trauma system self-assessment. The BIS process allows for the use of military and the Department of Defense Trauma Registry data and assets to drive consensus responses to the BIS. It is essential that the BIS process be completed by a multidisciplinary tri-service military group, most often the equivalent of a trauma system advisory committee. The BIS process can help focus the discussion on various system strengths and weaknesses, can be used to set goals or benchmarks, and provides the opportunity to target often limited resources and energies to the areas identified as most critical during the consensus process. The BIS process is useful to develop a snapshot of any given system at a moment in time, which is of great importance in light of the continuous leadership and provider turnover turbulence in the military trauma system. However, its true usefulness is in repeated assessments that reveal progress toward achieving various benchmarks identified in the previous application of the BIS. This process further permits the military trauma system to refine goals to be attained before future reassessments using the tool.

Optimal Elements

1. Assurance to the military community that services necessary to achieve agreed-on goals are provided by encouraging actions of others (public or private), requiring action through doctrine, or providing services directly.
2. Development of a baseline military trauma system identifying areas with the greatest need for improvement and measuring progress towards the military trauma system development goals.
3. Development of key trauma care and outcome performance indicators at military medical treatment facilities in order to benchmark care and processes

STATUTORY AUTHORITY AND ADMINISTRATIVE RULES

Purpose and Rationale

Reducing morbidity and mortality due to injury is the measure of success of the Joint Trauma System. A key element to this success is having the doctrinal authority necessary to improve and enhance care of the injured through doctrine, implementing regulations and administrative action, including the ability to regularly update policies, procedures, and protocols in conjunction with the Services and DoD. In the context of the trauma system, doctrine means the policies, regulations, or administrative actions necessary to meet or exceed a prescribed set of standards of care. It also refers to the operating procedures necessary to continually improve the care of injured patients from injury prevention and control programs through postinjury rehabilitation. The ability to enforce policies, doctrine, and rules guides the care and treatment of injured patients throughout the continuum of care.

There must be sufficient doctrinal authority to establish the Joint Trauma System to plan, develop, maintain, and evaluate the trauma system throughout all phases of care in conjunction with the Services, COCOMs and DoD. In addition, it is essential that as the development of the trauma system progresses, included in the doctrinal mandate are provisions for collaboration, coordination, and integration with other Service and DoD entities also engaged in preventing injury, providing care, treatment, or surveillance activities related to the injured. A broad approach to policy development should include

- ⊙ the building of system infrastructure that can ensure enduring system oversight and future development, enforcement, and routine monitoring of system performance;
- ⊙ the updating of doctrine, regulations or rules, and policies and procedures; and
- ⊙ the establishment of evidenced-based practices across all phases of intervention.

The success of the system in reducing morbidity and mortality due to traumatic injury improves when all Service providers and system participants consistently comply with the rules, have the ability to evaluate performance in a confidential manner, and work together to improve and enhance the trauma system through defined policies.

Optimal Elements

1. Comprehensive doctrinal authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development.
 - a. The doctrinal authority states that all the trauma system components, prehospital, injury control, incident management, and planning documents work together for the effective implementation of the military trauma system (sustainable infrastructure is in place).
 - b. Administrative rules and regulations direct the development of operational policies and procedures at the MTF and system levels.
2. The Joint Trauma System in conjunction with the Services and DoD acts to protect the public welfare by enforcing various doctrine, rules, and regulations as they pertain to the Joint Trauma System.
 - a. Doctrine, policies, rules, and regulations are routinely reviewed and revised to continually strengthen and improve the trauma system.

SYSTEM LEADERSHIP

Purpose and Rationale

In addition to Joint Trauma System staff and consultants (for example, current and past in-theater trauma system medical directors), there are other significant leadership roles, such as medical planning staff, Surgeons General consultants, COCOM SGs, etc. essential to developing mature trauma systems. A broad constituency of trauma leaders from all Services includes medical treatment facility (MTF) trauma medical directors and trauma program managers, prehospital personnel, injury prevention advocates, and others. This broad group of trauma leaders works with the Joint Trauma System to inform and educate others about the trauma system, implements trauma prevention programs, and assists in trauma system evaluation and research to ensure that the right patient, right place, right time and right care goals are met. There is a strong role for the trauma system leadership in conveying trauma system messages, building communication pathways, building coalitions, and collaborating with relevant individuals and groups. The marketing communication component of trauma system development and maintenance begins with a consensus-built public information and education plan. The plan should emphasize the need for close collaboration between coalitions and constituency groups and increased public awareness of the Joint Trauma System. The plan should be part of the ongoing and regular assessment of the trauma system and be updated as frequently as necessary to meet the changing environment of the trauma system.

When there are challenges to providing the optimal care to combat casualties within the system, especially the combat environment, the leadership needs to effect change to produce the desired results within the framework of the COCOMs needs. Broad system improvements require the ability to identify challenges and resources and to make the recommendations to the COCOMs and others in authority to improve system performance. However, system evaluation is a shared responsibility among all Services. Although the leadership will have a key role in the acquisition and analysis of system performance data, the Joint Trauma System will share the responsibility of interpreting those data from a broad systems perspective to help determine the efficiency and effectiveness of the system in meeting its stated performance goals and benchmarks. All stakeholders have the responsibility of identifying

opportunities for system improvement and bringing them to the attention of the Joint Trauma System. Often, clinical care providers notice subtle changes in system performance long before they become apparent through more formal evaluation processes.

Perhaps the biggest challenge facing the Joint Trauma System is to synergize the diversity, complexity, and uniqueness of individuals and organizations into a finely tuned system for prevention of injury, casualty mitigation, and for the provision of quality care for injured patients in peacetime and wartime. To meet this challenge, leaders in all phases of trauma care must demonstrate a strong desire to work together to improve care provided to injured victims.

Optimal Elements

1. Trauma system leaders (Joint Trauma System, MTF personnel, and other stakeholders) use a process to establish, maintain, and constantly evaluate and improve a comprehensive trauma system in cooperation with medical, professional, governmental, and other citizen organizations. Collected data are used to evaluate system performance and to develop policies.
2. Trauma system leaders and the Joint Trauma System, including, multiagency advisory committee, regularly review system performance reports.
3. The Joint Trauma System informs and educates Services, regional and local constituencies, and policy makers to foster collaboration and cooperation for system enhancement and injury control.

TRAUMA NETWORK BUILDING

Purpose and Rationale

Trauma network building is a continuous process of cultivating and maintaining relationships with key stakeholders who are needed to collaborate on injury control and trauma system development. From the point of view of a system intended to manage casualties from a specific theater of operations or disaster site the key constituents include health professionals, trauma facility administrators at various echelons, field care providers, data experts, advocates, policy makers, and relevant commanders, including those responsible for patient evacuation and transportation resources. The coalition of key constituents comprises the trauma system's stakeholders. The involvement of these key constituents is important for the following:

- ⊙ Trauma system plan development
- ⊙ Regionalization and inter-Service cooperation that promotes collaboration rather than competition.
- ⊙ System integration
- ⊙ DoD and Service policy development: authorizing legislation and regulations
- ⊙ Financing initiatives
- ⊙ Disaster preparedness (especially the role played in civilian, peacetime settings)

The network should be effectively organized through the formation of standing multidisciplinary DoD and Service advisory groups to coordinate development and maintenance of the military trauma system plan, and to oversee implementation strategy and tactics. Information and education are needed by constituents to be effective partners in policy development for trauma system planning. Regular communication about the status of the trauma system helps these key partners to recognize needs and progress made with trauma system implementation.

One of the most effective ways to educate elected officials, policy makers and commanders is through an organized public information and education effort that may involve a media campaign about the burden of injury in the DoD and the need for trauma system development. Information and education are important to reduce the incidence of injury in all age groups and to demonstrate the value of an effective systematized response when a serious injury occurs.

Optimal Elements

1. The Joint Trauma System informs and educates commanders and DoD leadership, as well as the Services, regional and local constituencies, and policy makers to foster collaboration and cooperation for system enhancement and injury control.
2. Key constituents include: Health Affairs, Defense Health Board, Trauma and Injury Subcommittee, Surgeons General, Joint Trauma System, National Ground Intelligence Center, Defense Medical Readiness Training Institute and its Combat Trauma Surgery Committee, Joint Improvised Explosive Device (IED) Defeat Organization, U.S. Special Operations Command, Army Medical Department Center and School, and Joint Trauma Analysis and Prevention of Injury in Combat.

