
Geographic Distribution of Trauma Burden, Mortality, and Services in the United States: Does Availability Correspond to Patient Need?



Arturo J Rios-Diaz, MD, David Metcalfe, LLB, MBChB, Olufode A Olufajo, MD, MPH, Cheryl K Zogg, MSPH, MHS, Brian Yorkgitis, DO, Mansher Singh, MD, Adil H Haider, MD, MPH, FACS, Ali Salim, MD, FACS

- BACKGROUND:** The association between the need for trauma care and trauma services has not been characterized previously. We compared the distribution of trauma admissions with state-level availability of trauma centers (TCs), surgical critical care (SCC) providers, and SCC fellowships, and assessed the association between trauma care provision and state-level trauma mortality.
- STUDY DESIGN:** We obtained 2013 state-level data on trauma admissions, TCs, SCC providers, SCC fellowship positions, per-capita income, population size, and age-adjusted mortality rates. Normalized densities (per million population [PMP]) were calculated and generalized linear models were used to test associations between provision of trauma services (higher-level TCs, SCC providers, and SCC fellowship positions) and trauma burden, per-capita income, and age-adjusted mortality rates.
- RESULTS:** There were 1,345,024 trauma admissions (4,250 PMP), 2,496 SCC providers (7.89 PMP), and 1,987 TCs across the country, of which 521 were Level I or II (1.65 PMP). There was considerable variation between the top 5 and bottom 5 states in terms of Level I/Level II TCs and SCC surgeon availability (approximately 8.0/1.0), despite showing less variation in trauma admission density (1.5/1.0). Distribution of trauma admissions was positively associated with SCC provider density and age-adjusted trauma mortality ($p \leq 0.001$), and inversely associated with per-capita income ($p < 0.001$). Age-adjusted mortality was inversely associated with the number of SCC providers PMP. For every additional SCC provider PMP, there was a decrease of 618 deaths per year.
- CONCLUSIONS:** There is an inequitable distribution of trauma services across the US. Increases in the density of SCC providers are associated with decreases in mortality. There was no association between density of trauma admissions and location of Level I/Level II TCs. In the wake of efforts to regionalize TCs, additional efforts are needed to address disparities in the provision of quality care to trauma patients. (J Am Coll Surg 2016;223:764–773. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)
-

CME questions for this article available at
<http://jacscme.facs.org>

Disclosure Information: Authors have nothing to disclose. Timothy J Eberlein, Editor-in-Chief, has nothing to disclose.

Disclosures outside the scope of this work: Dr Haider receives grants from the Patient-Centered Outcomes Research Institute and Affinity Research Collaborative, and is the co-founder and an equity holder in Patient Doctor Technologies Inc, which owns and operates the website www.doctella.com. Abstract presented at the Eastern Association for the Surgery of Trauma 29th Annual Assembly, San Antonio, TX, January 2016.

Received May 26, 2016; Revised August 30, 2016; Accepted August 31, 2016.

From the Department of Surgery, Center for Surgery and Public Health (Rios-Diaz, Olufajo, Zogg, Haider, Salim), Division of Trauma, Burn and Surgical Critical Care (Olufajo, Yorkgitis, Haider, Salim), Division of Plastic Surgery (Singh), Department of Surgery, Brigham and Women's Hospital, Harvard Medical School, Harvard TH Chan School of Public Health (Rios-Diaz, Olufajo, Zogg, Haider, Salim), Boston, MA, Department of Surgery, Thomas Jefferson University, Philadelphia, PA (Rios-Diaz), and Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, John Radcliffe Hospital, Oxford, UK (Metcalfe).

Correspondence address: Arturo J Rios-Diaz, MD, Thomas Jefferson University Hospital, 1100 Walnut St, Suite 620, Philadelphia, PA 19107. email: arturo.riosdiaz@jefferson.edu

Abbreviations and Acronyms

HCUP	= Healthcare Cost and Utilization Project
NIS	= Nationwide Inpatient Sample
PMP	= per million population
SCC	= surgical critical care
TC	= trauma center

Trauma continues to be the leading cause of death among Americans aged 1 to 44 years.¹ Despite advances in medical care, there was a 23% increase in traumatic deaths during the last decade.² Initiation of organized trauma systems has been reported to be associated with decreases in mortality of between 8% and 50%.^{3,4} The mechanisms by which trauma systems reduce trauma mortality are not clear, but might include prehospital emergency medical services, timely triage and transport, definitive medical care, and rehabilitation.⁵ Designated trauma centers (TCs) are fundamental components of organized trauma systems. These facilities provide a number of specialized resources—including a surgical critical care (SCC) workforce—that are likely to be involved in managing the most severely injured patients.

