

Trauma system funding: implications for the surgeon health policy advocate

Saunders Lin ,¹ Christian Johnson,² Frank Opelka,³ Amy Liepert ⁴

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/tsaco-2020-000615>).

¹Surgery, Oregon Health and Science University, Portland, Oregon, USA

²Division of Advocacy and Health Policy, American College of Surgeons, Washington, DC, USA

³Division of Advocacy and Health Policy, American College of Surgeons, New Orleans, Louisiana, USA

⁴Surgery, UC San Diego School of Medicine, San Diego, California, USA

Correspondence to

Dr Saunders Lin; sl7138@nyu.edu

Received 29 September 2020

Revised 11 November 2020

Accepted 11 November 2020

ABSTRACT

Background Trauma systems improve mortality for the most severely injured patients; however, these systems are managed by individual states with different funding mechanisms, which can lead to inconsistencies in the quality of care. This study compiles trauma system legislation and regulations of funding sources and creates a trauma funding categorization system. Such data help to inform the systems of trauma care delivery within and between states.

Methods Online searches of state statutes were performed to establish the presence of legislative code to establish a trauma system, the presence of legislative code that funds these trauma systems, and the amount of funding that was allocated to each state's trauma system in fiscal year 2016 to 2017. Following this, each state's trauma system was contacted via email and telephone to further obtain this information.

Results Specific state legislation creating a trauma system was identified in 48 states (96%). Data for categorization of trauma system funding were obtained in 30 states (60%). Of these 30 states, 29 have legislation funding their trauma systems. 17 states funded their trauma systems through general appropriations legislation, 10 states used percentages of fines from criminal and misdemeanor offenses, and 7 states used fees and taxes. New York state does not have any specific funding legislation. Individual state financial contributions to state trauma systems ranged from \$55 000 to \$25 899 450, annually.

Discussion There is a limited amount of trauma system funding details available, and among these there is wide variation of funding source types and amounts allotted toward trauma systems. It is difficult to obtain and summate legislative information for use for surgical health policy advocacy efforts. Further study and method development to disseminate comprehensive and comparative legislative and regulatory data and information to physicians and other trauma system stakeholders are needed.

Level of evidence III, economic and valued-based evaluation; analyses based on limited alternatives and costs; poor estimates.

INTRODUCTION

There are 150 000 deaths per year from traumatic injury, making it the leading cause of death under 40 years of age.¹ Trauma systems, created to combat and prevent these deaths, are organized, coordinated efforts in a defined geographical area that deliver the full range of advanced medical care to all injured patients.² Components of these systems include emergency medical services (EMS)/9-1-1

dispatch, prehospital care, triage and transport of the injured, emergency department coordination, trauma surgeon and trauma center team activation, surgical and other procedural interventions, intensive and general in-hospital care, rehabilitative services, mental and behavioral health, social services, medical care follow-up, and intentional and unintentional injury prevention.²

Funding for trauma systems is supplied by a combination of federal and state sources,³ with management coordinated at the state and/or regional level. Due to the progressive nature of legislation over 40 years, great variability of system functionality and interactions at the state and regional levels has developed. In 2012, the National Conference of State Legislatures (NCSL), a bipartisan non-government organization created to assess the quality of state legislatures, published a national report entitled "The Right Patient, The Right Place, The Right Time." The report examined seven key components of each state's trauma systems, including general state and federal funding sources, and obtained data for 30 states. The report did not evaluate or collate specific regulations or legislative items that directly affect clinical care delivery and therefore is of limited use to trauma system stakeholders.³

We sought to survey state legislation and regulations to understand the availability and variability in trauma system statutes at the state level. Surgical health policy stakeholders (trauma surgeon, trauma program coordinator, or injury prevention specialist) need to use these legislative resources to further locoregional trauma system advocacy and development in a targeted and specific manner. The aim of our study was to analyze specific state-based regulations and legislation in all 50 states to increase cooperation between states and trauma advocates to guide future trauma system development.

METHODS

This study was conducted between August 2017 and August 2018. A data collection tool was developed with the input of practicing trauma surgeons, a trauma surgery health policy advocacy expert, and health policy experts based on expert opinion of needed information for trauma system advocates interested in affecting regional or state-based trauma system development.

