Administration of a Level 1 Trauma Program

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Introduction

- The current structure of trauma care in the United States has evolved largely based on lessons learned during the 20th century. One of the central concepts in this structure is centralization of the care for the most severely injured patients at trauma centers. While there are varied ways that hospitals can become designated as trauma centers, the most common and well-studied method, is via verification by the American College of Surgeons (ACS).

- Verification by the ACS is a voluntary process in which hospitals are evaluated based on defined criteria to ensure that they possess the resources and commitment to provide optimal care for injured patients. Hospitals can pursue verification as Level I, II, III, or IV trauma centers, with Level I centers offering the most advanced and comprehensive level of care for the injured patient.

- The Level I trauma center plays a central role in coordination of the regional care of trauma patients. The Level I trauma center coordinates longitudinal care with field triage, comprehensive inpatient care, and rehabilitation of injured patients within the scope of these programs. In addition, the education of caregivers and quality assurance, with respect to the continuum of trauma care, are also key components of these centers.
- In addition to patient care, the Level I center plays an important role in research and development of systems for ongoing improvement. The comprehensive guide to the development and administration of trauma centers, based on the ACS guidelines, is contained in Resources For Optimal Care Of The Injured Patient published by the Committee On Trauma of the ACS (ACS-COT).

Clinical Administration of the Level I Trauma Center

- *Prehospital Care*
  - Optimal trauma care begins at the initial contact of medical personnel with the injured patient. Personnel of the trauma program should participate in the training of prehospital providers, as well as with development and continuing monitoring (process improvement) of prehospital care protocols.
  - Protocols will include specific patient management guidelines, as well as specific destination guidelines based on available regional resources and apparent severity of injury.
    - This will include guidelines for the use of air transport if this is available in the region.
    - Destination guidelines should be based on the 2011 Guidelines for Field Triage of Injured Patients, published by the Centers for Disease Control and Prevention.
  - As part of the ongoing performance improvement and patient safety (PIPS) program, the trauma program should participate in the evaluation of, and

compliance with, these guidelines as well as the incidence of undertriage and overtriage.

- *Interhospital Transfer*
  - Level I centers must develop transfer guidelines with other hospitals in the region to ensure that severely injured patients reach appropriate levels of care expeditiously.
  - Transfers need to occur after a direct physician-to-physician conversation and determination that the receiving hospital has the resources and capacity to care for the patient.
  - Injured patients at referring hospitals should be care for initially based on the principals outlined in the Advanced Trauma Life Support for Doctors materials from the ACS Committee on Trauma.

- *Clinical Functions-General Surgery*
  - The general surgeon is a central pillar in the clinical management of the injured patient. In addition to the evaluation and management of trauma patients, the general surgeon functions as a coordinator for all aspects of care, and must reconcile recommendations from other specialties.
  - General surgeons caring for trauma patients at Level I centers must maintain current board certification and clinical involvement. They must participate in the PIPS efforts and maintain adequate continuing education.
  - The Trauma Medical Director (TMD) for the trauma center must be drawn from this general surgery cadre.

- *Clinical Functions-Emergency Medicine*
  - In many cases, the emergency medicine (EM) physician is the first physician most trauma patients see. EM specialists allow for a safe transition from field care by emergency medical services to optimal care within the emergency department.
  - Roles and responsibilities of the general surgeons and emergency medicine physicians caring for trauma patients should be well defined and agreed upon.
  - Emergency medicine providers must be board certified, and maintain adequate clinical involvement. Continuing education as well as PIPS participation at the emergency medicine and multi-disciplinary peer review level is also required.

- *Clinical Functions-Neurosurgery*
  - Neurotrauma should be organized by a neurosurgeon with trauma care experience. Traumatic brain injury (TBI) accounts for roughly 40% of trauma deaths and significant morbidity and mortality may be mitigated by appropriate care after initial injury.
  - Neurotrauma care must be continuously available for all TBI patients. Neurosurgical care must also be immediately those with spinal cord injuries (though these responsibilities may be shared with appropriately trained and credentialed orthopedic surgeons).