Trauma systems across the US are more heterogeneous than in some other developed countries.^{6,7} For example, systems vary in terms of funding, designation of TC levels, allocation of resources, and quality assurance.⁸ Unlike some European countries in which healthcare is organized centrally,⁶ hospitals in many US trauma systems are free to pursue TC accreditation⁵ regardless of local need.⁹ This variation in organized trauma care could lead to unequal distribution of resources and geographic disparities in trauma outcomes.

Although there has been a substantial increase in the number of TCs during the last 20 years,⁵ up to 46.7 million Americans (approximately 15.8% of total population) do not have a TC within 1 hour of their home.¹⁰ It has also been suggested that many hospitals struggle to recruit specialists in SCC to cover emergency calls because the work can be “intensive, unpredictable, and poorly compensated.”^{11,12} In addition, among those who do decide to pursue the career, the majority are expected to continue practicing close to their training hospitals, potentially exacerbating the difficulty of attracting SCC providers to lower-level TCs and to more remote areas.¹³ However, with the emergence of acute care surgery as a practice paradigm, as much as 46% of general surgery residents are considering this as a career.¹⁴ This could alleviate the shortage in SCC providers in the future, given that the American Association for the Surgery of Trauma-sponsored fellowships include SCC training besides trauma and emergency general surgery.

One fundamental goal of trauma system design is to ensure TC access to all Americans and guarantee a sustainable SCC workforce. However, it is unclear whether existing TC provision is truly consistent with clinical need. In this study, we sought to examine the relationship between trauma burden and state availability of TCs, SCC providers, and SCC training opportunities; explore associations between trauma burden, trauma provision, per-capita income, and state-level trauma mortality; and provide an updated inventory of TCs, SCC providers, and SCC training positions across the US.

METHODS

We undertook a state-level ecological study using data from multiple administrative sources. The variables included were number of trauma admissions per million population (PMP; trauma admission density), number of TCs PMP (density of TCs), number of Level I and II TCs PMP (density of Level I and II TCs), number of SCC providers PMP (density of providers), number of SCC fellowship positions PMP (density of fellowship positions), state-level median per-capita income, and age-adjusted mortality rate. The study was approved by the Partners Human Research Committee, the IRB of Brigham and Women’s Hospital.

Incidence of trauma

The Healthcare Cost and Utilization Project (HCUP) Nationwide Inpatient Sample (NIS) and State Inpatient Databases were used to determine nationally representative characteristics of trauma cases severe enough to require hospitalization, regardless of the type of hospital (TC or non-TC) to which patients were admitted. The HCUP NIS is the largest publicly available all-payer inpatient healthcare database in the US and provides national weighted estimates of hospital inpatient stays based on discharges.¹⁵ The HCUP State Inpatient Databases include inpatient all-payer discharge records from nearly all acute care hospitals in each individual state.¹⁶ To obtain national and state-specific estimates, queries were performed through the HCUP online portal, HCUPnet,¹⁷ on the HCPU NIS, and on all 37 available HCUP State Inpatient Databases. Traumatic injuries were defined using primary ICD-9-CM diagnosis codes, including those within the “injury and poisoning” index range (800 to 999) except for “late effects of injuries, poisonings, toxin effects, and other external causes” (905 to 909), “superficial injuries” (900 to 919), “contusion with intact skin surface” (920 to 924), “effects of foreign body” (930 to 939), “burns” (940 to 949), “poisoning by drugs” (960 to 979), “toxic effects of substances”

Download English Version:

<https://daneshyari.com/en/article/5733513>

Download Persian Version:

<https://daneshyari.com/article/5733513>

[Daneshyari.com](https://daneshyari.com)