Virtual Mentor
American Medical Association Journal of Ethics
July 2009, Volume 11, Number 7: 516-520.

CLINICAL PEARL

The Team Approach to Management of the Polytrauma Patient

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Few events in modern medicine are as intense and rewarding as management of polytrauma victims. Unlike many chronic diseases that occur later in a person's life, trauma has a disproportionate impact on society's young and middle-aged people. Victims of severe trauma are often previously healthy people who, sometimes through no fault of their own, become suddenly and gravely ill.

With intensive, coordinated care, patients can often be brought back from the brink of death. Their road to survival, however, is not easy and not one most members of society, or even some health care workers, understand. This road is fraught with many difficulties and complications; it involves teams of health care professionals working together with one common goal. Emergency medicine physicians are often integral to this system, and, as neither the first nor the last to provide care, we are in a good place to understand how the system works, what is necessary for a good outcome, and some pitfalls that can be avoided. This article reviews some of the epidemiology of severely injured trauma patients, early management issues in the field and emergency department, and the system of care required for the patient to thrive after initial survival has been assured.

Understanding a patient's injuries, management, and prognosis first means understanding the *mechanism* of his or her injury, with certain mechanisms being associated with greater chance of severe injury and poor outcome [1]. The most critical branch point of many trauma algorithms is between penetrating and blunt trauma, with burns and environmental injuries considered separately. Motor-vehicle crashes are the primary cause of blunt injury, followed by falls and direct trauma. Penetrating trauma—often from gun shots, stab wounds, and industrial accidents—is more rare but poses a higher rate of fatality [2].

Prehosptial Care

Despite excellent epidemiological data, including information from the National Trauma Data Bank, significant debate surrounds the benefit of many prehospital interventions, transportation methods, and training of first responders involved in the care of trauma patients [3, 4]. Current thinking prioritizes methods that decrease prehospital time by addressing only life-threatening injuries in the field through control of bleeding, cervical-spine stabilization, and similar interventions [5, 6]. Performing invasive procedures in the hospital setting and having initial hospital care provided at a trauma center have been associated with better outcomes [7-10]. Understanding that effective triage gives priority to those most likely to benefit from

rapid intervention has led to creation of many prehospital and trauma scoring methods including the Glasgow Coma Score, Pediatric Trauma Score, Revised Trauma Score, and Injury Severity Score—but no consensus exists on best practices [11-14].

Emergency Department Care

Stabilization. Following the patient from the field to the hospital means moving from initial to more-definitive treatment of injuries. This may be a very short stop in the emergency department if surgery or interventional radiology is indicated, or it could mean hours of labor-intensive multispecialty resuscitation. When discussing stabilization of the trauma patient, clinicians refer to the first "golden hour" for the initial resuscitative techniques [15, 16]. Staffing for severely injured trauma patients is a team effort with allocated tasks conducted simultaneously [17]. The team is led by a trauma surgeon or emergency medicine-trained physician and involves concurrent evaluation and interventions. Physicians, nursing, and technical staff work to address immediate life-threatening injuries; identify secondary life-threatening injuries; establish intravenous access; and treat the patient with oxygen, crystalloid fluid, and often medications and blood products [18]. Treatment algorithms are highly regimented and follow Advanced Trauma Life Support (ATLS) protocols. ATLS is a periodically updated, evidence- and consensus-based training course taught by the American College of Surgeons to physicians who care for trauma patients [19].

The exam and associated interventions are divided into primary and secondary surveys, with the primary survey following the mnemonic ABCDE, which stands for airway, breathing, circulation, disability, and exposure.

A. Open the **airway**; address any obstruction by suction of secretions, foreign body removal, protective oral or nasal airway placement, and oral, nasal, or surgical airway management [20].
B. Stabilize **breathing** through provision of oxygen, managing life-threatening chest trauma such as a pneumothorax or hemothorax with a chest tube, and management of mechanical ventilation.
C. Establish **circulation** through intravenous, intraosseous, or central-venous access; administer crystalloid fluid and blood products, as well as any medications that may support the patient's circulation.
D. Assess **disability** from neurological injury such as paralysis and altered mental status.
E. **Expose** the patient by removing his or her clothes and evaluating for immediate life-threatening injuries such as femur fractures, penetrating wounds, and arterial bleeding.

Should a life-threatening injury or problem be identified at any level of ABCDE, it is addressed before moving on. Parts or all of the primary ABCDE evaluation may be repeated frequently during the management of the trauma patient.

The secondary survey is a thorough head-to-toe examination that identifies and documents evidence of traumatic injury. Adjunctive survey measures are conducted, such as ultrasonography for a Focused Assessment with Sonography for Trauma (FAST) exam, and chest and pelvic x-rays [21]. Many additional procedures (surgical interventions, laceration repairs, splinting, etc.), evaluations (expert evaluations, laboratory studies, CT scans, etc.), and interventions (medications, vent management, etc.) can be conducted after this initial evaluation and management.

Within 24 hours, a tertiary survey—a repeat of the primary and secondary surveys—is performed by the trauma service to identify injuries missed during the sometimes-chaotic initial surveys and management [22].

During these initial evaluations in the emergency department, the team delivering care to a severely injured patient often expands significantly, with members being added based on the specific injuries and the prior medical conditions, age, or social situation of the patient or event. For example, orthopedic, neurologic, eye, dental, genital, urinary, cardiac, or vascular injuries may all require immediate evaluation by a specialist. Pregnant and pediatric victims of severe trauma need special care, as do those with significant underlying medical problems such as diabetes or cancer. Social services and pastoral care are often beneficial, given the tremendous stresses such an event causes to a victim of severe trauma and his or her family.

Management. Stabilization of a polytrauma patient may initially be achieved in the emergency department or operating room, but the course of recovery is far from over. Continued sophisticated management of the patient in a skilled nursing setting (such as a surgical intensive care unit) is critical to good outcomes. It is particularly important where definitive management of injuries is delayed in favor of immediate stabilization—known as damage-control surgery. This delay can improve the patient's physiologic state at the time of definitive treatment, but it requires intensive and deliberate strategies [23]. Secondary illness may complicate the patient's recovery, possibly with aspiration pneumonia, infection, stress ulcers, exacerbation of chronic disease, thromboembolism, or contrast-induced nephropathy.

Should the patient recover enough to leave the intensive care unit and hospital, long-term recovery is again a team effort. Physical, speech, and occupational therapists are key players in maximizing patients' return to normal life. Input from occupational medicine and psychiatry helps patients manage consequences of trauma and significant life change. The special services available in rehab hospitals can be particularly beneficial in supplying the needs of patients with complicated injuries.

While the road to recovery for polytrauma victims may be one of fits and starts with many complications along the way, it offers clinicians the chance to reverse a tragedy. By working together, teams of care professionals can have the satisfaction of helping critically ill patients return to their lives.

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