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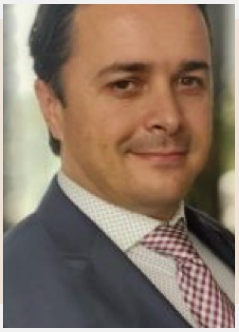
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Multidisciplinary Approach to Trauma Patients: The U.S. Concepts and Practice

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Abstract

Trauma is a well-known cause of mortality throughout the world and places an immense burden on the healthcare system. There have been documented improvements in trauma outcomes when care is approached through a comprehensive trauma system. It has been understood that this system is expensive, but the lives and years saved contribute to cost-effective treatments. The trauma response is led by an advanced team leader, mainly the trauma surgeon, who has extensive experience in the management of all traumatic injuries and has the skills to treat any acute condition.

Keywords: Trauma, multidisciplinary approach, comprehensive system, US concepts, practice

Traumatic injuries continue to place significant burden on healthcare systems throughout the world. In 1966, trauma was declared a neglected epidemic and the "leading cause of death in the first half of a patient's life span" in "Accidental Death and Disability: The neglected Disease of Modern Society." [1] This report spurred a change of trauma treatment in the United States of America (USA), leading to a unified trauma treatment system. Although this report was written over 50 years ago, trauma remains the leading cause of death in patients under 46 years of age in the USA and continues to stress the world's healthcare systems, despite the advances that have occurred since then. [2] There are 5 million deaths and 100 million people with temporary or permanent disabilities every year worldwide due to trauma.[3] The economic impact is also immense with an estimated economic cost of trauma amounting to $671 billion per year, including health care and work loss for those suffering both fatal and nonfatal injuries.[2]

With the establishment of the first trauma center at Cook County Hospital in Chicago, Illinois, the USA looked for a transition from the distinctly individual approach to trauma management to a consolidated trauma system with hopes of improving patient outcomes.[4] A significant investment was made towards this goal in 1973 with the federal grant to Illinois and Cook County Hospital to establish a statewide trauma system.[4] This investment set the stage for the modern trauma system we have today, including multiple connected trauma centers each with different capabilities within a region.

The modern trauma system has been evolving since its inception. The goal is to provide comprehensive, cost-effective, and high-quality care for the injured

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patient starting with the moment when an injury is recognized. This comprehensive nature includes triage to the appropriate trauma center with multidisciplinary care. Trauma management does not end with hospital discharge. Rather, it needs to include outpatient follow up for long-term physical and psychosocial problems. The comprehensive care, in addition to the injured patient, includes the community and all future trauma patients. The improvement of ongoing care is amplified by the additional responsibilities of the trauma system. These responsibilities include education and outreach for injury prevention, research, data registries, and disaster preparedness.[3,4]

To date, there are over 500 trauma centers throughout the US that are verified through the American College of Surgeons Committee on Trauma (ACS COT). [5] The ACS COT also oversees the Trauma Quality Improvement Program (TQIP), which provides assessments of regional trauma systems alongside resources to support quality improvement.[6] These efforts include ongoing training courses, such as Advanced Trauma and Life Support (ATLS) and Advanced Surgical Skills for Exposure in Trauma (ASSET). These courses provide structured education on the management of trauma patients for providers at the verified trauma centers.[7] The structure of the trauma system is a tiered one with increasing capabilities, as one increases the level. Each trauma center has a designation of 1 through 4 levels, with level 1 being the highest-level of care and only levels 1 and 2 providing definitive trauma care. To achieve a specific designation, the ACS COT has defined specific requirements including trauma volume, education, and research through the published Resources for Optimal Care of the Injured Patient.[8]

