
COMMITTEE ON SURGICAL COMBAT CASUALTY CARE POSITION STATEMENT



ROLE 2 ORTHOPEDIC SURGERY NEEDS ASSESSMENT FOR LARGE SCALE COMBAT OPERATIONS



INTENT

1. Inform the Joint Force on the historic burden of orthopedic injuries and precedents for orthopedic surgical intervention during combat operations and its anticipated requirement in large-scale combat operations (LSCO).
2. Recommend developing doctrine which defines the deployment of orthopedic surgeons within a military theater of operations in order to assist the Joint Force with optimizing deployed orthopedic surgical capabilities for LSCO.
3. Improve battlefield care of Service Members with orthopedic injuries.

FACTS

1. **An orthopedic surgeon is a board eligible or board-certified physician in the medical specialty of Orthopedic Surgery.**
 - Orthopedic surgeons provide specialized surgical care for bone and soft tissue injuries of the extremities, pelvis, and spine.
2. **Orthopedic surgeons are not substitutable for surgical management of orthopedic injuries.**
 - Most general surgeons are not privileged to perform orthopedic surgical procedures, nor do they have significant experience in performing them.
 - The Accreditation Council for Graduate Medical Education does not require education in orthopedic surgery as part of a General Surgery residency training program.¹
3. **In U.S. and NATO doctrine, the furthest forward surgical care on the battlefield is the Role 2 level.**
 - The Army, Navy, and Air Force Medical Corps all employ and deploy orthopedic surgeons.
 - Providing orthopedic surgical procedures remains a doctrinal requirement for Role 2 surgical units.²
4. **Orthopedic surgery comprises a significant volume of surgical procedures for combat injuries.**
 - An overwhelming majority of combat wounded personnel have an orthopedic injury. 58% of combat casualties in World War II³ and 75% in the Global War on Terror (GWOT) had extremity injuries.³⁻⁹
 - From 2002 to 2016 over 51,000 orthopedic procedures were performed during counterinsurgency operations in U.S. Central Command (CENTCOM). This number is miniscule compared to what is anticipated during large-scale combat operations.¹⁰
 - 12% of Forward Surgical Team patients in Afghanistan were polytraumas of which 60% also had orthopedic injury.¹¹
5. **Orthopedic surgery for combat casualties is resource intensive in operating room materiel.**
6. **Deploying orthopedic surgeons will decrease extremity injury morbidity and mortality and consequent battlefield attrition.**
 - Disease non-battle injury further increases the volume of musculoskeletal injury in the deployed setting being three times as common as battle injury.¹²
 - Maintaining combat power in light of the anticipated casualty volume in LSCO will be difficult. The presence of an orthopedic surgeon to accurately diagnose and treat minor extremity injuries may improve return to duty without having to evacuate these injured service members from theater.
 - Combat orthopedic injuries are a significant source of disability and inability to return to duty. (64% of soldiers with a primary diagnosis of extremity wound were ultimately found unfit for service.)⁷
7. **The concept of 'damage control' has been adopted in battlefield trauma care. It is a strategy of rapid interventions that support the physiologic restoration of the casualty (avoid hypothermia, coagulopathy, acidosis, etc.) over definitive anatomic repair.**
 - Damage control orthopedics (DCO) is applied in unstable polytrauma patients with pelvic and long bone fractures to mitigate the physiologic impact of these fractures (bleeding, inflammation, pain) by temporarily stabilizing them to avoid a 'second hit' from a lengthy definitive orthopedic operation shortly after injury.
 - Deployable orthopedic surgeons must be capable of optimizing limb salvage through temporary fracture stabilization utilizing splinting or external fixation, extremity wound debridement and infection management, amputation, fasciotomy, and temporary vascular shunting. (See [Appendix A](#))

Background and Relevance

Irrespective of the conflict, extremity injuries account for the majority of combat injuries requiring surgical management. The management of orthopedic injuries and trauma has been an historic principle in wartime casualty management, and surgeons with orthopedic expertise have been a part of the battlefield care paradigm since antiquity. During World War I, casualties with a femur fracture had an 80% mortality.¹³ This was reduced to 20% by the introduction of the Thomas Splint in 1918 by Dr. Hugh Owen Thomas, who has been considered the father of orthopedic surgery in Great Britain. An analysis of the DoD Trauma Registry from 2002 to 2016 demonstrated that of the over 189,150 procedures performed 37.5% involved soft tissue injuries and 13.8% involved osseous injuries.¹³

