The Multiply Injured Trauma Patient: Resuscitation, Rehabilitation, Recovery

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***A 73-year-old man who fell off a** ladder presented to the emergency department with tachycardia, hypotension, and a fractured pelvis. His pelvis was wrapped for stability;, two liters of intravenous fluids were administered. CT scans revealed rib fractures, spine fractures, and a splenic injury, but shortly thereafter, the patient had a sudden decrease in his blood pressure and required blood transfusion. Trauma surgeons performed an emergency splenectomy and pre-pelvic hemostatic packing while orthopedic surgeons performed external fixation of the pelvis for temporary stabilization. His abdomen was left open, dressed with a temporary negative pressure dressing, and he was taken to the trauma intensive care unit for resuscitation and re-warming.*

Two days later, the patient underwent abdominal closure and definitive pelvic fixation. His post-operative complications included delirium, ventilator-associated pneumonia, and prolonged respiratory failure requiring a tracheostomy. By the time the patient was able to participate in rehabilitation, he demonstrated impairments in memory, ability to perform self-care, and basic mobility. In conjunction with the surgical teams, physical and occupational therapists built a treatment plan which included bracing the spine fracture, activities of daily living retraining, and therapeutic exercises for balance and muscle strengthening. Ten days after the commencement of therapy, the patient stood up for the first time, was able to follow simple commands, and was more oriented in speech. The patient's prolonged intubation led to abnormal swallowing which required several speech pathologist evaluations and ongoing education for safe swallowing strategies. One month after the original trauma, the patient could eat a regular diet. While the patient's family watched him recover, social workers provided support. After multiple meetings between the patient and his family, the case manager, and the medical team, he was discharged to an acute rehabilitation facility one month after he was admitted.

In 2006, the **Centers for Disease Control and Prevention** (CDC) reported that over 29 million people in the United States suffered non-fatal injuries and more than 179,000 people died as a result of traumatic injuries.[1] Last year, the trauma team at Rhode Island Hospital, the busiest level one trauma center in southern New England, treated 5,512 patients.

The management of the multiply injured patient begins in the field with first responders and continues into the hospital with an initial evaluation and treatment plan overseen by the trauma team. After stabilization, the patient's age, injury pattern, and co-morbidities dictate management. As in our patient, this may require intensive care admission, use of invasive monitoring devices, and surgical intervention. Once the patient's injuries have been addressed and his/her physiologic and mental status stabilize and improve, the trauma team will manage the medical aspects of care while rehabilitation begins.

Ideally, an interdisciplinary trauma team consists of doctors, nurses, therapists, technicians, social workers, case managers, and other support staff. The following is a description of each team member's contributions.

Beginning the road to recovery: The roles of the specialized rehabilitation therapists

On a national level, in the year 2000, 50 million injuries resulted in an estimated $326 billion in lost productivity.[2] This lost productivity highlights the importance of rehabilitation therapies. Like medical specialists, physical, occupational, and speech-language pathologists offer different skills and work together to treat multiple disabilities in trauma patients.

Physical Therapy

The physical therapist receives most of the consults for impaired function and is a key contributor to the rehabilitation of a patient. An initial evaluation begins with a complete patient exam by system (i.e. cognitive, musculoskeletal, neurologic, cardiopulmonary, etc.) followed by chart evaluation documenting the activity limitations set forth by the treating teams. Based on the deficits, treatment is individualized. As the patient progresses, the therapist will recommend a discharge plan. The patient may receive rehabilitation in an acute, sub-acute, or skilled nursing facility depending on the expected duration, disability, and ability of the patient to participate. If outpatient therapy is suggested, the nature and number of treatments per week is recommended. These recommendations along with the patient's overall medical stability help determine the patient's eventual destination.

Occupational Therapy

Along with the loss of productivity, traumatic injuries usually impair basic **activities of daily living** (ADLs) such as dressing, hygiene, or feeding. Occupational therapists provide treatment to restore independence in these tasks and maximize both cognitive and functional outcomes. These therapists define the specific impairments and help patients regain the cognitive, perceptual, and motor skills to perform them. In addition to self-care, the patient's responsibilities to family members, home safety issues, and community integration are addressed. Treatment may include range of motion or strengthening exercises, splinting, and task-oriented exercises. Occupational therapists also provide burn rehabilitation, complex wound care, and cognitive rehabilitation after a head injury. As with physical therapy, continuation of services may occur in various settings.

