

Trauma centers: an underfunded but essential asset to the community

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SUMMARY

Research indicates that specialized trauma centers, especially those of level I and II designation, can generate revenue if financial support is provided, and most importantly provide better outcomes for an injured patient by reducing length of stay and mortality when compared with treatment at hospitals without trauma center designation.

Costs associated with trauma center operation have risen over the past few years in association with growing patient volumes and inflation. Documentation regarding costs for trauma center operations is sparse, and there exists a large variance between reported numbers based on their region. In most cases, the greatest proportion of funds are spent on clinical personnel while the smallest fraction is dedicated to educational and prevention programs. Studies confirm that as a product of these rising costs and a lack of state and federal funding that trauma centers remain uniquely financially vulnerable. Multiple strategies have been implemented to mitigate these costs but have proven insufficient. Legislations providing patients with expanded access to healthcare such as the Affordable Healthcare Act have failed to deliver on their intended purposes, and managed care organizations have moved to protect their own interest at the expense of trauma patient mortality. In lieu of concerted federal support, states and municipalities have explored solutions to support trauma centers such as small fees added to fines or encouraging charitable donations, although these programs have not seen ubiquitous implementation. Most trauma centers have begun incorporating activation costs to recoup losses from their low reimbursement rate, but these have continued to inflate, and pose a growing burden on vulnerable patients.

Lack of funding from external sources such as state or federal appropriations poses a tangible threat to trauma centers for closure, and with multiple trauma centers acting as critical pillars of healthcare infrastructure for disadvantaged communities as well as the impact of this lack of funding being so broad and systemic, multiple 'trauma deserts' may emerge, leaving communities—especially disadvantaged communities which rely on the safety-net function of many high designation trauma centers—deprived of an essential treatment resource and increasing annual mortalities that could have otherwise been averted.

INTRODUCTION

Trauma is the leading cause of mortality for individuals up to the age of 45 years, and the fourth leading cause of death. Moreover, traumatic injury comprises the largest death toll for any singular

cause, eclipsing infectious disease and COVID-19 combined.¹ While the volume and severity of traumatic injury are evident, trauma currently receives only 1% of global healthcare funding despite affecting proportionately greater populations than other conditions.²

Consistent and proportionate funding is essential for the operation of any trauma center, as well as to address the growing incidence and burden of trauma on patients and society. This lack of global funding is compounded by growing costs to trauma centers as a result of increasing patient populations among other factors, and reflects trends in trauma care reimbursement and funding at the national level, which if left unaddressed, will culminate in trauma center closures, poorer outcomes for trauma patients, and most critically, increased mortality rates, especially for vulnerable populations who are disproportionately impacted by traumatic injury. This article aims to explore the importance and vulnerability of trauma centers, and provide justification for a reallocation of budget in support of trauma center maintenance and development.

Trauma centers

Trauma centers provide an essential service and treatment for one of the most prolific and lethal conditions on a constant basis and are especially relevant in responses to national disasters or other instances of mass injury.³ Trauma center capability is verified by the American College of Surgeons and their guidelines, with designation conferred by state and municipal bodies in accordance with these guidelines (though in some instances state authorities both verify and designate centers) which stratify trauma centers into levels I–V, with level I being the highest.⁴ A level I trauma center is distinguished by a holistic approach to patient care and outcomes encompassing research, prevention, treatment, and rehabilitation on a 24/7 basis. Prevention is a crucial arm of trauma care that through educational programs, ordinances, and public welfare strategies reduces the incidence of traumatic injuries. Research provides insights on new treatment modalities, or optimizations for existing techniques in pursuit of improved quality of life and reduced mortality. Treatment is the core effector arm of trauma care where lives are tangibly improved and saved, and rehabilitation exists as an important supplement to treatment to ensure demonstrable improvements in quality of life following treatment. Studies confirm that level I trauma centers significantly reduce hospital patient mortalities and improve quality of life when compared against hospitals without

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trauma centers or trauma centers of a lower designation.^{4,5} In addition to their documented efficacy at improving patient outcomes and reducing mortality, level I trauma centers are profitable, the top 10 garnering an annual median net revenue of approximately US\$2.9 million as of 2023.⁶ Furthermore, studies indicate a maximization of profits when level I trauma centers treat the most critically injured patients well enough to result in the lowest length of stay with average profits around US\$7.6 million, lending credence to the notion that the interests of both trauma centers and patients align if given the means.⁷ In spite of their per patient revenue, many trauma centers, especially crucial level I and II centers, remain financially vulnerable due to underfunding. Studies illustrate even the most productive, effective, and widely serving trauma centers now operate at a loss and are direly in need of financial support due to the fact they operate largely uncompensated as safety-net hospitals and low reimbursement rates of approximately 20% attributed to the implementation of the Affordable Care Act (ACA).⁸

