

## **CHAPTER 9- CLINICAL FUNCTIONS: ORTHOPAEDIC**

### **OTA Model of Orthopaedic Service Organization Surgery**

More than half of all hospitalized trauma patients have one or more musculoskeletal injuries that could be life- or limb-threatening or that might result in significant functional impairment. An estimated 200,000 adolescents and adults under the age of 65 years are hospitalized each year in the United States for the management of lower extremity fractures. These injuries are the leading cause of all trauma admissions in this age group, generating \$1.2 billion in hospital costs.<sup>1</sup> The majority of these patients are male blue-collar workers who are motivated to perform well at their jobs.<sup>2</sup>

The probability of death caused by an injury is higher in rural areas particularly if motor vehicle related. The development of rural based trauma systems is critical to the overall advancement of orthopedic trauma care.

Patients with isolated simple fractures with low-grade soft tissue injuries are appropriately treated in any well-equipped hospital by orthopaedic surgeons committed to quality fracture care. Patients who have multiple fractures, fractures associated with multiple injuries, complex fractures (including pelvic, acetabular, intraarticular, and spinal column) and high-grade soft tissue injuries are appropriate candidates for musculoskeletal trauma care in a Level I or II trauma center. The more complex the spectrum of injury, the more important the decision-making process becomes. For example, prompt stabilization of proximal long bone fractures and spinal fractures has the potential to decrease inflammatory mediator production, catecholamine release, analgesic requirements, morbidity rate, and hospital costs.<sup>3</sup> It is important to categorize patients as to their physiologic insult, anatomic injuries and their response to resuscitation in order to plan the appropriate fracture management. For example, a patient with an unstable pelvic fracture with significant bleeding and potential intraabdominal hemorrhage requires rapid and coordinated consultation among many specialty services. The team decides the priority of laparotomy, angiography, and spinal, pelvic and long bone fracture stabilization. Such patients are best managed by experienced personnel with significant resources and protocols at Level I or II trauma centers.

Musculoskeletal trauma usually requires a prolonged recovery phase because of the extended healing time of the soft tissue and bony injury. Early established and continuing physical, mental, and vocational rehabilitation maximizes both functional and psychological outcome.

### **MUSCULOSKELETAL TRAUMA PATIENT TYPES**

Patients with musculoskeletal injury can be classified into three distinct types that affect resource utilization.

The first type is a patient with an isolated closed simple musculoskeletal injury unassociated with any other fracture or injury potential. The acute injury assessment is appropriately performed by an emergency department physician with timely referral to an orthopaedic surgical specialist. Surgical intervention is determined on an elective basis. Trauma team involvement is not a requirement.

The second type comprises individuals who have multiple fractures of major long bones and joints or significant injury potential. Because of the potential for missed life-threatening injuries, they do require assessment by the trauma team. After resuscitation and the exclusion of other potential injuries, there should be no contraindication to proceeding with early aggressive fracture stabilization.

The third type consists of individuals who have multiple fractures of major long bones, joints and/or the spinal column, associated with additional injuries outside the musculoskeletal injury. They are the multiply-injured fracture patients. Such patients require skillful decision-making by the trauma team. Therefore, injury prioritization may modify standard fracture care. These patients will usually require the resources available at a Level I or II trauma center.

### **ORTHOPAEDIC SURGICAL TEAM MEMBER(S)**

The orthopaedic surgeon's responsibility to the trauma team begins with the initial evaluation of the patient in the emergency department. In conjunction with the trauma team leader, the orthopaedic surgeon on call is responsible for the development and coordination of the management strategy of all axial and appendicular musculoskeletal injuries so that the overall goals of patient care are not forgotten. After the acute treatment phase, the orthopedic surgeon is frequently delegated the responsibility of rehabilitation, co-coordinating transfers and providing long-term follow-up care for fracture related problems.

Minimal qualifications for the orthopaedic surgeon who participates as a member of the trauma team and is on call at a Level I or II trauma center are described at the end of this chapter. These requirements are similar to those established for the emergency medicine physician, general surgeon, and neurosurgeon.