JOINT TRAUMA SYSTEM AND HUMAN RESOURCES WITHIN THE JTS

Purpose and Rationale

The Joint Trauma System under the US Army Medical Command (MEDCOM) should have a strong trauma medical director and trauma program manager who are responsible for leading the trauma system. The Joint Trauma System should have the doctrinal authority, responsibility, and resources to lead the planning, development, operations, and evaluation of the trauma system throughout the continuum of care in conjunction with the Services, COCOMs and DoD. The Joint Trauma System ensures system integrity and provides for program integration with other health care and community-based entities, namely, public health, prehospital, emergency management, disaster preparedness, social services, and other military Service organizations.

The Joint Trauma System works through a variety of groups to accomplish the goals of trauma system planning, implementation, and evaluation. The ability to bring multidisciplinary, multiagency advisory groups together to accomplish trauma system goals is essential in developing and maintaining the trauma system and is part of providing leadership to evolving and mature systems.

The Joint Trauma System's trauma medical director and trauma program manager coordinate trauma system design, the adoption of minimum standards (prehospital and in-hospital), and provide for overall system evaluation through performance indicator assessment and assurance. In addition to a trauma medical director and trauma program manager, the Joint Trauma System must be sufficiently staffed to actively participate in each phase of development and in maintaining the system through a clearly defined structure for decision making (policies and procedures) and through proactive surveillance and evaluation. Minimum staffing usually consists of a trauma medical director, trauma program manager, performance improvement staff, data entry and analysis personnel, and information technology/management personnel. COCOM Joint Trauma

System staff at a minimum should consist of a theater trauma medical director, a trauma program manager, a sufficient number of trauma nurse coordinators and administrative staff to effectively implement the COCOM SGs trauma program.

Optimal Elements

1. Comprehensive doctrinal authority and administrative rules support trauma system leaders and maintain trauma system infrastructure, planning, oversight, and future development.
 - a. The Joint Trauma System in conjunction with the Services, COCOMs and DoD plans, develops, implements, manages, and evaluates the trauma system and its component parts, including the designation of trauma facilities.
 - b. The Joint Trauma System has adopted clearly defined trauma system standards (for example, facility standards, triage and transfer guidelines, and data collection standards) and has sufficient doctrinal authority to ensure and enforce compliance.
2. Sufficient resources, including financial and infrastructure-related, support system planning, implementation, and maintenance.

TRAUMA SYSTEM PLAN

Purpose and Rationale

The Joint Trauma System should have an over-arching plan that provides a template for establishing system components within a specific theater of operation, and serves as guidance for the individual Services, COCOMs and DoD stakeholders. Each regional (COCOM) theater component of the JTS, as defined in doctrine, should have a clearly articulated trauma system planning process that results in appropriate theater-specific modifications to the template. The template, and theater-specific modifications should be developed based upon a completed inventory of trauma system resources, identifying gaps in services or resources and the location of assets, as well as an assessment of population demographics, topography, or other access enhancements (location of hospital and prehospital resources) or barriers to access. It is important that the plan identifies special populations (for example, burns, non-combatants) within the geographic area served and addresses the needs of those populations within the planning process. A needs assessment should also be completed as part of initial planning and updated periodically as needed to assess system changes over time.

The trauma system plan will be developed by the COCOM SG staff in conjunction and consultation with the Joint Trauma System staff based on the results of a needs assessment and other data resources available for review. It describes the system design, procedures for expanding into new theaters of operation, procedures for withdrawal from theaters of operation, and establishes standards of care for field personnel, transportation and evacuation resources, and personnel at MTFs at all echelons of care. In addition there should be a process to regularly review and update the plan over time. The plan is built on input from stakeholder groups that assist in analyzing data, identifying resources, and developing system standards of care, including system policies and procedures and overall system design. Ideally, although every stakeholder group may not be satisfied with the plan or system design, the plan, to the extent possible, should be based on consensus of the advisory committees and stakeholder groups. These

advisory groups should be able to review the plan before final adoption and approve the plan before it is submitted to the COCOM SG for final approval.

The trauma system plan is used to guide system development, implementation, and management. Each component of the trauma system is clearly defined and an acceptable baseline level of performance is identified with goals for enhancement (benchmark). Within the plan are incorporated other planning documents used to ensure integration of similar services and build collaboration and cooperation with those services.

Optimal Elements

1. The Joint Trauma System has a comprehensive written trauma system plan based on over-arching principles that is adaptable to specific COCOM requirements. The plan integrates the trauma system with all pertinent components including field resources, transportation resources, and MTFs at all echelons of care. The written trauma system plan is developed in collaboration with Service partners and stakeholders.
2. The Joint Trauma System plan clearly describes the system design and is used to guide system implementation and management. For example, the plan includes references to policies, rules, and regulations and includes procedures for expansion into new theaters of operation, withdrawal from theaters of operation, and data collection and analysis.

SYSTEM INTEGRATION

Purpose and Rationale

Trauma system integration is essential for the daily care of injured people in the combat and noncombat environments. It includes both direct care services and supportive services such as behavioral health, social service, and public safety. The trauma system should use the public health approach to injury prevention and casualty mitigation to contribute to reducing the entire burden of injury in a theater or region. This approach enables the trauma system to address injury prevention and casualty mitigation through closer integration with all involved elements. Collaboration with the military health community also provides access to health data that can be used for system assessment, development of DoD policy, and education of the military community.

Integration of TCCC principles and field personnel are essential because the trauma system is linked with the combat casualty or emergency medical response and communication infrastructure, and it transports severely injured patients to and between MTFs at each echelon of care. Triage and destination protocols should exist for treatment and patient delivery decisions. Regulations and procedures should exist for online and off-line medical direction.

The Joint Trauma System is a significant resource to the DoD and the COCOMs for the response to mass casualty incidents (MCI), in support of existing civilian trauma systems, especially in circumstances where the existing civilian system is either undeveloped or has been significantly disabled. Under the system plan, if a need is appropriately identified, such MCIs would be treated in the same general fashion as the establishment of a system in a new theater of operations, with the Joint Trauma System deploying its own autonomous resources.

Optimal Elements

1. The Joint Trauma System has a global and comprehensive trauma system plan based upon national and military guidelines. The global plan includes a template that can be modified to establish a plan specific to each regional COCOM, along with procedures for expanding into a new theater of operation and for withdrawing from a theater of operation. The plan integrates the trauma system with all components, including field personnel, transportation resources, MTFs at all echelons of care, and operational command elements. The written trauma system plan is developed in collaboration with all Services and stakeholders.
 - a. The Joint Trauma System plan has established clearly defined methods of integrating the trauma system plan across all Services and regions.

FINANCING

Purpose and Rationale

The Joint Trauma System needs sufficient funding to plan, implement, and evaluate the DoD system of care. All components of the trauma system need funding, including prehospital, acute care facilities, rehabilitation, and prevention programs. The COCOM Joint Theater Trauma Systems also need funding. The Joint Trauma System management requires adequate funding for daily operations and other important activities such as advisory committee meetings, development of regulations, data collection, performance improvement, and public awareness and education. Adequate funding to support the operation of trauma centers and their state of readiness to care for seriously injured patients within the DoD is essential. The financial health of the trauma system is essential for ensuring its integrity and its improvement over time.

The Joint Trauma System needs a process for assessing its own financial health, as well as that of the trauma system. The system requires formalization as a program of record within the DoD and financing through the standard program objective memorandum (POM) process.

Trauma system financial planning should be related to the trauma plan outcome measures (for example, patient outcome measures such as mortality rates, length of stay, and quality-of-life indicators). Such information may demonstrate the value added by having a trauma system in place.

Optimal Elements

1. Sufficient resources (financial and infrastructure-related) support system planning, implementation, and maintenance.
 - a. Financial resources exist that support the planning, implementation, and ongoing management of the administrative and clinical care components of the trauma system.
 - b. Designated funding for trauma system infrastructure support (Joint Trauma System) is appropriated through the DoD according to the POM process.
 - c. Operational budgets (system administration and operations, facilities administration and operations, and prehospital and TCCC operations) are aligned with the trauma system plan and priorities.

PREVENTION AND OUTREACH

Purpose and Rationale

Trauma systems must develop prevention strategies that help mitigate casualties and control injury as part of an integrated, coordinated, and inclusive system. The Joint Trauma System and providers throughout the system should be working with the DoD, Service stakeholders, COCOMs, and other Commanders to enact prevention programs and prevention strategies that are based on epidemiologic data collected by the system.