Legislative and regulatory information was collected via two approaches. Data point collection included the presence (or lack of presence) of legislative code to establish a trauma system, state code sections that establish or explain funding

© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Lin S, Johnson C, Opelka F, et al. *Trauma Surg Acute Care Open* 2020;**5**:e000615.

mechanisms for the trauma system, and if able to be obtained, the amount (in dollars) allotted for state trauma funding systems in 2017.

Approach 1

Approach 1 was an online query by a study author (SL or CJ) of each state's regulatory body governing the trauma system of that state, such as the Department of Health. If not covered by the Department of Health, other state government agencies were sought by online review. Each site overseeing each state's trauma system was reviewed for statutes, Department of Health budgets, and/or any other legislation concerning state trauma systems or trauma system funding regulations. If titles, chapters, or other major legislative code sections were identified, a detailed search of the specific sections and subsections was conducted.

For those states that had their legislative code readily available, keyword searches were queried within online portals when the function was available⁴. These included "trauma," "trauma system," "statewide trauma system," "EMS," and "Emergency Medical Services." If the Department of Health (or other agency of jurisdiction) posted their EMS and/or trauma system rules on their website, these were cross-checked with the statutory research described previously.

Approach 2

Approach 2 was used for missing data after attempts to locate data online via approach 1 were exhausted. It consisted of an emailed standardized letter request to each state's Department of Health contact listed on the online site. If no contact was found on the Department of Health website, the state trauma system web page was queried for a contact to send the standardized letter. If this was unsuccessful, a phone inquiry was made to the listed contact number on the state's Department of Health site to track down the personnel responsible for trauma system administration. Often this required communication with multiple members of state government and state regulatory bodies. Once the correct department officials, often with titles such as state trauma system program director or trauma system manager, were identified and contacted, the same standardized letter request was submitted. For data questions or discrepancies, consensus among authors was used to categorize and choose appropriateness for inclusion. Freedom of Information Act (FOIA) requests were submitted when requested.⁵ This process is summarized in figure 1.

The authors independently reviewed and coded all responses for trauma funding categories. Based on this coding, categories of responses were created. Discrepancies were resolved by consensus obtained via discussion. The resultant categories were general appropriations, fines, fees, unknown, and none. Federal funding sources were not included.

RESULTS

Specific state legislation creating a trauma system was identified in 48 states (96%). We confirmed that one state, Michigan, does not have specific legislation creating a trauma system. The presence or absence of direct legislation of the formation of a trauma system was not confirmed in one other state, Vermont.

Via approach 1, data were obtained for 12 states (Arizona, Florida, Georgia, Massachusetts, New Mexico, New York, Ohio, Pennsylvania, Texas, Utah, Washington, and Wisconsin). Approach 2 was required for the remaining 38 states. Ten states required additional phone calls with different personnel or departments to obtain or precisely identify the data. FOIAs were required for three states.