### **ALLIED TEAM MEMBERS**

Optimal musculoskeletal management requires that the orthopaedic surgeon be supported and assisted by a team of skilled individuals who can assist with tasks, such as traction, casting, daily patient management, operative care, rehabilitation, and documentation. Well-trained X-ray technologists and operating room staff are important to the smooth running of an efficient musculoskeletal trauma system. Physical and occupational therapists and rehabilitation specialists trained in the management of acute musculoskeletal trauma problems and the rehabilitation phase are essential at Level I and II trauma centers. Social workers and discharge planners facilitate the transition of care from the acute care setting to home or the definitive recovery environment.

### **FACILITIES**

Modern operative musculoskeletal injury care depends upon the coordination of three synergistic resources: (1) a well-trained staff, (2) a well-equipped hospital and, (3) a readily available operating room. Operating rooms must be promptly available to allow for emergency operations on musculoskeletal injuries, such as open fracture debridement and stabilization and compartment decompression. However, the majority

of surgical fracture care can be conducted on a semi-urgent or elective basis. It is necessary to provide timely operating room access for semi-urgent and elective surgical treatment of musculoskeletal injuries that do not require emergent care in the off-hours. This should include allocation of sufficient operating room time to complete operative orthopaedic trauma care in a timely manner.

A functional orthopaedic surgical service requires flexibility in the operating room and staff scheduling. In Level I and II trauma centers, a system must be organized so that musculoskeletal trauma cases can be scheduled without delay and not at inappropriate hours that might conflict with more emergent surgery or other elective procedures. This is necessary to avoid inappropriate delays in patient care. Unique solutions to this scheduling problem may be necessary in each trauma center. In centers where the trauma volume demands daily availability, ideally, a designated operating room will be provided to the orthopedic trauma service so that these cases can be handled in an efficient manner. A mechanism for prompt operating room availability must be present. These solutions need to be monitored to determine effective usage of time.

## **MUSCULOSKELETAL TRAUMA CARE IN TRAUMA CENTERS**

### **All Levels**

The orthopaedic surgeon assigned to provide scheduled coverage for trauma patients must meet the requirements for inclusion on the orthopaedic trauma call panel. An orthopaedic surgeon should participate in service-related activities, especially those related to performance improvement and to the development of institutional protocols for systematic evaluation and management of common injuries. A minimum on-call experience should maintain the skills of the orthopaedic surgeon in both evaluation and management. All Level I and II trauma centers must have an orthopaedic surgeon who is identified as the liaison to the trauma program. This orthopaedic surgeon should be included in the initial planning for the program, and should maintain on going involvement in the organization of the program. The only exception to this is the rare level III center where no orthopaedic surgeons are on staff.

### **Level I**

The care of musculoskeletal trauma at a Level I trauma center should be organized, and run by a director who is highly experienced and devoted to the orthopaedic care of the injured patient. If this surgeon is not the director of the orthopaedic service, a liaison orthopaedic surgeon with the same qualifications for the care of the injured must be designated. Under the auspices of the trauma director, the orthopaedic trauma director should have the authority to affect all aspects of orthopaedic trauma care, including (1) recommending trauma team privileges, (2) cooperating with the nursing administration to support the nursing needs of orthopaedic trauma patients, (3) developing orthopaedic treatment protocols, (4) insuring orthopaedic participation in the PIPS process, (5) organizing the orthopaedic trauma call schedule, and (6) excluding from orthopaedic trauma call those team members who do

not meet criteria. The need for more specialty-trained surgeons depends on the volume and priorities of the service. Plastic surgery, hand surgery, and spinal injury capabilities are essential at Level I trauma centers. Orthopaedic team members must have dedicated call at their institution or have an effective backup call system. They must be promptly available in the trauma resuscitation area when consulted by the attending surgical trauma team leader for multiply injured patients. A PGY 4 or higher level orthopaedic resident or orthopaedic trauma fellow may act as a temporary consultant as long as this is acceptable to the attending surgical trauma team leader. If the on-call orthopaedic surgeon is unable to respond promptly, a back-up consultant call surgeon must be available. The design of this system is the responsibility of the orthopaedic trauma liaison, but must be approved by the trauma program director. Compliance with these requirements must be monitored by the hospital's trauma performance improvement and patient safety (PIPS) program.