- Given the current shortage of neurosurgeons in the US, a neurotrauma specialist may be on call for more than 1 institution. Therefore, a backup call schedule that ensures timely initial evaluation of those with suspected neurologic injury is necessary.
- The neurosurgical staff involved in trauma care must be board certified and maintain adequate continuing education and clinical involvement. Involvement in PIPS efforts centering on neurotrauma care is also necessary.

- *Clinical Functions-Orthopedic Surgery*
  - Orthopedic care must be overseen by a physician who has completed an Orthopedic Trauma Association recognized fellowship in orthopedic traumatology. The burden of orthopedic injury is significant, with over half of patients having an orthopedic injury.
  - Orthopedic liaisons must also ensure that adequate non-physician care is available to provide comprehensive care of those with complex orthopedic injuries. These team members may include occupational and physical therapists, rehabilitation workers and skilled individuals able to provide and oversee cast and splint placement as well and traction management.
  - Orthopedic surgeons participating in trauma care at the Level I centers must be board certified, and maintain adequate clinical involvement. Continuing education as well as PIPS participation is also required.

- *Collaborative Clinical Services*
  - Other services are also required to provide collaborative care to the injured patient at a Level I center.
    - Anesthesia services must be available 24 hours a day and should be organized by a board certified anesthesiologist committed to trauma care.
    - Conventional radiology must also be available 24 hours a day and staffed by a board certified radiologist.
    - Both specialties play a central role in the evaluation and care of the injured patient and should participate in multidisciplinary PIPS.
    - While needed with less regularity, a Level I center must have available other surgical services such as cardiothoracic surgery, vascular surgery, plastic and otolaryngology surgery, ophthalmology, urology, and obstetric/gynecologic surgery.
  - An adequately staffed and equipped operating room with immediate (15 minutes) availability is a Level 1 requirement. Availability and optimal function should be continuously evaluated by the PIPS program.
    - Adequate post anesthesia care space and personnel available 24 hours a day is also required.
  - Intensive care unit services are vital to the trauma center. Trauma care in the ICU should be directed by a physician certified in surgical critical care.
    - 24-hour coverage is mandated

        - In addition, critical care nursing by qualified nurses must be available at all times.
    - Support services (e.g. respiratory care, hemodialysis, and nutrition support services), as well as clinical laboratory staff and social workers, must be available and involved in trauma care.
        - Adequate equipment for these services must be available and adequately maintained and staff should be trained to safely use these items.

- *Rehabilitation*
    - Adequate rehabilitation resources contribute to the prevention of further functional loss and recovery after trauma. The ultimate goal is to return the patient to the highest level of function possible, and this effort begins on admission to the hospital.
    - Rehabilitation should be pursued through a team structure and Level I trauma centers must have Physical therapy, Occupational therapy, Speech therapy and social services available to pursue this goal.
    - Access to rehabilitation services for TBI and spinal cord injury are also commonly needed after injury.
    - Increasing awareness of the mental health sequelae of traumatic injury demonstrates the frequency of this problem and that it interferes with functional recovery. Identification and treatment of, or prevention of, post-traumatic stress disorder and depression can be accomplished by screening and early referral to psychotherapy and psychiatry services.

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- *Trauma Registry*
    - The trauma registry consists of a dataset describing the injury circumstances, prehospital care, demographics, care and outcomes for injured patients.
    - The dataset should be compliant with the National Trauma Data Standard (NTDS) and will be submitted to the National Trauma Data Bank (NTDB) on a yearly basis.
    - Data collection, entry, and management is done by dedicated trauma registrars. One registrar is necessary for every 500-750 trauma patients placed in the registry and they should work closely with the trauma program manager (TPM) and the TMD.
    - The registry serves multiple roles in trauma management at the local and regional levels. The registry is essential for the PIPS program and is used to track outcomes, comparing current function to previous time frames locally, as well as to national benchmarks on performance.
    - Performance improvement objectives are formulated and programs implemented and tracked based on the registry data.

- In addition to local PIPS objectives, the registry data play an important role in identifying and addressing appropriate injury prevention and public health issues in the region.
- The registry also plays a vital role in trauma-related research.
- Registry data can be used to determine resource utilization and needs. Such information can be used to justify institutional financial support for needed resources.