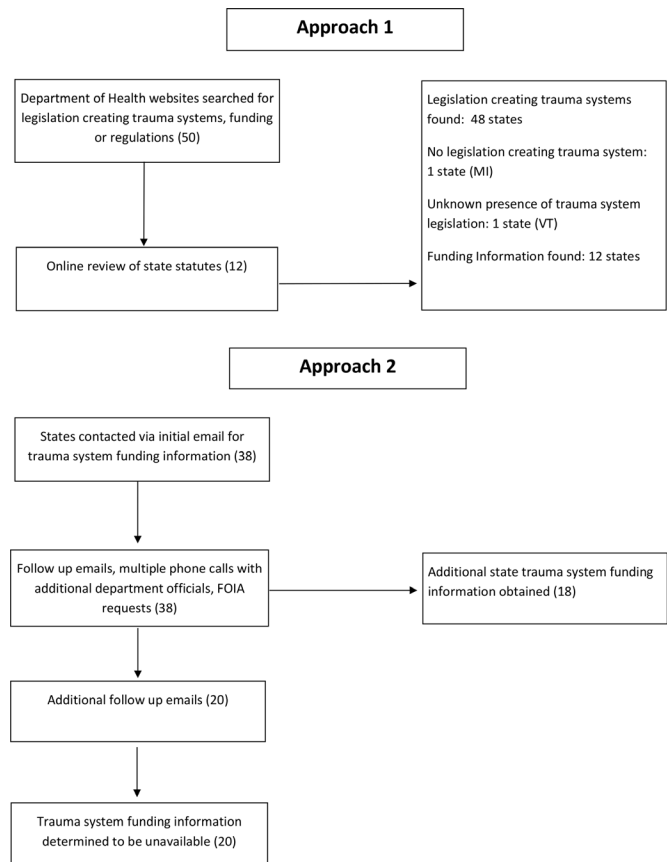


Figure 1 Contact approaches to state offices. FOIA, Freedom of Information Act, MI, Michigan; VT, Vermont.

Data available for the creation of a categorization of trauma funding are shown in table 1. It was fully compiled in 11 (22%) states, partially compiled in 19 (38%) states, and no accurate data were available in 20 (40%) states.

We confirmed the presence of trauma funding legislation or regulation information for 30 states (figure 2), and percentages are based on the number of states in each category relative to the total number of states with information found. Seventeen states funded the trauma system through general appropriations legislation (59%). Ten states used set percentages of fines from criminal and misdemeanor offenses to fund the trauma system (34%), including fines from traffic violations, releases of bailed persons and illegal drug citations. Seven states (24%) used fees from vehicle registration and cigarette taxes to fund their trauma system. One state (New York) was confirmed to have no specific legislation in state statutes regarding trauma funding. Percentages reflect that various states used a combination of all three mechanisms to fund the trauma system. For the complete state database, see online supplemental appendix A.

Allocations of trauma system funding from fiscal year 2016 to 2017 were captured in nine states, ranging from gross annual amounts of \$55 000 in Wyoming to \$25 899 450 in Arkansas in 2016 to 2017.^{6,7} Two states, Texas and Washington, fund both EMS and trauma care systems together through various general appropriations bills and traffic tickets/motor vehicle registration fines, respectively.⁸ Washington allocated a total of \$24 312 000⁹ and Texas a total of \$969 149.02¹⁰ in fiscal year 2016 to 2017. The seven other states (Arizona, Pennsylvania, Oregon, Arkansas, Wyoming, Minnesota, and Georgia) funded their trauma systems separate from their EMS systems. Arizona allocated \$1 955 147.

Table 1 Categorization of trauma funding sources

| Categories of trauma system funding | States | Percentage of all states | State specific examples |
|-------------------------------------|--|--------------------------|---|
| General appropriations | AL, AR, CA, CT, IL, LA, MD, MN, MO, MS, NM, OR, PA, SC, TN, WI, WY | 34 | AR: House Bill (HB) 1168 benchmarks an appropriation of \$25 899 450 for the Arkansas Trauma System. |
| Fines | | | |
| Traffic violations | FL, GA, KY, MS, OK, TX, VA, WA | 16 | TX: Texas Health and Safety Code (THSC) §780.001 through 780.003 requires the Department of Public Safety to remit surcharges collected under the driver responsibility program (Texas Transportation Code §708) to the comptroller, who then must distribute 49.5% of the funds into the Trauma Facility and Emergency Medical Services Account. |
| Illegal drug citations | VA | 2 | VA: \$50 fine that must be paid by persons with repeat convictions for drug and alcohol offenses, generating about \$200 000 per year. |
| Bailed person fees | OH | 2 | OH: §4513.263(E) requires that the trauma and emergency medical services fund be satisfied with monies from (1) "(a)pplication fees for certificates of accreditation, certificates of approval, certificates to teach, and certificates to practice"; funds from fees and fines assessed as part of the fire service training program; fees and fines assessed for operation of emergency medical, fire, transportation, and ambulance services; as well as "(f)orty-five per cent of the fines collected from or moneys arising from bail forfeited by persons apprehended or arrested by state highway patrol troopers..." |
| Fees | | | |
| Cigarettes | AZ, HI, MS, OK | 8 | MS: The legislature passed House Bill (HB)1511 in the 2017 Regular Session. This bill restored up to \$7 023 197 of fees collected from moving violations to the trauma system, but will reduce spending on Trauma Fiscal Year 2018 Mississippi Trauma System of Care Plan. |
| Vehicle registrations | CA, CO, NE | 6 | CO: \$1 surcharge on motor vehicle registrations to support emergency medical and trauma services state-wide. |
| No funding sources | NY | 2 | NY: State does not provide trauma-specific funding. |
| Unknown | AK, DE, ID, IN, IA, KS, ME, MA, MI, MT, NV, NH, NJ, NC, ND, RI, SD, UT, VT, WV | 40 | |