Forward surgical care at Role 2 Military Treatment Facilities (MTFs) evolved during the GWOT conflicts in Iraq and Afghanistan. Combat casualty care during the counterinsurgency operations of GWOT focused on rapid transport to reach surgical care within the “Golden Hour” for early lifesaving hemorrhage control.¹⁴ Role 2 MTFs were positioned accordingly throughout the theater to maintain the Golden Hour. The U.S. enjoyed unchallenged air superiority which ensured rapid casualty transfer usually within 3-5 hours¹⁸ to Role 3 facilities which all had orthopedic surgeons. Later in GWOT, with the adoption of the Austere Resuscitative Surgical Care construct which utilized smaller, more agile surgical teams closer to the point of injury the need for Role 2 damage control orthopedics was tapered because there is no orthopedic Golden Hour.^{15,16} Furthermore, many of these small teams did not have an assigned orthopedic surgeon. After undergoing hemorrhage and contamination control at Role 2 MTFs casualties would be rapidly transported to Role 3 MTFs where they would receive any needed damage control orthopedics.^{17,18} This bias for DCO at the Role 3 was revealed in a subgroup analysis from the Joint Trauma System of 51,159 orthopedic procedures performed over 15 years in CENTCOM; 85% of these procedures were performed at the Role 3 MTFs.¹⁹

This GWOT deployed trauma system led to the questions: 1) is DCO necessary at Role 2 MTFs? and 2) should orthopedic surgeons be deployed to Role 2 MTFs? The answer to these questions pivots on the physiology and injuries of the casualty and the capabilities of the deployed trauma system. If casualties are dying from hemorrhage secondary to traumatic injuries, then the goals of initial surgical care are to stabilize hemorrhage, which in cases of severe pelvic and long bone fractures includes orthopedic stabilization. In polytrauma patients treated at Role 2 MTFs the presence of an orthopedic surgeon can diminish the length of surgery by stabilizing orthopedic sources of hemorrhage simultaneously with the General Surgeon stabilizing truncal sources of hemorrhage. Additional reasons to consider performing DCO at Role 2 MTFs in this GWOT environment are if a Role 2 is far from the Role 3 or there are other impediments to reliable rapid transfer. Lastly DCO must be performed at Role 2 MTFs for patients, like partner forces or civilian casualties, who may not be eligible for care at the Role 3.

Considering the ongoing large-scale conflicts in both European Command and CENTCOM and the pacing threats for the potential of peer-peer conflict, the U.S. Military has pivoted toward preparedness for LSCO.¹¹ LSCO will substantially stress the battlefield trauma system secondary to the volume and complexity of casualties generated. Additionally, longer transport times between roles of care as well as need for prolonged casualty holding at every role of care are anticipated. Although warfare has evolved since the last time the U.S engaged in LSCO, the expectation remains for large volumes of extremity injuries which will require surgical management. Ensuring Role 2 surgical capabilities are manned, trained and equipped for damage control orthopedic surgery will decrease battlefield death and morbidity during large scale combat. Adequate preparation for LSCO requires ensuring there are enough orthopedic surgeons to manage orthopedic injuries at Role 2 MTFs and at every subsequent role of care in the DoD’s Trauma System.

ASSUMPTIONS AND RISK

1. Future conflicts are anticipated to be LSCO with large numbers of casualties, multiple mass casualty incidents, and delays in evacuation.
2. High rates of orthopedic injuries are anticipated in LSCO.
 - LSCO will produce exponentially more casualties (6,967 KIA and 52,802 WIA in GWOT^{18,19}, 270 KIA and 62,489 WIA Battle of the Bulge¹¹) with attendant stress on medical resource utilization and management.^{21,22}
 - The time constraints of damage control surgery may lead to increased morbidity of extremity injuries if an orthopedic surgeon is not available for timely DCO.
 - Orthopedic surgeons must have proper Class VIII resources, like radiographic capabilities, to optimally manage combat orthopedic trauma.
3. Increased combat theater size and lack of assured air superiority will limit casualty movement in LSCO.
 - The United States lacks firsthand experience with casualty movement in the modern era of drone surveillance and cyberwarfare.
 - Role 3 medical facilities risk being targeted during LSCO. Therefore, positioning of Role 3 MTFs has the potential to be more dynamic which could further prolong evacuation timelines and further delay DCO interventions if orthopedic surgeons are not located at Role 2 MTFs.
4. An adequate inventory of deployable orthopedic surgeons to staff Role 2 through Role 4 MTFs is a critical planning factor for management of orthopedic injuries in future conflict.
5. Extremity injuries that do not receive adequate surgical management in the deployed theater will result in increased morbidities to include infection, amputation, loss of extremity function, chronic pain, disability, and overall force attrition.