Efforts at prevention must be targeted for the intended audience, well defined, and structured, so that the impact of prevention efforts is system-wide. The implementation of injury control and prevention requires the same priority as other aspects of the trauma system, including adequate staffing, partnering with the Services, COCOMs, and DoD stakeholders, and taking advantage of outreach opportunities. Many systems focus information, education, and prevention efforts directly to the general public (for example, restraint use, driving while intoxicated). However, a portion of these efforts should be directed toward field and MTF trauma care personnel safety (for example, securing the scene, infection control). Collaboration with the Services, COCOMs and DoD stakeholders is essential to successful prevention program implementation. Such partnerships can serve to synergize and increase the efficiency of individual efforts. Alliances with multiple agencies within the system, MTFs, and professional associations, working toward the formation of an injury control network, are beneficial.

Activities that are essential to the development and implementation of injury control and prevention programs include the following:

- ⊙ A needs assessment focusing on the information needed for individual Services, Commands and other stakeholders, thus ensuring a better understanding of injury control and prevention
- ⊙ Needs assessment both from the perspective of operational commands and the patient care resources of the trauma system to identify areas that can be productively addressed

- ⊙ Preparation of annual reports on the status of injury prevention and trauma care in the system
- ⊙ Trauma system databases that are available and usable for routine surveillance

Optimal Elements

1. The Joint Trauma System informs and educates Services, COCOMs and DoD constituencies and policy makers to foster collaboration and cooperation for system enhancement and injury control.
 - a. The trauma system leaders (Joint Trauma System, advisory committees, and others) inform and educate constituencies and policy makers through dissemination of information and active collaborations aimed at injury prevention and trauma system development.
2. The Joint Trauma System, in cooperation with other agencies and organizations, uses analytic tools to monitor the performance of population-based prevention and trauma care services.
 - a. The Joint Trauma System, along with partner organizations, prepares annual reports on the status of injury prevention and trauma care in specific theaters of operation, regions, or local areas.
3. The Joint Trauma System ensures that the trauma system demonstrates prevention and medical outreach activities within its defined service area.
 - a. The Joint Trauma System is active in the evaluation of specific theater-based or region-based activities and of injury prevention and response programs.
 - b. The effect or impact of outreach programs (medical and community training and support, and prevention activities) is evaluated as part of a system performance improvement process.

ENROUTE CARE CONTINUUM OF CARE

Purpose and Rationale

The Joint Trauma System includes and/or interacts with several different platforms with regard to the Enroute Care Continuum. A key component is that the Enroute Care Continuum be established as a fluid system that will adjust according to mission requirements. This system is fundamental to mission success with the goal of giving the casualties the best care possible – without any degradation of care – as they move progressively through the enroute continuum.

The transport of casualties can occur through a variety of platforms to include:

- ⊙ Ground Transport
- ⊙ Rotary aircraft
- ⊙ Fixed wing aircraft

The role of transport must be broken down to scene response (point of injury) and interfacility transport. Scene response is carried out primarily with rotary wing aircraft followed by ground transport. The main focus of scene response is to stabilize the casualty and transport them to the closest appropriate level of care for further intervention/stabilization. The personnel level of training within this platform can vary from Service to Service; ranging from 68W to Para Rescue Medics. As with the civilian medical community a medical director must be involved in the training of the personnel, oversight of practice, and establishment of a means of ongoing quality assessment to ensure the optimal provision of prehospital care.

When addressing casualty moves within a Theater of Operations, the transport between medical facilities can be carried out through a rotary wing or fixed wing platform. The platform utilized is dependent on the patient acuity, threat, mission requirements, and location of the sending and receiving facilities.

Rotary wing platform personnel will vary according to casualty severity and mission requirements. When moving a stable casualty, the MEDEVACs inherent capability can be utilized. On the other hand, when moving a critically injured casualty from one level of care (facility) to another, critical care personnel should be utilized to ensure that the highest standard of care is met during the transport of the casualty.

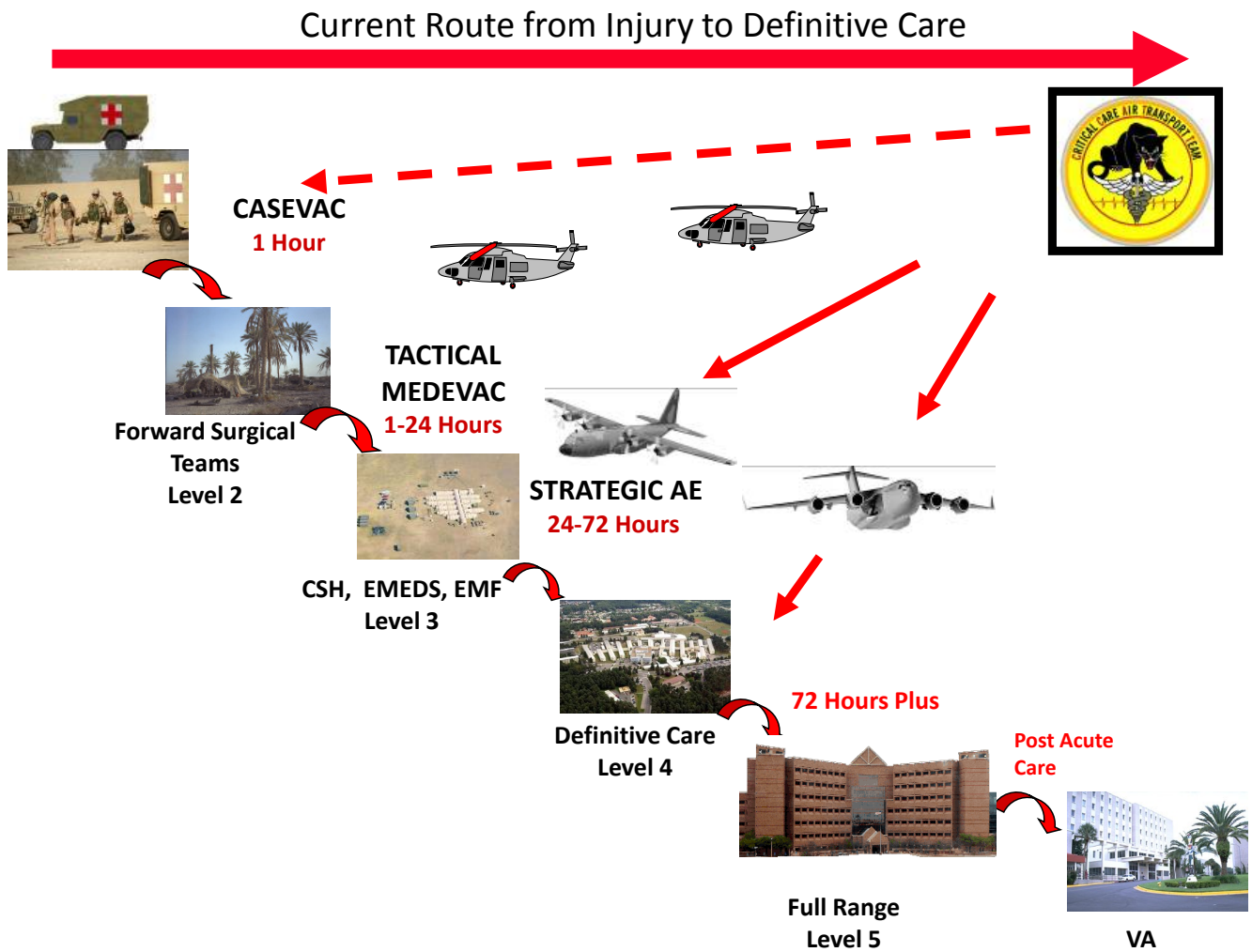
The Air Force’s Aeromedical Evacuation (AE) System requires the availability of a secure landing strip, which can handle the fixed-wing platforms that are utilized to move casualties. AE is a regulated, in-transit-visible system designed for the movement of casualties. It utilizes a variety of opportune aircraft with dedicated medical crews and equipment, primarily the C-130, KC-135, and the C-17. The medical crews are made up of flight nurses, aeromedical technicians, and medical attendants trained to perform routine care to stable patients during transport. This system is not designed as a primary/scene response team. A recent revolution in military medicine has resulted in the need for a new approach to AE:

- ⊙ air transportation of stabilized patients, and,
- ⊙ to an extent, caring for patients whose resuscitation is in evolution.

To achieve this, AE crews can be augmented with special medical attendants or advanced care teams such as Critical Care Air Transport Team (CCATT), neonatal intensive care unit (NICU) teams, burn teams, and special lung-support teams to add the advanced capability of transporting critically injured or ill patients.

See Figure 5, Current Route from Injury to Definitive Care illustrates the enroute care continuum designed to move casualties progressively through the system.