AK, Alaska; AL, Alabama; AR, Arkansas; AZ, Arizona; CA, California; CO, Colorado; CT, Connecticut; DE, Delaware; FL, Florida; GA, Georgia; HI, Hawaii; IA, Iowa; ID, Idaho; IL, Illinois; IN, Indiana; KS, Kansas; KY, Kentucky; LA, Louisiana; MA, Massachusetts; MD, Maryland; ME, Maine; MI, Michigan; MN, Minnesota; MO, Missouri; MS, Mississippi; MT, Montana; NC, North Carolina; ND, North Dakota; NE, Nebraska; NH, New Hampshire; NJ, New Jersey; NM, New Mexico; NV, Nevada; NY, New York; OH, Ohio; OK, Oklahoma; OR, Oregon; PA, Pennsylvania; RI, Rhode Island; SC, South Carolina; SD, South Dakota; TN, Tennessee; TX, Texas; UT, Utah; VA, Virginia; VT, Vermont; WA, Washington; WI, Wisconsin; WV, West Virginia; WY, Wyoming.

Pennsylvania allocated \$18 901 000, Minnesota \$352 000 and Georgia \$11 961 703.^{11 12} The state of Oregon used a biennial funding system, which appropriates the amount for 2 years per state statute (2015–2017), and this amount was \$984 871.¹³

DISCUSSION

This article sought to acquire and collate current state-level, trauma-specific funding legislation and regulations to demonstrate the complex legislative environment surrounding trauma systems, demonstrate the difficulties in obtaining such information, and yet demonstrate methodology that can be used as an advocacy tool for surgeon advocates. A major difficulty with this approach is the variation between state statutes. Each state

arranges their code differently, and this complexity required phone calls to speak to experts to get their perspective, experience and expertise on how each state trauma system is implemented. These difficulties in transparency are experienced in many different advocacy organizations, and we highlight the need for making review processes as explicit and transparent as possible and addressing any potential conflicts of interest, which allows for complete scientific debate and the ability to produce effective change.¹⁴

For the most severely injured trauma patients, minutes determine survival and ability to recover and return to meaningful societal contribution. The trauma system was developed with a series of federal bills, including the Highway Safety Act of 1966, the Emergency Medical Systems Act of 1973, the Trauma Systems Planning and Development Act of 1990, and the 2002 Health Resources and Services Administration National Assessment of State Trauma System Development, Emergency Medical Services Resources, and Disaster Readiness for Mass Casualty Events Act.¹⁵ However, implementation was left to the states, resulting in a variety of state laws and regulations that are often difficult for the clinical stakeholders and hospital-based program managers to access.

A recent study by Hashmi *et al*¹⁶ examining access to trauma care and prehospital death found that state by state disparities exist in age-adjusted mortality rate. To address these disparities,

Trauma System Funding Sources



Figure 2 Categories of trauma system funding, by state.

trauma system advocates will need to have data and information as to the current landscape of existing state-based trauma system legislation and regulations as well as a methodology to obtain the most up-to-date regulatory data. However, a “theory policy practice gap” exists between physicians and policy makers, which limits effective change at the patient care, policy, regulatory, and legislative levels.¹⁷ Continuing this lack of dialogue between health policy theorists and the physicians providing trauma patient care may result in the American medical system being destined for continued struggles and inefficiencies. With a developed systematic approach to the analysis of policy information from physicians, stakeholders can intervene more effectively in the policy process.¹⁸

Although we encountered an impressive lack of access to data in nearly half (40%) of states, this was consistent with data reported in the 2012 NCSL report, “The Right Patient, The Right Place, The Right Time.” We unfortunately demonstrate that access to these very specific data was not readily available in public forums, and it required reliance on the staff of state departments to provide these data. Although this informs that a large amount of effort is required to acquire the information needed regarding specific trauma systems, relationships with those government employees could be leveraged in the future for ongoing advocacy work and meaningful legislative or regulatory gains for trauma systems and patients. Although some of the information presented here will be out of date by the time of publication, this work demonstrates the need for ongoing research and tools to improve access to trauma system legislative and regulatory data to enable surgeons and trauma system administrators to more effectively influence state trauma policies. We have outlined a process to obtain more granular data that can be used to influence state-level policy as well as to serve as a comparison between states.