## **Level II**

Within a Level II trauma center, there must be a musculoskeletal component of the trauma program designated for the management of complex skeletal injuries, multiple fracture patients, and multiply-injured patients with fractures. The director of the trauma program and the orthopaedic liaison should clearly define those patients for whom the orthopaedic service will be the primary care team, and which of those patients must be seen in consultation with the trauma service.

These centers must provide all of the necessary resources, including instruments, equipment, and personnel for modern musculoskeletal trauma care, with readily available operating rooms for musculoskeletal trauma procedures. The services of the related specialists such as plastic surgeons and a spinal injury service should be available, and, if not available, transfer guidelines with a Level I trauma center must be established.

Ideally, the individual is on-call at only one institution and must be promptly available. If the orthopaedic surgeon is unable to comply with this requirement, a back-up call system must be in place.

## **Level III**

Level III facilities will vary significantly in the staff and resources that they can commit to musculoskeletal trauma care. A Level III facility with an orthopaedic surgeon can provide basic immediate musculoskeletal care. Management of major long bone fractures and articular fractures should be carried out only if the appropriate resources are available. The orthopaedic staff at a Level III facility should be realistic about its capabilities and develop a working relationship and transfer guidelines with higher-level institutions.

## **PERFORMANCE IMPROVEMENT**

The orthopaedic service must participate actively with the overall trauma PIPS program and the Trauma Program Committee (dealing with system issues). The orthopedic representative(s) to the Trauma PIPS program must attend a minimum of 50% of these meetings (Level I and II). As well, the musculoskeletal trauma program

must review their own cases and develop ongoing processes to assess their care. Prospective reviews of identifiable problems must be developed at all levels of care. Reports must be submitted to the trauma program's PIPS director for review (see Chapter 16: Performance Improvement and Patient Safety).

## **REHABILITATION**

The goal of rehabilitation is to return an injured individual to society with the maximum function consistent with his or her injuries. This is best accomplished by using a cooperative team approach between the surgeon responsible for the acute management of the patient and the rehabilitative specialist. For skeletal injuries, rehabilitation protocols should be adjusted to the individual needs and should be supervised by the surgeon who is responsible for the management of the injured patient. The overall rehabilitation program should be managed by a rehabilitation specialist and the appropriate allied health personnel. Rehabilitation protocols should be commenced at the time that the patient enters the hospital and continue until discharge from the system. The return to full activity after major musculoskeletal injury often requires a year or more.

Optimal rehabilitation systems for trauma patients are still developing. Regional rehabilitation centers specializing in the physical and vocational rehabilitation of the multiply injured should be developed to assist the patient and society in the most efficient return to function.

## **PAIN MANAGEMENT**

Pain management of the injured patient begins in the initial phases of care. It is important to establish an appropriate regimen as the injured patient is prone to develop a dependency on pain medications due to the prolonged nature of their recovery. Early fracture stabilization provides an effective method of providing relief of pain during the acute hospitalization. Appropriate consultation with Pain and Rehabilitation services to co-operatively assure that the patient's pain is relieved throughout their care is optimal.

## **GERIATRIC TRAUMA**

As the population ages, the number of older patients with injury will increase. This is a twofold problem. First the patients have significant comorbidities that effect care and outcome. The second problem is the stabilization of fracture in osteoporotic bone leading to increasing complication rates. Specialized programs for care and rehabilitation for the older individual will need to be developed along with improved techniques of fracture care in osteoporotic bone. To attempt to lessen the impact of this problem, effective programs for prevention and treatment of osteoporosis are needed.

## SPECIFIC QUALIFICATIONS FOR ORTHOPAEDIC SURGEONS

### 1. Board Certification

Basic to qualification for trauma care for any surgeon is board certification in a surgical specialty recognized by the American Board of Medical Specialties, a Canadian board, or other equivalent foreign board. Examples for orthopaedic specialists include: The American Board of Orthopaedic Surgery; the American Board of Osteopathy or The Royal College of Physicians and Surgeons of Canada.

It is acknowledged that many boards require a practice period and that complete certification may take three to five years after a residency approved by the Accreditation Council for Graduate Medical Education (ACGME). If an individual has not been certified five years after successful completion of an ACGME or Canadian residency, that individual is ordinarily unacceptable for inclusion on the trauma team. Such an individual may be included when recognition by major professional organizations has been received in his or her specialty (for example, The American College of Surgeons).