FIGURE 5, Current Route from Injury to Definitive Care



The CCATT mission is to provide seamless intensive care unit (ICU) level care of critically ill, injured, or burned patients while transporting them to a higher level of care. While CCATTs are now an integral part of the AE system, it is important to note that they do not function independently from AE crews. The composition of CCATTs includes an ICU level physician – this may be a pulmonary/critical care physician, an anesthesiologist, an emergency medicine physician, or other physician with the expertise to manage the critically ill or injured patient. The other two members of the CCATT are a critical care nurse and a respiratory therapist. Each CCATT has the capability of caring for up to three ventilated patients or six less acute patients. This capability can be expanded up to five ventilated patients by augmenting the primary CCATT with a CCATT Extender Team, comprised of two critical care nurses.

When the casualty is transported out of the Theater of Operations this mission is carried out exclusively by the AE system and the CCATTs.

The Enroute Care system allows the trauma system to function as one hospital, one medical staff, under one set of practice guidelines, where capacity is measured by flow rate, not beds.

Selection of the CCATT Patient

When deciding if a casualty requires the expertise of a CCATT, the provider needs to assess what requirements the casualty will have during transport. A basic definition of a CCATT patient is:

Patients requiring CCATT transport include those in need of intensive nursing care, constant hemodynamic monitoring, mechanical ventilation, frequent therapeutic interventions, or other medical or surgical interventions vital to sustain life, limb, and eyesight during movement of the patient through the aeromedical environment. A wide variety of adult and pediatric patients with serious medical and surgical conditions may potentially require transport by CCATT.

To ensure mission success a CCATT should be used to move the patient if any of the criteria listed is present.

Use a CCATT if the patient:

- ⊙ is intubated
- ⊙ requires aggressive fluid administration or has received more than 10 units of blood products in past 24 hours
- ⊙ requires blood replacement or vasopressor support
- ⊙ requires invasive hemodynamic or intracranial monitoring
- ⊙ requires frequent suctioning or nebulizer treatments
- ⊙ has an increasing oxygen requirement
- ⊙ has undergone a vascular reconstruction
- ⊙ has unstable angina
- ⊙ has a condition requiring the need to initiate or continue intravenous (IV) drips for pain relief, anti-coagulation, or other condition while in flight
- ⊙ has an unstable spine fracture
- ⊙ requires the Vacuum Spine Board for movement
- ⊙ has altered mental status
- ⊙ will require electrolyte replacement and monitoring in flight

If there is a question on whether a patient without any of the above criteria should be moved via CCATT, the sending provider should contact the Theater Validating Fight Surgeon. Consultation with all providers involved is fundamental in ensuring that the appropriate resources are utilized to move the patient.

After it is determined that a casualty requires the expertise of a CCATT the next step lies in the preparation of that casualty for transport. The most important aspect in ensuring that the movement of a critically injured or ill patient is successful lies in the preparatory phase. To accomplish this task the sending facility must make certain that all the aspects of the Intertheater Transport Checklist are followed.

Upon arrival of the CCATT, a one-on-one report should be given to the team ensuring that any changes of patient condition have been addressed. Whenever possible it is preferred that the sending physician directly speaks to the CCATT physician prior to departure. This will ensure that a smooth transition of care is accomplished.

Performance Improvement and Documentation

Complete documentation must be ensured through all the different facets of transport of the casualty through the Enroute Care Continuum. Documentation is the foundation for the performance improvement (PI) process. The goal is ultimately to maintain the standard of care through the Enroute Care Continuum. A key component to accomplishing this task is a proactive PI program with direct feedback to the providers involved.

Optimal Elements

1. The trauma system is supported by the Enroute Care System. Important components of all levels include communication between the provider and components of the Enroute Care System, medical oversight, and performance improvement. The trauma system and the Enroute Care System must be well integrated. The following criteria should be met in order to ensure a successful system:
 - a. There is well-defined trauma system medical oversight integrating the specialty needs of the trauma system with the medical oversight for the different components of the Enroute Care System.
 - b. There is a clearly defined, cooperative, and ongoing relationship between the trauma specialty physician leaders and the medical directors for the different components of the Enroute Care System.
 - c. Performance Improvement must be integrated to all the different components of the Enroute Care System.

EMERGENCY MEDICAL SERVICES

Purpose and Rationale

COMBAT ENVIRONMENT

Prehospital care is very unique and complex in the combat environment with regards to care under fire and transport of the critically injured. There are various levels of care in the combat environment.

When injury occurs in the combat environment, at the point of injury (POI), a patient is typically provided care through self aid, buddy care, or a combat medic (Level I care). Once care is provided at the POI, the patient may be transported to a facility that may have medical care, but no surgical care (Level IIa or Level II-), or a facility that has stabilizing surgical care (Level IIb or Level II+), or even robust surgical/inpatient capability (Level III).

Movement of patients from POI to higher levels of care may involve nonmedical ground transportation, medical ground transportation (ambulance), rotary wing with medical crews and infrequently without medical crews, and fixed wing aircraft. In some environments, patient care and movement aboard surface ships is another important aspect of care in the combat or disaster mass casualty environment.

Some of the challenges of care in the combat environment include care under hostile fire, austere environments, prolonged time period between injury and evacuation, tourniquet use, documentation issues, appropriate medical oversight, limited resources, restricted communication capability, and limited equipment. Additionally, patients in the combat setting frequently undergo multiple movements within and out of the theater of operations.

In this setting every Service member is a potential initial care provider, which mandates extensive training for Service members to the level tactical combat casualty care, EMT and paramedic standards.

The trauma system includes and/or interacts with many different agencies, institutions, and systems. The prehospital system is one of the most important of these relationships. Prehospital care is often the critical link between the injury-producing event and definitive care at a trauma center. Even though at its inception the prehospital system was a very broad

system concept, over time, prehospital care has come to be recognized as the initial care component of the larger Joint Trauma System. It is a complex system that not only transports patients, but also includes public access, communications, personnel, triage, data collection, and quality improvement activities. The Joint Trauma System also facilitates/maintains a close relationship with the tactical community to ensure appropriate patient care during transport within the constraints of the combat/hostile environment.

Owing to the multidisciplinary nature of trauma system response to injury, conferences that include all levels of providers (for example, prehospital personnel, nurses, and physicians) need to occur regularly with each level of personnel respected for its role in the care and outcome of casualties. Communication with and respect for prehospital providers is particularly important, especially in rural areas where exposure to major casualties might be relatively rare.

INTEGRATION OF PREHOSPITAL CARE WITHIN THE TRAUMA SYSTEM

In addition to its critical role in the prehospital treatment and transportation of injured patients, the prehospital system must also be engaged in assessment and integration functions that include the trauma system, public health agencies, and other public safety agencies. Prehospital agencies should have a critical role in ensuring that communication systems are available and have sufficient redundancy so that trauma system stakeholders will be able to assess and act to limit death and disability at the single patient level and at the population level in the case of mass casualty incidents (MCI).

Further integration might be accomplished through the use of prehospital data to help define high-risk geographic and demographic characteristics of injuries within a response area. The prehospital system should assist with the identification of injury prevention program needs and in the delivery of prevention messages. The prehospital system also serves a critical role in the development of all-hazards response plans and in the implementation of those plans during a crisis. This integration should be provided by the military trauma plan and overseen by the Joint Trauma System. The prehospital system should participate through its leadership in all aspects of trauma system design, evaluation, and operation, including policy development, public education, and strategic planning.

Optimal Elements

1. The trauma system is supported by the prehospital system that includes communications, medical oversight, prehospital triage, and transportation; the trauma system, prehospital system, and public health agency are well integrated.
 - a. There is well-defined trauma system medical oversight integrating the specialty needs of the trauma system with the medical oversight for the overall prehospital system.
 - b. There is a clearly defined, cooperative, and ongoing relationship between the trauma specialty physician leaders (for example, trauma medical director within each trauma center) and the prehospital providers.
 - c. There are sufficient and well-coordinated transportation resources to ensure that prehospital providers arrive at the scene promptly and expeditiously transport the patient to the correct hospital by the correct transportation mode.
2. The Services ensure a competent workforce.