COSTS

Trauma center expenses

Maintaining trauma center readiness is integral to the ability of a hospital to provide 24/7 emergency response service and is key to trauma operations. Readiness encompasses several components with accompanying costs, including staffing, outreach programs, blood banks and operating rooms as defined by the American College of Surgeons which cannot be circumvented, especially for those trauma centers of level I and II.⁹ Despite the ubiquity of these costs and their inexorable tie to trauma center function, resources regarding median trauma center readiness costs are sparse and there is no single unified source for cost-measuring or comparison on a national level, thus multiple sources have categorized expenditures with various methods, with differing corresponding figures. One study provided an aggregated annual readiness cost estimate of US\$6.8 million for level I trauma centers in Georgia while another purported US\$10 million.^{10,11} The second of these two studies also provided averages for some of the American College of Surgeons trauma center components with comparisons between level I and II: US\$5.5 million for clinical personnel at a level I and US\$4.9 million at a level II, US\$115 132 for education and outreach programs at level I and US\$109 043 at level II, and US\$3.6 million for administrative personnel at a level I and US\$1.4 million at a level II. The authors posit these costs, and the differences between levels is attributable to a number of factors, namely that level I centers must serve a larger volume of patients while providing a breadth of specialists and rehabilitation programs, all at a 24/7, on-call basis. Additionally, they highlight the drastically low proportion of the costs associated with maintaining educational and outreach programs. This indicates that since these programs are not mandated as rigorously as others, their funding is often diverted, underscoring the need for additional funding. Others opted to represent data by median per patient costs, with US\$1689 for level I and II centers and US\$450 for level III and IV.¹² Regardless of cost metric, it is evident that higher designation trauma centers which disproportionately serve great volumes of patients, and especially disadvantaged patients, are uniquely financially burdened to maintain compliance with care standards and readiness to ensure reduced mortality. Of note are the components neglected by these aggregations, namely the necessary but overlooked costs of equipment and essential transportation, such as helicopter lifts for critically injured patients which recorded Medicare spending of US\$200–US\$240 million for 2010 alone.¹³

Legislation

Several organizational and legislative measures have been attempted to remedy the issue of underfunding in trauma. However, despite the intentions, including those of one such measure in the 2010 ACA, both the socioeconomically disadvantaged patients disproportionately affected by traumatic injury cases and the trauma centers that treat them have seen minimal benefit since the implementation of these bills and groups. While trauma bills following the ACA were universally found to have increased significantly, a proportionate increase in reimbursement for patient treatment was not consistently observed (although an increase having been observed in some trauma centers), with one review positing that provisions from the ACA were much less than previous allocations.¹⁴ Another study noted that the population of uninsured patients rose sharply again in 2017, despite the ACA's core tenets aimed at reducing this population.¹⁵ Additional promises also remain to be upheld: the US\$224 million allotment to trauma care and research by the ACA has yet to be distributed, and a subsequent effort in 2015 to pass the Trauma Systems and Regionalization of Emergency Care Reauthorization Act, which would allocate money from the Public Health Service Act, remains introduced but unvoted on by the Senate.¹⁶ The implementation of the ACA has also resulted in a significant decrease in other sources of trauma center funding. One study reported a shift in the payor mix, leading to fewer commercially insured patients, which has been an essential avenue for maintaining trauma center margins. Additionally, there has been a marked 17.4% reduction in disproportionate share hospital funding, intended to support level I trauma centers like the subject of the study.¹⁷ Furthermore, as demonstrated by a meta-analysis, most studies have consistently reported no significant reduction in in-hospital mortalities since the introduction of the ACA. This signals that while the ACA has provided tenable foundations to support disadvantaged patients and essential high designation trauma centers, additional care and funding are necessary to ensure tangibly improved outcomes.¹⁴ Federal funding from other congressional appropriations, although present, is still insufficient to cover trauma center operating costs on its own and has consistently eroded, with federal offerings from the Trauma-Emergency Medical Services Systems Grant budget having decreased from US\$4.8 million to US\$2 million from 1996 to 2005.¹⁸

SOLUTIONS AND CONSEQUENCES

Support

An essential conceit to addressing the issue of trauma center funding is ensuring a tenable solution for both trauma centers and patients. A survey found that per patient costs rose with length of stay, injury severity and length of ventilator usage, and that level I trauma centers consistently held the highest of these metrics as well as proportionately high per patient costs.¹¹ With a cost per patient of US\$1689 and an average reimbursement rate of 20%, treating a recommended 1200 patients per year would require a reimbursement fee of US\$8445 per patient to cover treatment costs alone. To this end, many trauma centers have introduced activation costs to recoup losses from processes associated with visits and maintenance, although these costs are largely unstandardized. There exists a large degree of variance even between trauma centers of the same level depending on region and ownership. Activation costs can range from US\$1000 to US\$61 734, with a median of US\$9500 for level I trauma centers. Furthermore, most costs, including those associated with rising costs for trauma centers themselves, appear to be rising unabated once again.^{19,20}