6. Combat historically drives medical innovation. If orthopedic surgeons are not present along the continuum of surgical management of combat extremity injuries from Roles 2-4, there is a risk of missing innovation and advancement in orthopedic injury management.

RECOMMENDATIONS

The Committee on Surgical Combat Casualty Care, Defense Committee on Trauma¹, Tri-Service Orthopedic leadership, and the Joint Trauma System as the reference body for trauma across the military health system² recommend the following to mitigate risk to the Joint Force from musculoskeletal injuries sustained in large scale combat operations.

1. Orthopedic surgeons remain on Role 2 Surgical Teams for all the Service constructs of Role 2 forward surgical care.
2. Implement a joint interoperable orthopedic surgery support for military operations where:
 - Role 3 orthopedic care is not Military Department specific, and orthopedic surgeons are interchangeable between departments.
 - Military Department retention of orthopedic surgeons should be prioritized.
3. Medical Planners undergo recurring education on how to best deploy orthopedic surgeons to:
 - Understand concepts of 'damage control' as it applies to the military continuum of battlefield surgical care to include damage control orthopedics (rapid temporary stabilization of pelvic/long bone fractures, extremity hemorrhage control, and wound management to facilitate physiologic stabilization of a polytrauma casualty).
 - Distribute orthopedic surgeons to best support all roles of surgical care during large scale combat operations.
 - Integrate critical resources like orthopedic Class VIII resupply into medical plans.
 - Optimally match MTF capabilities with anticipated orthopedic surgical combat casualty care requirements.
4. Role 2 and Role 3 MTFs should be equipped to provision orthopedic surgical care to include plain radiography (X-ray) capability, OR sets, and other Class VIII requirements.
5. Both pre-deployment and sustainment training specific for high energy orthopedic trauma is critical to maintaining deployment-ready orthopedic surgeons. This can be accomplished through military hospital surgical practice, military-civilian partnerships, or Memorandums of Understanding/Training Affiliation Agreements which allow currency in orthopedic trauma.
6. The Emergency War Surgery Course which includes the Combat Orthopedic Trauma Surgery (COTS+) and the Advanced Surgical Skills for Exposure in Trauma (ASSET+) courses should be maintained and required at least every 3 years for military orthopedic surgeons and general surgeons. This provides both surgeons refresher training for their primary surgical role and the knowledge to better assist their respective counterparts in the management of combat casualties.

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¹ DoD Instruction 6040.47, "Joint Trauma System (JTS)," September 28, 2016, as amended

² Public Law 114-328, Section 707, "National Defense Authorization Act for Fiscal Year 2017," December 23, 2016

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APPENDIX A**Essential JTS Clinical Practice Guidelines (CPGs) for Orthopedic Surgeons**

Amputation: Evaluation and Treatment, 10 Oct 2024
Cervical and Thoracolumbar Spine Injury Evaluation, Transport and Surgery in the Deployed Setting, 19 Jun 2020
Acute Compartment Syndrome and the Role of Fasciotomy in Extremity War Wounds, 25 Jul 2016
High Bilateral Amputations and Dismounted Complex Blast Injury, 05 Aug 2024
War Wounds: Debridement and Irrigation, 27 Sep 2021
Pelvic Fracture Care, 15 Mar 2017
Orthopedic Trauma: Extremity Fractures, 15 Mar 2017

Orthopedic Surgery Individual Critical Task Lists (ICTL)

Complete COTS+ course every 4 years
Complete Joint Forces Combat Trauma Management Course every 4 years
Complete Advanced Trauma Life Support every 4 years
Perform a fasciotomy
Perform vascular repair and/or placement of a vascular shunt
Perform external fixation of fractures
Perform a definitive below knee amputation
Perform initial stabilization of a spinal injury
Treat a pelvic fracture

Critical Procedures as Outlined in COTS+ Manual and CPGs

Surgical debridement of wounds and open joints
Primary amputation of mangled extremity
Definitive amputation
Application of spinal immobilization
Complete fasciotomy of the upper and lower extremities
Extremity escharotomy
Pelvic packing
Pelvic ring stabilization with binder or external fixation
External fixation of long bone fractures
Spanning external fixation of the ankle, knee, and elbow
Vascular exposure and control of subclavian, axillary, brachial, radial, and ulnar arteries
Vascular control of external iliac, common femoral, superficial femoral, profunda, and popliteal arteries
Temporary vascular shunting above the knee or elbow

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