Speech/Swallow/Cognitive Therapy

Certain trauma patients may need the **speech-language pathology** (SLP) department. Among severely head injured patients, 60-90% may have dysphagia, [3] and other affected populations include those with prolonged intubation, direct neck trauma, and the elderly.

These clinicians will focus special attention towards head injury-related disability, facial trauma, prolonged intubations, tracheostomies, respiratory insufficiency, previous communication disorders, and burns. When dysphagia is suspected, patients are carefully observed swallowing substances with various consistencies to determine aspiration risk. Patients may need radiographic evaluations (modified barium swallow) or exams allowing direct visualization of vocal cord motion to fully delineate swallowing disorders. Cognitive and communication impairments in trauma patients are assessed with tests of language abilities, memory, executive functions, and voice. Treatment plans may include assistive communication devices (i.e. word boards, computerized devices, etc) and/or cognitive exercises for memory or social interaction.

Supporting the patient and families in the hospital: Social work

Traumatic injury is always unexpected, and **Post-Traumatic Stress Disorder** (PTSD) and depression may persist in patients for months after the initial trauma.[4] For this reason, early assessment and support are intertwined through the social work department. At Rhode Island Hospital, a social worker is always available to interact with patients and families both in the emergency department and as inpatients.

The initial interview includes a psychosocial evaluation, focusing on a patient's relationship with family, employment, circumstances surrounding the trauma, and social supports. Other issues may include the patient's loss of control, loss of independence, neurological problems, PTSD screening, changes in self-image, and end-of-life care. Following one or more meetings with a patient and/or family, interventions may include either actions (e.g., referral to community resources, hot lines, safety plans for domestic violence) or ongoing supportive counseling. The latter can help a patient to verbalize emotions in confidence and develop coping mechanisms. If a patient needs formal psychiatric treatment, the social worker can notify psychiatry.

Discharge planning: Matching needs to resources

Discharge planning begins as soon as a patient is stabilized and rehabilitation needs are identified. The case managers at Rhode Island Hospital serve as the liaison between the primary care team, specialty teams, therapists, families, insurance agencies, rehabilitation facilities, and the patient. Following a chart review to determine specific needs, the patient and/or family are interviewed to set goals for rehabilitation and recovery. These goals may include physical, social, work-related, financial, and family expectations. Following the initial evaluation, the case manager consults with the care team to assemble a discharge plan that provides continuity of care and optimizes patient outcomes while remaining conscious of resources available.

Trauma patients have a unique set of discharge planning issues. First, the mechanism and the circumstances surrounding the injury are very important: Was this work related? Did substance abuse play a role? Is there an ongoing criminal investigation? Is it safe for the patient to return to his/her dwelling? Secondly, many patients sustain multiple injuries and the degree of functional loss with the expected duration of disability must be considered when arranging care. In the event of long-term disability, the impact on family support and financial resources must be assessed early to avoid surprises, both short- and long-term. Finally, from a public health perspective, inpatient beds are a community resource. As patients recover, it is imperative to arrange their safe discharge and optimally utilize outpatient services to ensure that those who need inpatient care may continue to receive it in an efficient manner.

Rhode Island Rehabilitation Resources: Are there enough?

Last year alone, the trauma service at Rhode Island Hospital discharged over 2000 patients. Although many required only home discharge with follow-up, the more complex patients may have required any or all types of therapy services including wound care, nursing assistance, and respiratory care. With increasing numbers of services required, representatives from the different care facilities will come to evaluate patients in order to match their particular resources with the needs of the patient. Many of these facilities are staffed with physicians and therapists whose primary focus is rehabilitation and they are vital to bridging the gap between the inpatient and outpatient experiences.