MILITARY MEDICAL TREATMENT FACILITIES

Purpose and Rationale

Inclusive trauma systems are the systems that include all military treatment facilities (MTF) at all levels of care, to the extent that their resources and capabilities allow and in which the patient's needs are matched to MTF resources and capabilities. Thus, as the core of the military trauma system, MTFs operating within the JTS provide definitive care to the entire spectrum of patients with traumatic injuries. MTFs must be well integrated into the continuum of care, including prevention and rehabilitation, and operate as part of a network of facilities within a public health framework. All MTFs should participate in the essential activities of a trauma system, including performance improvement and patient safety, data submission to the Department of Defense Trauma Registry, representation at the weekly continuum of care and monthly system-wide video teleconferences, tri-service trauma advisory committees, and mutual operational agreements with other regional MTFs to address interfacility transfer, educational support and outreach, to include the VA healthcare system. The roles of all definitive care facilities including specialty MTFs (for example, pediatric, burns, severe traumatic brain injury (TBI), spinal cord injury (SCI)) within the system should be clearly outlined in the joint military trauma plan and monitored by the Joint Trauma System. Facilities providing the highest level of trauma care are expected to provide leadership in education, outreach, patient care, and research and to participate in the design, development, evaluation, and operation of the Joint Trauma System.

In an inclusive system, patients should be triaged to the appropriate facility based on their needs, facility resources, military service, and location of immediate family. Patients with the least severe injuries might be cared for at appropriately designated facilities located closest to their home base, whereas the most severe should be triaged to an ACS defined Level I or II capable trauma center or its equivalent.

CONUS-based MTFs providing definitive care to patients with other than minor injuries must be specifically designated by the Joint Trauma System and equipped and qualified to do so at a level

commensurate with injury severity. To assess and ensure that injury type and severity are matched to the qualifications of the facilities and personnel providing definitive care, the Joint Trauma System should have a process in place that reviews and verifies the qualifications of a particular facility according to a specific set of resource and quality standards. This criterion-based process for review should be consistent with national standards and be conducted on periodic cycles as determined by the Joint Trauma System. Criteria should include commitment of the MTF leadership, prehospital trauma care, interfacility transfer, a defined trauma program, clinical functions including surgical and medical specialists, supporting collaborative disciplines, and rehabilitation. Resources should be available to support the trauma registry, performance improvement and patient safety, injury prevention, scholarly activities, and disaster planning. When facilities do not meet set standards, there should be a process in place to assist the facility in meeting the required standards.

Designation by the Joint Trauma Theater System should be restricted to facilities meeting predefined criteria and quality standards, and should be based on patient care needs of the Joint Trauma System. There should be a well-defined relationship between the Joint Trauma System and designated MTFs in the form of a guidelines, or memoranda of understanding. These documents should define the relationships, roles, and responsibilities between the Joint Trauma System and the medical leadership from each designated MTF.

The numbers of MTFs by level of designation and the location of these facilities must be periodically assessed by the Joint Trauma System with respect to patient care needs, timely access to definitive trauma care, and current medical evacuation routes. There should be a process in place for augmenting and restricting, if necessary, the numbers and/or level of MTFs based on these periodic assessments. The Joint Trauma System plan should address means for improving MTF participation in the Joint Trauma System, particularly in areas in which there has been difficulty addressing needs.

Human Resources

The ability to deliver high-quality combat casualty care is highly dependent on the availability of skilled human resources. Therefore, it is critical to assess the availability and educational needs of providers on a periodic basis. Because availability, particularly of subspecialty resources, is often limited due to a variety of factors including frequent deployments, some means to address transferring, retaining and engaging of qualified personnel should be a priority. Periodic workforce assessments should be conducted and the Joint Trauma System should work with the specialty consultants from the various Services to ensure the availability of adequately trained subspecialty resources both at the Joint Trauma System staff and at the MTF levels. Maintenance of competence should be ensured by requiring standards for credentialing, certification, and specifying continuing educational requirements for physicians and nurses providing care to combat casualties. Specialty Skill Identifier (SSI) should be developed for those personnel who have trauma specific competence and who have worked with the JTS. Mechanisms for the periodic assessment of ancillary and subspecialty competence, educational needs, and availability within the system for all designated MTFs and the Joint Trauma System staff should be incorporated into the trauma system plan. The lead MTFs caring for combat casualties will need to utilize teleconferencing and telemedicine to assist smaller MTFs in providing education on regionally identified needs. In addition, lead MTFs caring for combat casualties within the region should assist in meeting educational needs while fostering a team approach to care through periodic educational multidisciplinary trauma conferences. These activities will do much to foster a sense of teamwork and a functionally inclusive system.

Integration of Designated Trauma Facilities within the Trauma System

Designated MTFs must be well integrated into all other facets of an organized system of trauma care, including military health systems, injury surveillance, prevention, field care, rehabilitation, and system performance improvement. This integration should be provided by the Joint Trauma System plan and overseen by the Joint Trauma System.

Each designated MTF should participate, through its trauma program leadership, in all aspects of trauma system design, evaluation, and operation. This participation should include policy and instructions,

as well as education, and strategic planning. In addition, the trauma program and subspecialty leaders should provide direction and oversight to the development, implementation and monitoring of integrated protocols for patient care used throughout the system, including region-specific primary (field) and secondary (early transfer) triage protocols. The highest level designated MTFs should provide leadership of the regional trauma committees through their trauma program medical leadership. These medical leaders, through their activities on these committees, can assist the Joint Trauma System and help ensure that deficiencies in the quality of care within the system, relative to established standards, are recognized and corrected. Educational outreach by these higher level centers should be used when appropriate to help achieve this goal.

Optimal Elements

1. Military treatment facilities are integrated into a resource-efficient, inclusive network that meets required standards and provides optimal care for all injured patients.
 - a. The Joint Trauma System plan has clearly defined the roles and responsibilities of all military treatment facilities treating trauma and of facilities that provide care to specialty populations (for example, burns, prosthetic rehabilitation, TBI, SCI, and others)
 - b. To maintain its military level designation, each MTF will continually work to improve the trauma care as measured by patient outcomes.
 - c. The trauma system engages in regular evaluation of all military treatment facilities that provide trauma care to combat casualties and of designated trauma hospitals. Such evaluation involves independent external reviews
2. The Joint Trauma System ensures a competent workforce.
 - a. As part of the established standards, appropriate levels of trauma training are set for nursing personnel who routinely care for combat casualties in military treatment facilities. Appropriate, approved trauma training courses with a curriculum that is inclusive of care

across the spectrum of environments are sustainable and provided for nursing personnel on a regular basis.

- b. Implement a robust and broad skill set that allows the specialty trained Trauma Nurse to deploy their knowledge and expertise across a continuum of work environments from the emergency department to intensive care units to ensure one work force.
- c. In cooperation with the nursing licensure authority, ensure that all nursing personnel who routinely provide care to combat casualties have a trauma training certificate (for example, Advanced Trauma Care for Nurses, Trauma Nursing Core Course, emergency or critical care nurse certification course). Additional training must also be driven by the ongoing performance improvement cycle.
- d. In cooperation with the physician licensure authority, ensure that physicians who routinely provide care to combat casualties have a current trauma training certificate of completion, for example, Advanced Trauma Life Support (ATLS) and others. As an alternative, physicians may maintain trauma competence through continuing medical education programs after initial ATLS completion.
- e. Conduct at least one multidisciplinary trauma conference annually that encourages system and team approaches to trauma care.
- f. As new protocols and treatment approaches are instituted within the system, structured mechanisms are in place to inform all personnel about the changes in a timely manner.

SYSTEM COORDINATION AND PATIENT FLOW

Purpose and Rationale

The goal of the military trauma system is to provide the most appropriate care to all casualties, providing the optimal opportunity for survival, functional recovery, and return to duty. To achieve the best possible outcomes, the military trauma system must be designed so that the right patient is transported to the right facility at the right time. However, due to the nature of delivering field trauma care in a battle zone, achieving this goal is frequently challenging. In addition to perceived injury severity, battlefield conditions, the geography and weather, placement of trauma facilities within the battle space, and available transportation may all play a role in selection of the initial facility available for provision of care.

It is often necessary within the context of military trauma for the injured patient to receive care at several centers after injury. This system is in contrast to the civilian setting, where the most severely injured patients are routinely triaged to the regional trauma center, where they receive the majority of their acute medical care. In the military setting, life and limb-preserving care is delivered far forward in the field and at resource-limited Level II and III facilities, while more complex reconstructive care and rehabilitation is reserved for the resource-rich environment of the fixed military treatment facilities within the region and in the United States. This approach, with almost all seriously-injured patients being transported to sequentially higher levels of care, necessitates significant coordination of care and ongoing communication between facilities and during transport to provide optimal patient outcomes.

Another contrast between the military trauma system and the civilian system is the necessary distinction between care of the injured Service personnel and care of other non-military patients (such as “local-nationals”). Of necessity, given the resource-limited nature of combat casualty care, care of these non-military patients must be carefully defined in advance, lest the numbers of these patients overwhelm the military trauma system. In general, the care of non-military patients is best provided by local medical

facilities outside of the military trauma system, but plans must include their care in circumstances where local facilities are either insufficient or non-existent.