The most injured patients to enter the trauma system will likely be triaged to a level 1 trauma center. It activates the trauma team. This is a defined response to expedite immediate treatment of life-threatening injuries. Each trauma activation has a defined team that knows the specific role each member is to perform. This team is led by the trauma surgeon, who provides the guiding voice and is responsible for the patient's care. The trauma surgeon has been identified as the "captain of the ship." She/he assumes responsibilities for coordinating interdisciplinary care in addition to acute resuscitation, general surgical operative care, and subsequent critical care.[9] This role ensures that a single individual is maintaining the overall care plan, while the known injuries are addressed by subspecialists. The major role for the trauma surgeon in the acute phase is to treat life-threatening injuries at any location, spanning the entire body. The advanced education through general surgery residency and, then, surgical critical care or acute care surgery fellowship gives additional exposure to acute thoracic, vascular, complex hepatobiliary, operative trauma cases, and surgical critical care.[10] "Often the acutely injured patient has been evaluated, diagnosed, and effectively operated upon before a surgical subspecialist is able to come into the hospital from home."[10] Additional responsibilities include the post-acute phase of care while hospitalized and ensuring safe transition to outpatient care. Frequently, this includes the management of traumatic injuries that have been treated by subspecialty services, including fractures and traumatic brain injuries.[9]

The transition to a trauma system was completed with the goal of improved care. Data continues to show that care through the trauma system does, in fact, improve the outcomes of the trauma patients. The biggest goal is to reduce mortality, and this has been demonstrated in multiple prior studies. E.J. MacKnzie et al. demonstrated a 25% reduction in mortality, if treatment is completed in a trauma center versus a non-trauma center, with the biggest effect being observed in the younger patients.[11] R. Durham showed a similar reduction of 18% in mortality, when care is provided in a trauma center in the state of Florida.[12] Additional improvements have been demonstrated in recent literature, El-Menyer et al. demonstrated significant decline of in-hospital mortality but also in ventilator associated pneumonia and total hospital length of stay after accreditation of their trauma center.[13]

Many reports have shown the effectiveness of the trauma system and its improvement in mortality. This raises the question of whether or not the cost of improvement is cost-effective. One study evaluated this concern and found that the cost of care at the trauma center was significantly higher; the initial hospital cost being 71% more than at a non-trauma center.[14] The total lifetime cost was estimated to be 27,000 US dollars (USD) higher at the trauma center.[4] It is logical to assume that the cost of specialized trauma care would eventually increase. However, this is not a comprehensive endpoint to look at. When evaluating cost effectiveness, it is useful to look at lives-saved and additional life-years produced. MacKenzie estimated these values to be 3.4 lives saved per 100 major trauma patients with 70 additional life-years per the same 100 patients. The projected life-years gained increased with severity and were greatest for patients younger than 55 years.[14] The cost effectiveness ratio is then found to be 36,319 USD per life-year gained. This value shows that trauma care is cost-effective. The effect of the trauma system has been demon-

strated to improve patient outcomes and can be done in a cost-efficient manner.

The adoption of a consolidated trauma approach throughout the world has been sporadic and more likely implemented in high-income counties. This is especially evident in mid- to low-income countries, where 90% of total global trauma related deaths occur.[4] The World Health Organization (WHO) has been active in trying to reduce this disparity and produce a document as a "how-to" guide titled "Guideline for Trauma Quality Improvement Programmes." This guideline discusses trauma related topics with focus on quality improvement. It also delves deeper into techniques utilized to improve trauma care.[15]

In conclusion, trauma is a well-known cause of mortality throughout the world and places an immense burden on the healthcare system. There have been documented improvements in trauma outcomes, when care is approached through a comprehensive trauma system. It has been shown that this system is expensive, but the lives and years saved contribute to cost-effective treatment. The trauma response is led by an advanced team leader, mainly the trauma surgeon, who has extensive experience in the management of all traumatic injuries and has the necessary skills to treat any acute condition. Lastly, trauma related deaths disproportionately effect mid- to low-income countries. There are many organizations that have a framework for developing a trauma system, including the WHO, in which improved patient outcomes can be delivered.

Conflict of Interest Disclosure Statement

The authors have no financial interests nor conflicts of interest to disclose.

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