As can be expected in the acute trauma population, several obstacles impede a patient's discharge with service requirements. One of the more common issues comes from one of the most fundamental challenges to the health care system: lack of health insurance. This issue does not affect acute medical decision making, but in the event of absent or limited insurance coverage, the ability to supplement or apply for new coverage to cover out-of-hospital services is problematic. Delays may occur due to paperwork processing or waiting periods "necessary" to approve care. Lapses in coverage can prolong hospitalizations for some patients, sometimes to the point of rehabilitating and recovering enough in the inpatient setting to take care of themselves at home. With rising unemployment in Rhode Island, lack of health care coverage may contribute to rising inpatient hospitalization costs, when patients may benefit most from insurance covered outpatient services. Other concerns facing trauma patients include limited specific types of rehabilitation services in the state. As previously reported,[5] patients with severe head injuries and certain spinal cord injuries (i.e. above the C6 level) often have to be treated at specialty facilities outside Rhode Island, which can delay discharge. With many of these out-of-state rehabilitation facilities offering services to maximize function, time spent in the inpatient setting is not optimal for the recovery process. Overall, most patients have access to a variety of rehabilitation services in RI, but efforts should be directed to help those whose injuries or finances limit their ability to receive available rehabilitation services.

Summary

The care of the acutely injured patient requires a multidisciplinary approach from the moment of injury through rehabilitation and reintegration into society. In addition to the doctors and nurses providing many aspects of the acute and chronic medical care, the rehabilitation component is delivered by several skilled specialists focused on maximizing functional outcomes.

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Inpatient Rehabilitation Services: Regulatory Changes

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Inpatient rehabilitation facilities (IRFs) operate in a changing environment. First was the transition from the reimbursement system of the 1980s and 1990s to our current Prospective Payment System. Along with that came the challenges of educating and re-educating staff and patients about achieving optimal outcomes within prescribed periods of time. Now the paradigm is shifting once again. This time the shift is more clinical rather than fiscal. Although the following discussion specifically applies to patients with Medicare coverage, the new guidelines set the standard within the industry for all patients.

In 2009, the **Centers for Medicare and Medicaid Services (CMS)** rescinded HCFA Ruling 85-2, "Medicare Criteria for Coverage of Inpatient Hospital Rehabilitation Services," 50 FR 31040 (July 31, 1985) as corrected at 50 FR 32643 (August 13, 1985). Some regulations remain unchanged. Patients can be considered acute rehabilitation candidates if they can be expected to make significant functional gains in a reasonable time. They must require intensive and interdisciplinary care from rehabilitation clinicians, including twenty-four-hour rehabilitation nursing and either physical or occupational therapy along with speech therapy. Patients should have the potential to return to the community, not a **skilled nursing facility (SNF)**. Medical management, typically by a primary care doctor, is required, as well as close supervision by a rehabilitation physician. Inpatient rehabilitation should be reasonable and necessary, with the patient's needs unable to be met at a SNF or outpatient facility. The 60% Rule for IRFs, which determines the DRG-exempt status of the unit or facility, is based on 60% of patients falling within one of 13 diagnostic categories (CMS-13). Ischemic or hemorrhagic strokes, late effects of stroke, hypertensive encephalopathy, and diseases of cerebral arteries and venous sinuses, e.g. amyloid, are eligible diagnoses. Brain injuries may include benign and malignant neoplasm, meningitis, encephalitis (and its late effects), toxic encephalopathy, traumatic injuries/concussions; complications of medical and surgical conditions (encephalopathies) are also considered qualifying diagnoses. Among various qualifying neurologic conditions are neuropathies (e.g. B12, GBS), mononeuritis multiplex, radiculopathies, plexopathies, and myopathies. Patients with complications related to worsening of Parkinson's, multiple sclerosis, muscular dystrophies, motor neuron diseases, and post-polio syndrome can also be considered. Spinal cord injuries, either traumatic or those related to myelitis, neoplasms, or infections still qualify for acute rehabilitation, as do hip fractures at the neck and/or head of the femur, the acetabulum, or in the sutrochanteric area. Amputations may be vascular, traumatic, or due to infections, but residual limb complications are also included in the CMS-13. Joint replacements may qualify, but only if they are bilateral, or if the patient with a single replacement is morbidly obese (BMI $\geq$ 50) or if the age is $\geq$ 85. Major multiple trauma is an important category that obviously requires intensive rehabilitation, as are major burns.