- *Performance Improvement and Patient Safety*
  - Process improvement programs are required for the continuous monitoring, assessment, and management directed at improving trauma care.
  - One important function of the PIPS process is to help reduce unnecessary variations in care by developing and tracking compliance with management protocols and pathways.
  - Processes outlined should allow for reliable event identification, development of corrective action plans, and methods of re-evaluation and loop-closure, to ensure corrective action has been effective.
  - Events identified by the PIPS process will undergo a tiered review that ranges from the PIPS program itself, review by the trauma medical director, review at group-level Peer meetings or hospital-level peer review.
  - The trauma Peer Review program involves evaluation by multidisciplinary committee. This committee consists of surgeons on the trauma call panel, as well as liaisons from emergency medicine, orthopedics, neurosurgery, radiology and anesthesia/critical care.
  - When opportunity for improvement is identified, corrective actions must be determined, carried out, and documented.

- *Education, Outreach and Prevention*
  - Trauma centers play an important role in ongoing education of the public, as well as other health care professionals.
  - Public education is largely focused on injury prevention strategies. This helps reduce death and disability by educating the public as to the nature of the disease of trauma and methods of prevention, such as seat belt use, bicycle helmet use, intoxicated driving awareness, and prevention of gun violence.
    - First aid and cardiopulmonary resuscitation courses are also important pieces of the trauma education and outreach effort.
    - These efforts include the numerous courses available for physicians, nurses, or other caregivers in trauma care. Some examples include Advanced Trauma Life Support for Physicians and Trauma Nursing Core Course for nurses. Education of residents at level 1 centers also is a vital part of professional education.

- *Trauma Research and Scholarship*
  - The Level I trauma center is uniquely positioned to advance the methods and understanding of care of the injured patient. The large volume of injured patients in the setting of an academic medical center allows research questions

to be developed and explored. This may take the form of basic science inquiry, translational, or purely clinical research.
    - Research activity is required for trauma center verification and serves to improve care and outcomes over time.
    - Scholarly activities in the trauma arena serve to build and advance the structure of trauma care. Such activities include, among other things, participation and leadership in major trauma organizations, participation in regional or national conferences, and supporting resident participation in similar activities.

- *Disaster Planning and Management*
    - Disaster management is a multidisciplinary effort that trauma surgeons are uniquely positioned to play a useful central role in. A surgeon from the trauma panel must be a member of the hospital disaster committee.
    - Planning and drills for such events should be tailored to the local risk assessment. Such drills should occur in conjunction with other hospitals in the region or state, as well as local first responders, emergency management and public health agencies.
    - Development of a hospital disaster plan starts with a local hazards vulnerability analysis based on assessment of the most likely threats to the hospital and surrounding community. This evaluation is used to develop an "all hazards" plan addressing response to multiple types of disasters.
    - The management of incidents should be done within the structure of the Hospital Incident Command System (HICS). This is an emergency management system that has clearly defined responsibilities and reporting structures and is scalable to the size and extent of the incident.

- *Solid Organ Procuremen*t
    - *T*he trauma center must have an established relationship with a recognized organ procurement organization (OPO) and should work closely to see that best practices are followed when dealing with possible donors.
    - As potential donors are recognized, it is important that the OPO team, rather than the primary care team, approach the family for possible consent. This has been shown to result in higher rates of consent for donation.
    - Most donors in trauma care are declared deceased under the criteria of brain death. A trauma center must have a written protocol for declaration of brain death that is consistent with national and local guidelines.

<u>Verification Process</u>

- ACS verification of Level I centers is provided via a site-visit by a multidisciplinary team including 2 ACS-COT surgeons and an experience trauma program manager (RN).
- A consultation visit, which focuses on providing suggestions in preparation for a verification visit, may be requested in preparation for the formal verification visit.

- The most recent edition of Resources For Optimal Care Of The Injured Patient outlines structure of the visit as well as the criteria that must be met by the trauma center in order to be verified. Verified centers will have demonstrated an institution wide, multidisciplinary commitment to the care of the injured patient.

Suggested Reading:

1. Rotondo MF, Cribari C, Smith RS. American College of Surgeons Resources for Optimal Care of the Injured Patient 2014. 6th edition, 2014.