The military trauma system is designed to provide initial stabilization and triage of patients (those unlikely to be able to rapidly return to duty) to the appropriate facilities away from the resource-limited region of the battlefield. This care is provided within the theater by Level II and III facilities. Level II facilities have limited holding capacity, necessitating early transport of all but minor injuries to a higher level of care. Level III facilities provide hospital-based resources within the theater, allowing for limited hospitalization and more complex medical and surgical care. Most patients requiring a significant period of recovery will require evacuation to a Level IV facility (a regional fixed military medical facility outside of the battle zone) or a Level V facility (a regional fixed military medical facility within the United States).

The decision to transfer a seriously-injured trauma patient is inherent to the care of military injuries. The importance of care in the field setting, timely initial care at the first level of trauma care, appropriate transfer, and care during transport are all significant factors in outcomes of the military trauma patient. Delays or problems with supply or process within this continuum of care almost certainly contribute to excess morbidity and mortality. However, all levels of care fall under the control of the military trauma system, allowing for a significant and robust oversight process. Given the importance of these factors, data derived from tracking and monitoring the performance of each of these components should be utilized to correct and improve the process of care in a real-time fashion and should be used to help define optimal system configuration and function.

A central communications center with real-time access to information on system resources greatly facilitates the transfer process. Ideally, this center identifies the appropriate receiving facility, facilitates dialogue between the transferring and receiving centers, and coordinates interfacility transport.

To ensure the system operates at the greatest efficiency, it is important that seriously injured patients are transported to the appropriate level of care for long-term recovery. For the injured Service member this may include a specialized facility to allow for appropriate rehabilitation, a VA facility, or a local military hospital. It is important to consider both the facility that provides the best care and when possible, is close to the patient’s family support. This process opens up the limited acute care resources

available to care for newly injured patients. In addition, it provides the opportunity for the patient to be placed in the best setting to recover for further duty or transition to a non-military setting.

Optimal Elements

1. The Joint Trauma System includes field personnel and all echelons of care, ensuring communications, medical oversight, initial care, triage, and transportation. All elements are tightly coordinated throughout the system.
 - a. There are mandatory system-wide triage and transfer criteria to ensure that injured patients are transported to an appropriate initial facility based on their injuries and local theater conditions, and subsequently moved to higher echelons of care as injuries, local conditions and clinical course warrant. These criteria are regularly evaluated and updated to ensure optimal system performance.

There are reliable communications for military personnel to access the trauma system, with dispatch of appropriate field resources. There is a central communications system to ensure efficient and reliable communications among all system participants across all echelons of care.
 - b. There is a procedure for communications among MTFs when arranging for interfacility transfers, including contingencies for communication systems failure.
2. Military treatment facilities within the Joint Trauma System are integrated into a resource-efficient network that meets required standards and that provides optimal care for all injured patients.
 - a. When injured patients arrive at an MTF that cannot provide the appropriate level of definitive care, there is an organized and regularly monitored system to ensure that the patients are expeditiously transferred to an appropriate MTF.

3. The Joint Trauma System includes an effective mechanism to allow for real-time performance improvement. This mechanism includes the following components:
 - a. Appropriate resources are available for collection of data at all levels of care to support performance improvement processes and ensure optimal patient care. Resources include necessary personnel, information technology, and logistical support.
 - b. Medical personnel with appropriate background and training have the ability to affect changes in the system to improve patient care.
 - c. System-wide commitment to performance improvement is ensured as evidenced by participation of appropriate stakeholders in performance improvement activities.

REHABILITATION

Purpose and Rationale

As an integral component of the Joint Trauma System, rehabilitation services in acute care facilities and dedicated rehabilitation centers provide coordinated care for combat casualties who have sustained severe or catastrophic injuries resulting in long-standing or permanent impairments. Patients with less severe injuries may also benefit from rehabilitative programs that enhance recovery and speed return to function and productivity. The goal of rehabilitative interventions is to allow the patient to return to the highest level of function, reducing disability and avoiding handicap whenever possible. The rehabilitation process should begin in the acute care MTF as soon as possible, ideally within the first 24 hours. Inpatient and outpatient rehabilitation services should be available. In the combat environment some basic rehabilitation services may be provided, however, patients requiring extensive rehabilitation are usually evacuated from theater and receive rehabilitation at a higher level of care, potentially including the facilities in the VA system.

Rehabilitation specialists should be members of the multidisciplinary advisory committee to ensure that rehabilitation issues are integrated into the trauma system plan. The trauma system should demonstrate strong linkages and transfer agreements between Level IV and V MTFs and their referral rehabilitation facilities. Plans for repatriation of patients should be part of rehabilitation system planning. Feedback on functional outcomes after rehabilitation should be made available to the MTFs.

Optimal Elements

1. The Joint Trauma System ensures that adequate rehabilitation facilities have been integrated into the trauma system and that these resources are made available to all populations requiring them.
 - a. The Joint Trauma System has incorporated, within the trauma system plan and the MTF standards, requirements for rehabilitation services, including interfacility transfer of combat casualties to rehabilitation centers.
 - b. Rehabilitation centers and outpatient rehabilitation services provide data on combat casualties to the MTF that transferred the patient to them; and the Department of Defense Trauma Registry that include final disposition, functional outcome, and rehabilitation costs and also participate in performance improvement processes.
 - c. A resource assessment for the rehabilitation needs of the Joint Trauma System has been completed and is regularly updated.
 - d. The trauma system has reviewed a comprehensive system status inventory that identifies the availability and distribution of current rehabilitation capabilities and resources.

MASS CASUALTY AND DISASTER PREPAREDNESS

Purpose and Rationale

The Joint Trauma System is a critically important resource for the DoD and the COCOMs in response to military and civilian mass casualty incidents (MCIs) in peacetime and wartime. The Joint Trauma System and its MTFs are central to disaster preparedness. Trauma system leaders need to be actively involved in public health preparedness planning to ensure that trauma system resources are integrated into the national, regional, and local disaster response plans. Within the civilian community, acute care facilities (sometimes including one or more trauma centers) are the first line of response to an MCI. However, an MCI may result in more casualties than the local acute care facilities can handle, requiring the activation of a larger emergency response plan with support provided by state, regional and DoD assets. MTFs within or adjacent to affected communities may also become part of the disaster response under appropriate DoD directive. In the combat setting, theater MTFs have the primary role in mass casualty and disaster planning for military populations at risk.

For this reason, the Joint Trauma System in conjunction with COCOM SGs must conduct a resource assessment of its surge capacity to respond to MCIs. The resource assessment should build on and be coupled to a hazard vulnerability analysis. An assessment of the trauma system's response to simulated incident or tabletop drills must be conducted to determine the trauma system's ability to respond to MCIs. Following these assessments, a gap analysis should be conducted to develop MCI response resource standards. This information is essential for the development of an emergency management plan that includes the trauma system.

Planning and integration of the trauma system with plans of related systems (public health, prehospital, and emergency management) are important because of the extensive impact disasters have on the trauma system and the value of the trauma system in providing care. Relationships and working cooperation between the trauma system, public health, and prehospital agencies support the provision of assets that enable a more rapid and organized disaster response when an

event occurs. For example, the prehospital emergency preparedness plan needs to include the distribution of severely injured patients to trauma centers, when possible, to make the best use of trauma center resources. This plan could optimize triage through directing less severely injured patients to lower level trauma centers or nondesignated facilities, thus allowing resources in trauma centers to be spared for patients with the most severe injuries. In addition, the trauma system and its trauma centers will be targeted to receive additional resources (personnel, equipment, and supplies) during major MCIs.

Mass casualty events and disasters are chaotic, and only with planning and drills will a more organized response be possible. Simulation or tabletop drills provide an opportunity to test the emergency preparedness response plans for the trauma system and other systems and to train the teams that will respond. Exercises must be jointly conducted with other agencies to ensure that all aspects of the response plan have the trauma system integrated.

Optimal Elements

1. An assessment of the trauma system's emergency preparedness has been completed, including coordination with the public health agency, prehospital system, and the emergency management agency.
 - a. There is a resource assessment of the trauma system's ability to expand its capacity to respond to MCIs in an all-hazards approach.
 - b. There has been a consultation by external experts to assist in identifying the current status and needs of the trauma system to be able to respond to MCIs.
 - c. The trauma system has completed a gap analysis based on the resource assessment for trauma emergency preparedness.

NOTE: All-hazards events routinely include situations involving natural (for example, earthquake), unintentional (for example, school bus crash), and intentional (for example, terrorist explosion) trauma-producing events that test the expanded response capabilities and surge capacity of the trauma system.