***Alternate Criteria for a non-board certified orthopaedic surgeon:*** In rare instances, in a Level I trauma center, a non-boarded specialist who does not meet all of the nine criteria listed in the Alternate Pathway document may be included on the trauma panel if he/she has:

- a. provided exceptional care of trauma patients
- b. has numerous publications and presentations
- c. has published excellent research
- d. and is documented to provide excellent teaching

In rare circumstances in Level II trauma centers, a non-board-certified orthopaedic surgeon may be included in the trauma service. This situation may arise when a limited number of qualified orthopaedic surgeons are available to a community that desires to establish a verified trauma program. To assist these programs in providing optimal care to the injured patient with existing surgical resources, the following alternative to board certification is available. This option cannot be used for the trauma director of a trauma program. The criteria are:

*1. A letter by the trauma medical director indicating this critical need in the trauma program because of the physician's experience or the limited physician resources in general surgery within the hospital trauma program.*

*2. Evidence that the orthopaedic surgeon completed an accredited residency training program in that specialty. This must be certified by a letter from the program director.*

3. *Documentation of current status as a provider or instructor in ATLS®.*
4. *A list of the 48 hours of trauma-related CME over the past three years.*
5. *Documentation that the orthopaedic surgeon is present at least 50 percent of the trauma performance improvement and educational meetings.*
6. *Documentation of membership or attendance at local, regional and national trauma meetings over the past three years.*
7. *A list of patients treated over the past year with accompanying ISS and outcome.*
8. *Performance improvement assessment by the trauma medical director demonstrating that the morbidity and mortality results of the orthopaedic surgeon compare favorably with the morbidity and mortality results of comparable patients treated by other members of the trauma call panel.*
9. *The orthopaedic surgeon must be licensed to practice medicine and be approved for full and unrestricted surgical privileges by the hospital's credentialing committee.*

## **2. Clinical Involvement**

Qualified orthopaedic surgeons must be regularly involved in the care of injured patients. In a hospital committed to trauma care, orthopaedic surgeons with special expertise in trauma should be identified. Participation in the organization of trauma protocols, trauma teams, trauma call rosters, and trauma rounds are clear indicators of commitment to excellence in trauma patient care.

## **3. Education**

The background of orthopaedic surgeons should reflect an interest in and a commitment to trauma care. Formal orthopaedic trauma fellowships, training in orthopaedic surgery on an active trauma service, or combat experience as an orthopaedic surgeon constitute prime examples of such interest. Active participation as an instructor for the American College of Surgeons ATLS® Course clearly demonstrates educational involvement in trauma. It is helpful, but not required for orthopaedic surgeons on the trauma team to successfully complete an ATLS Student Course. Participation in specialty sponsored educational fracture and trauma courses is valuable. Orthopaedic surgical liaison to the trauma team at Level I and II centers must be involved in at least 16 hours of trauma-related CME annually. In addition, the other members of the orthopaedic trauma team need to be knowledgeable and current in care of the injured patient. This may be documented by acquisition of 16 hours of CME per year on average or through an internal educational process conducted by the trauma

program and the orthopaedic liaison based on the principles of practice based learning and the performance improvement program.

#### **4. Regional/National Commitment**

The major trauma organizations in the United States and Canada include (1) the Committee on Trauma of the American College of Surgeons and its state/provincial committees, (2) the American Association for the Surgery of Trauma, (3) the Canadian Trauma Association, (4) the American Burn Association, and (5) the Orthopaedic Trauma Association (6) the trauma organizations of various surgical specialties, such as the Section on Neurotrauma and Critical Care of the American Association of Neurological Surgeons, and the Congress of Neurological Surgeons. The criteria governing membership in these organizations are such that active membership ordinarily signifies a position of leadership among surgeons involved in the care of injured. Participation in regional groups, such as state and regional trauma committees, and membership in regional organizations, such as the Western Trauma Association or the Eastern Association for the Surgery of Trauma, identify significant involvement in and commitment to trauma-related matters.

(This chapter has been approved by the Orthopaedic Trauma Association and the American Academy of Orthopedic Surgeons)

#### **REFERENCES**

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