CONCLUSION

Trauma systems are an important example of direct patient care interfacing with state-level legislation, regulations, policy, and budgets. This work lays the foundation for trauma system health policy advocates, including trauma surgeons, to target specific legislative or regulatory policies to impact care for each state’s specific needs. Further study and method development to disseminate comprehensive and comparative legislative and regulatory data to physicians and other trauma system stakeholders are needed.

Contributors SL performed data collection, performed statistical analysis, wrote the article, and created the figures and tables. CJ performed data collection, wrote and edited the article, and added legal input. FO contributed to study design, article drafting and editing. AL edited the article and facilitated all processes in the work of this article.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Map disclaimer The depiction of boundaries on this map does not imply the expression of any opinion whatsoever on the part of BMJ (or any member of its group) concerning the legal status of any country, territory, jurisdiction or area or of its authorities. This map is provided without any warranty of any kind, either express or implied.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval As patient data were not used in this study, institutional review board approval was not needed.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information. Data are collated from online state department websites and information gathered from individual state employees.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Saunders Lin <http://orcid.org/0000-0003-4579-699X>

Amy Liepert <http://orcid.org/0000-0002-9333-9905>

REFERENCES

- 1 A national trauma care system: integrating military and civilian trauma systems to achieve zero preventable deaths after injury. *Mil Med* 2017;182:1563–5.
- 2 H.a.H. Services. *Model trauma system planning and evaluation*: Health and Human Services, 2006.
- 3 National Conference of State Legislatures. The Right Patient, the Right Place, The Right Time: A Look at Trauma and Emergency Medical Services Policy in the United States. 2012. <http://www.ncsl.org/Portals/1/Documents/Health/NCSTraumaReport812.pdf> (18 Nov 2018).
- 4 Gov hawk. (Accessed August 15th, 2018).
- 5 Freedom of information act. <https://www.foia.gov/>.
- 6 Wyoming trauma program. <https://health.wyo.gov/publichealth/ems/index-5/>.
- 7 House bill 1168. <http://www.arkleg.state.ar.us/assembly/2017/2017R/Bills/HB1168.pdf>.
- 8 Trauma Facilities and Emergency Medical Services. *Health and safety*. United States of America, 2018.
- 9 Senate bill 5883: United States of America. 2017.
- 10 EMS-Trauma systems funding. 2018 <https://dshs.texas.gov/emstraumasystems/efunding.shtm>.
- 11 O.C.G.A. § 40-6-189
- 12 PA HB 218. 2017.
- 13 Rules and statutes. <https://www.oregon.gov/oha/ph/providerpartnerresources/emstraumasystems/pages/rules.aspx>.
- 14 Cruz VO, Walt G. Brokering the boundary between science and advocacy: the case of intermittent preventive treatment among infants. *Health Policy Plan* 2013;28:616–25.
- 15 Gaston SR. "Accidental death and disability: the neglected disease of modern society". A progress report. *J Trauma* 1971;11:195–206.
- 16 Hashmi ZG, Jarman MP, Uribe-Leitz T, Goralnick E, Newgard CD, Salim A, Cornwell E, Haider AH. Access delayed is access denied: relationship between access to trauma center care and pre-hospital death. *J Am Coll Surg* 2019;228:9–20.
- 17 Chinitz DP, Rodwin VG. On health policy and management (HPAM): mind the theory-policy-practice gap. *Int J Health Policy Manag* 2014;3:361–3.
- 18 Buse K. Addressing the theoretical, practical and ethical challenges inherent in prospective health policy analysis. *Health Policy Plan* 2008;23:351–60.