2. The Joint Trauma System ensures that its trauma system plan is integrated with, and complementary to, the comprehensive mass casualty plan for natural and manmade incidents, including an all-hazards approach to planning and operations.
 - a. The prehospital staff, the trauma system, and the all-hazards medical response system have operational trauma and all-hazards response plans; and they have established an ongoing cooperative working relationship to ensure trauma system readiness for all-hazards events.
 - b. The trauma system, through the Joint Trauma System, has access to additional equipment, materials, and personnel for large-scale traumatic events.

SYSTEM-WIDE EVALUATION AND QUALITY ASSURANCE

Purpose and Rationale

The Joint Trauma System has responsibility for instituting processes to evaluate the performance of all aspects of the trauma system. Key aspects of system-wide effectiveness include:

- ⦿ the outcomes of population-based injury prevention and casualty mitigation initiatives,
- ⦿ access to care, as well as the availability of trauma services,
- ⦿ the quality and timeliness of services provided within the trauma care continuum from the field and acute care management phases through rehabilitation and community reintegration.

Intrinsic to this function is the delineation of valid, objective metrics for the ongoing quality audit of system performance and patient outcomes based on sound benchmarks and available clinical evidence. Trauma management information systems (MIS) must be available to support data collection, analysis, and system-wide dissemination.

The Joint Trauma System should ensure that the military treatment facilities establish forums that promote inclusive multidisciplinary and multiagency review of cases, events, concerns, regulatory issues, policies, procedures, and standards that pertain to the trauma system.

The evaluation of system effectiveness must take into account the integration of the various components of the trauma care continuum and review how well personnel, agencies, and facilities perform together to achieve the desired goals and objectives. Results of customer satisfaction (patient, provider, and facility) appraisals and data indicative of service and population needs as well as operational requirements should be considered in strategic planning for system development. The Joint Trauma System should evaluate each MTF's provision of safe, efficient, and effective care to the combat casualty. In order to do so, it must possess the programmatic infrastructure with the authority and accountability

to continuously measure, evaluate, and improve the process and outcome of care (performance improvement). This effort must attempt to reduce unnecessary variation in care and prevent adverse events (patient safety). These essential elements of the administrative infrastructure of a trauma center are commonly known as a Trauma Performance Improvement and Patient Safety (PIPS) program.

System improvements derived through evaluation and quality assurance activities may encompass enhancements in clinical care, critical resource availability technology, and doctrinal or regulatory infrastructure. The development of expectations from evidence-based guidelines, pathways, and protocols are a means for measuring the process, expected outcomes, and consistency of care. System performance improvement entails demonstrating that a corrective action has the desired effect as determined by continuous evaluation. Ineffective processes should be identified, revised, and reevaluated to determine if these revisions have been effective. As the definition of quality is neither exact nor constant, improvement cannot always be demonstrated with compelling data; however systematic use of a defined PIPS process can.

To promote participation and sustainability, the Joint Trauma System should associate accountability for achieving defined evidence-based expectations and trauma system performance indicators with meaningful incentives that will act to cement the support of key constituents in the health care community and general population. For example, the benefits of the trauma system as they relate to reducing mortality or decreasing years of productive life lost may make the value of promoting trauma system development more tangible. The Joint Trauma System should promote ongoing dialog with key stakeholders to ensure that incentives remain aligned with system needs.

Optimal Elements

1. The trauma management information system is used to facilitate ongoing assessment and assurance of system performance and outcomes and provides a basis for continuously improving the trauma system, including communication of outcomes to the individual MTFs and a cost benefit analysis.

- a. The Joint Trauma System ensures that each MTF in the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the lead authority.

The Joint Trauma System provides pertinent data to each participating MTF in the system that measures and reports on the rate and incidence of audit filters and outcome data.

2. The Joint Trauma System, in cooperation with other agencies and organizations, uses analytic tools to monitor the performance of population-based prevention, casualty mitigation, and trauma care services.

TRAUMA MANAGEMENT INFORMATION SYSTEMS

Purpose and Rationale

Analogous to civilian hospital-based trauma registries, the Department of Defense Trauma Registry (DoDTR) developed from the idea that aggregating data from similar cases may reveal variations in care and ultimately result in a better understanding of the underlying injury, its treatment, and outcome. The DoDTR, as the program of record for the DoD, has proven to be very effective in improving trauma care across the military health system. When possible, these data from the DoDTR are linked to incident reports, ED records, administrative discharge data, medical examiner records, vital statistics data (death certificates), and tactical and operational data (commonly classified data). This information system is designed to provide system-wide data that allow and facilitate evaluation of the structure, process, and outcomes of the entire system; all phases of care; and their interactions. This information is used to support DoD decision makers in development and implementation of military policy.

The Joint Trauma System maintains oversight of the information system. In doing so, it defines the roles and responsibilities for agencies and MTFs regarding data collection and outlines processes to evaluate the quality, timeliness, and completeness of data. There is a means to ensure patient and provider confidentiality adheres to federal regulations. The agency develops policies and procedures to facilitate and encourage injury surveillance and trauma care research using data derived from the DoDTR. Patient information collected within the DoDTR is standardized to ensure that noted variations in care can be characterized in a similar manner across differing geographic regions, facilities, and prehospital agencies. The composition of patients and injuries included in the DoDTR (inclusion criteria) is consistent across centers, allowing for the evaluation of processes and outcomes among similar patient groups. The optimal approach is to collect data from all acute care facilities within the military trauma system. However, within the combat zone, it is not always possible to collect data from smaller MTFs,

especially Level IIs. Uniform protocols are in place for data abstraction and collection. Research suggests that if the process of case abstraction is not routinely calibrated, practices used by abstractors begin to drift.

To derive value from the tremendous effort that goes into data collection, it is important that a similar focus address the process of data reporting from the DoDTR. Dedicated staff and resources must be available to ensure rapid and consistent reporting of information to vested parties with the authority and vision to prevent injuries and to improve the care of patients with injuries. An optimal information reporting process will include standardized reporting tools that allow for the assessment of temporal and/or system changes as well as a dynamic reporting tool, permitting anyone to tailor specific “views” of the information.

The Joint Trauma System should support individual MTFs in accessing their institution’s data to create reports for a wide variety of purposes using the DoDTR Report Writer function. A limited number of predefined reports must be available to provide a system-wide snapshot of the prevalence of a predetermined set of demographic data, injury scoring reports, mechanism of injury, procedures, diagnoses, complication rates, systems events, unique injury populations, and some aspects of the patient experience moving through the military trauma system.

Optimal Elements

1. There is an established Department of Defense Trauma Registry for ongoing injury surveillance and system performance assessment.
 - a. There is an established injury surveillance process that can, in part, be used as a DoDTR performance measure.
 - b. Injury surveillance is coordinated with DoD stakeholders.
 - c. There is a process to evaluate the quality, timeliness, completeness, and confidentiality of data at the system level and the MTF level.
2. The DoDTR is used to facilitate ongoing assessment and assurance of system performance and outcomes; and it provides a basis for continuously improving the trauma system, including a benefit analysis.

- a. The Joint Trauma System ensures that each member hospital of the trauma system collects and uses patient data, as well as provider data, to assess system performance and to improve quality of care. Assessment data are routinely submitted to the Joint Trauma System.
- b. Prehospital care providers collect patient care and administrative data for each episode of care. They not only provide these data to the hospital, but also have a mechanism to evaluate the data within their own agency, including monitoring trends and identifying outliers.
- c. The DoDTR is a comprehensive trauma system registry that incorporates data from ED, prehospital agency, rehabilitation, and other sources.
- d. The Joint Trauma System has available for use the latest in computer/technology advances and analytic tools for monitoring injury prevention and control components of the trauma system. There is reporting on the outcome of implemented strategies for injury prevention and control programs within the trauma system.

RESEARCH

Purpose and Rationale

OVERVIEW OF RESEARCH ACTIVITY

The Joint Trauma System is a performance improvement-based organization. The problems inherent in the care of both combat and noncombat related casualties in a foreign theater of operations and the array of potential solutions are diverse. This diversity reflects the need to tailor the system to meet the specific needs of a region based on the unique combination of geographic, strategic, and tactical characteristics. In addition, an extension of the Joint Trauma System into a specific theater of operation is not fixed in time, location or operation. The system evolves over time in response to lessons learned, critical review, and changes in the tactical situation. When research can be conducted, it is valuable to evaluate the effectiveness of the Joint Trauma System, both as a whole and with respect to its subcomponents. Performance improvement drives the system and provides the foundation for system development and research. Research helps provide value in defining best practices that might alter system development. Thus, the system should encourage and facilitate trauma-related research through processes designed to make data available to investigators. The DoD and the individual Services should also provide funding for research activities. All system components should contribute to the performance improvement and research agendas. The extent to which research activities are required should be clearly outlined in the trauma system plan.