One avenue to address these rising costs is state-based aid for trauma centers. This approach has already been documented to markedly reduce mortalities in injured patients, as shown by one assessment of trauma centers across 17 states. The study used data from over 500 000 patients, revealing that states with higher funding levels experienced lower mortality rates at trauma centers.²¹ While multiple states and municipalities such as those of Maryland, New York, and Virginia have funds in place to mitigate waning federal support and the rising costs of trauma centers to support the essential functions they provide, these programs are not ubiquitous and funding on the state level remains sorely needed. Maryland is most notable for its Trauma Physician Services Fund, which serves underfunded trauma centers with a US\$5 surcharge on all motor vehicle registrations.²² New York, for its part, funds trauma centers with generous allocations from public welfare programs such as the Statewide Healthcare Facility Transformation Program, which most recently contributed US\$200 million to two hospitals' trauma centers.²³ Following a 2004 audit that determined designated trauma centers in Virginia were losing a combined US\$44 million annually, the state code was amended to form the Trauma Center Fund for the Commonwealth of Virginia. This fund is furnished by fees collected for the reinstatement of revoked or suspended driver's licenses and from repeat driving under the influence offenders.²⁴ It is evident that these programs have been implemented and maintained with little cost to the citizenry while providing the unparalleled benefit of maintaining consistent access to 24/7, high-quality care from high-designation trauma centers, providing ample justification for their universal adoption by other states.

Managed care

Another factor influencing the accessibility, efficacy and cost of trauma care to patients is the development of managed care organizations, which aim to simplify a patient's healthcare experience at the cost of restricting the potential providers they may visit. While there is no unilateral approach to treating managed care populations in trauma, managed care organizations predominantly aim to either contract specific existing trauma centers or create their own proprietary centers.²⁵ However, complications arise when managed care organizations intervene to prioritize patient treatment at approved facilities rather than trauma specialized centers, as one study observed a majority of trauma patients were admitted to non-trauma centers in accordance with managed care policies, a practice which has already been demonstrated to significantly increase mortality rates.²⁶ Furthermore, studies indicate in cases where trauma patients belonging to a managed care organization are moved from a trauma center after an initial period to a location affiliated with the managed care organization, they experience longer length of stays.²⁵ In contrast, a later study on geriatric hip fracture patients demonstrated a lowered mortality rate for managed care patients when compared with non-managed care, although this can be attributed to the lack of repatriation in this instance and the authors concede that the cohort of non-managed care patients was not as rigorously delineated, leading to potentially inflated measures.²⁷ This reinforces both that treatment at trauma centers is essential for trauma patients, and that cooperation between healthcare organizations and trauma centers is essential to minimize mortality.

One study reported initial hospitalization charges were nearly doubled for patients admitted to non-trauma centers for traumatic injuries with traumatic brain injuries when compared with

patients admitted to level I trauma centers.²⁶ Furthermore, it is essential that managed care organizations and hospitals cooperate to ensure the profit motive does not override patient care, as some studies indicate the emergence of some managed care organizations incentivizes hospitals away from supporting trauma centers to focus on more lucrative areas of healthcare.²⁸

Closures

Without support, trauma centers may be unable to provide consistent, quality care or even operate at all. Among the most dire and immediate consequences of the dearth of funding for trauma centers is closure. Demonstrably a core component of healthcare infrastructure, the loss of a trauma center can have significant consequences for the local population, especially socioeconomically disadvantaged patients. Studies further lend credence to this notion, as following trauma center closures, hospitals without them are ill-equipped to handle injured patients, leading to significant decreases in survival and recovery rates.²⁹

Although the ramifications of closing one trauma center in otherwise well-supported locations can already be significant as adjacent hospitals buckle under the pressure of patient volume influx, these issues are compounded further by the universalized lack of trauma funding. This often leads to the closure of multiple trauma centers simultaneously, propagating 'trauma deserts'.³⁰ These trauma deserts precipitate heightened rates of mortality by precluding large populations—often vulnerable minority and uninsured groups—immediate trauma care. This further highlights the essential safety net function of level I and II trauma centers.^{28 29} Specifically, studies highlight remote rural and urban communities as the most affected by these growing closures. This issue becomes doubly concerning when considering that these communities are already relatively inaccessible for most other forms of infrastructure and are difficult to natively support trauma centers due to the proportion of uninsured patients.^{31 32} Regardless of specificity though, multiple studies reiterate the notion that the further distance traveled from the site of injury to the treatment location proportionally increases the odds of mortality for the injury.^{33 34} As such, it is imperative to ensure equitable access to high-designation trauma centers for all patients, and to ensure that existing trauma centers remain open. Many studies conclude that with sufficient financial support, the pressure on trauma centers from uninsured and federally insured patients can be managed comparably to others. This underscores that trauma care has the capacity to become financially sustainable.

Conclusion

The current lack of funding for trauma centers will result in tangible consequences for trauma patients as patient volumes and costs rise unabated. While state and local funding programs do exist, they are neither standardized nor supported enough to compensate for the financial needs of modern trauma centers. Furthermore, allocations from federal programs such as the Affordable Healthcare Act have yet to be fully distributed as originally outlined. In the private sector, managed care organizations have yet to create a unilateral framework with which to cooperate with trauma centers. Bereft of external support, trauma centers will have to rely heavily on dwindling patient fees, or else face closure. Inevitably, these problems will culminate in increased mortality and lower quality of life for patients if appropriate actions are not taken.

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