The DoDTR is a prime source of data used for retrospective research, under IRB protocols. As of 2011 this database primarily captures serious trauma admitted to Level III facilities. In order to capture all serious trauma within a theater of operations, it would need to be expanded to include data collection on all admissions from Level I and II and outcome data from Level V. To capture all trauma (minor trauma not admitted) it would have to be expanded even further. As an alternative, population-based research might provide a broader view of trauma care within the region. Primary source data collection is expensive but could provide insights into system performance that might not be otherwise available. An adequate electronic medical record that was

available at all levels, required minimal training, and was not burdensome to the providers could help augment costs and additional personnel.

TRAUMA REGISTRY-BASED RESEARCH

Investigators examining the Joint Trauma System can use the information recorded in the DoDTR to great advantage. They can determine the prevalence and annual incidence rate of injuries, specific patterns of injury, the timeliness and appropriateness of care that is delivered to injured patients in the various regions, and clinical outcomes for these patients. These data can be compared with standards available from other trauma registries, such as the National Trauma Data Bank (NTDB), with the understanding that the fundamental nature of the populations and injuries involved are not strictly comparable. Such comparisons may enable investigators to assess outcomes within the Joint Trauma System in relation to civilian systems, and may allow for benchmarking. Initiating and sustaining injury prevention and casualty performance initiatives is an important goal of the Joint Trauma System. Investigators can take a leadership role in performing research using trauma registry data that identify emerging threats and instituting appropriate measures to mitigate the threats.

Joint Trauma System administrators have a responsibility to manage appropriate access to the data. Administrators have a responsibility to control investigators' access to the registry. The integrity and reliability of data in a trauma system's registry are essential if accurate research and valid conclusions are to be reached using the data. Joint Trauma System administrators should have a process for information assurance that screens data entered into the system's composite registry from individual facilities. There should be a mechanism that ensures that the information is stored and accessed in a secure manner. Investigators who seek access to the trauma registry must follow a written policy, create a data sharing agreement with a legally reviewed Memorandum of Understanding (MOU) and follow a procedure, which includes approval by an authorized institutional review board or boards if data from more than one institution are involved. Trauma registry data may include unique identifiers, and system administrators must ensure that patient confidentiality is respected, consistent with state and federal regulations.

POPULATION-BASED TRAUMA SYSTEM RESEARCH

A major disadvantage of using only trauma registry data to conduct research that evaluates injured patients in a civilian system is the bias resulting from missing data on patients not treated at trauma centers. Given the closed nature of the Joint Trauma System, and stronger authority regarding data collection, registry data are likely to be more comprehensive, approximating a population-based data set. Civilian datasets, such as state and national hospital discharge databases are less likely to be of value in evaluation of the Joint Trauma System, but may have applicability in specific settings where accurate and efficient electronic databases are integrated.

PARTICIPATION IN RESEARCH PROJECTS AND PRIMARY DATA COLLECTION

Multi-institutional research projects are important mechanisms for learning new knowledge that can guide the care of injured patients. Investigators within trauma systems can participate as coinvestigators in these projects. Investigators can participate by recruiting patients into prospective studies, being leaders in the design and administration of grants, and preparing manuscripts and reports. Joint Trauma System staff should identify and reach out to resources both inside and outside the military with research expertise. These include academic centers and public health agencies.

MEASURES OF RESEARCH ACTIVITY

Research can be broadly defined as hypothesis-driven data analysis. This analysis leads the investigators to a conclusion, which might become a recommendation for system change. Full manuscripts published in peer-reviewed research journals are an exemplary form of research activity. Research reported in annual reviews or in public information formats intended to inform the trauma system's constituency can also be considered legitimate research activity.

Optimal Elements

1. The Department of Defense Trauma Registry is used to facilitate ongoing assessment and assurance of system performance and outcomes; and it provides a basis for continuously improving the trauma system, including a benefit analysis.
 - a. The Joint Trauma System has available for use the latest in computer/technology advances and analytic tools for monitoring injury prevention and control components of the trauma system.
2. There is reporting on the outcome of implemented strategies for injury prevention and control programs within the trauma system.
3. The Joint Trauma System ensures that the trauma system demonstrates prevention and medical outreach.
 - a. The JTS has developed mechanisms to engage all military trauma system participants in their research findings and performance improvement efforts on a concurrent and continual basis.
 - b. The effect or impact of outreach programs at all levels within the JTS structure is evaluated as part of a system performance improvement and patient safety process.
4. Each MTF will continually work to improve the trauma care as measured by patient outcomes.
 - a. The trauma system implements and regularly reviews a standardized report on patient care outcomes as benchmarked against national or specific military norms.

GLOSSARY

Acronyms	Title
ACS	American College of Surgeons
ACS-COT	American College of Surgeons – Committee of Trauma
AE	Aeromedical Evacuation
AF	Air Force
AMEDD	Army Medical Department
AMEDD C&S	AMEDD Center and School
AOR	Area of Responsibility
BAS	Battalion Aid Station
BIS	Benchmarks, Indicators and Scoring
BSWM	Body surface wound mapping
CASEVAC	Casualty Evacuation
CASS	Center for AMEDD Strategic Studies
CCB	Configuration Control Board
CCB-IPT	Configuration Control Board – Integrated Product Team
CCATT	Critical Care Air Transport Team
CENTCOM	U.S. Central Command
CHCS II/IIT	Composite Health Care System II / II Theater
COCOM	Combatant Command
CONOPS	Concept of operations
CONUS	Continental United States
CoS	Chief of Staff
CPG	Clinical Practice Guideline
CSH	Combat Support Hospital
CY	Calendar Year
DB	Database
DBA	Database associate
DCO	Deputy chief of operations
DHB	Defense Health Board
DHIMS	Defense Health Information Management System (formerly TMIP and CITPO)
DMRTI	Defense Medical Readiness and Training Institute
DoD	Department of Defense
DoDTR	Department of Defense Trauma Registry
ED	Emergency Department
EMEDS	Expeditionary Medical Support

EMF	Expeditionary Medical Facility
EMS	Emergency Medical Service
FACS	Fellow, American College of Surgeons
FHP&R	Force health protection and readiness
GAO	U.S. General Accounting Office
HA	Health Affairs
HRSA	Health Resources and Services Administration
IAW	In accordance with
ICD-9 CM	International Classification of Diseases, 9th edition, Clinical Modification
ICU	Intensive Care Unit
IED	Improvised Explosive Device
IRB	Institutional Review Board
IT	Information Technology
IV	intravenous
JCTMC	Joint Combat Trauma Management Course
JMD	Joint Manning Document
JTAPIC	Joint Trauma Analysis Prevention in Combats
JTS	Joint Trauma System
JTTR	Joint Theater Trauma Registry
JTTS	Joint Theater Trauma System
LRMC	Landstuhl Regional Medical Center
MC	Medical Corps
MCI	Mass Casualty Incident
MEDCOM	Medical Command
MEDEVAC	Medical Evacuation
MHSS	Military Health Services System
MIS	Management Information System
MNC-I	Multi-National Corps - Iraq
MOA	Memorandum of Agreement
MOTR	Military Orthopedic Trauma Registry
MOU	Memorandum of Understanding
MTF	Medical Treatment Facility
NATO	North Atlantic Treaty Organization
NCO	Noncommissioned Officer
NCOIC	Noncommissioned Officer in Charge

NICU	Neonatal Intensive Care Unit
NTDB	National Trauma Data Bank
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
PASBA	Patient Administration and Biostatistics Activity
PHTR	Prehospital Trauma Registry
PI	Performance Improvement
PIPS	Performance Improvement and Patient Safety
POI	Point of Injury
POM	Program Objective Memorandum
QA	Quality Assurance
SCI	Spinal Cord Injury
SG	Surgeon General
SPC	Specialist
SSI	Specialty Skill Identifier
TBI	Traumatic Brain Injury
TCCC	Tactical Combat Casualty Care
TFWG	Theater Functional Work Group
TMDS	Theater Medical Data Store
TMIP-J	Theater Medical Information Program- Joint (now DHIMS)
TNC	Trauma Nurse Coordinator
TOPIC-M	Trauma Outcomes and Performance Improvement Course - Military
USAISR	U.S. Army Institute of Surgical Research
USAMITC	U.S. Army Medical Information and Technology Center
VA	Veterans Affairs

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