Poor access to trauma center linked to higher death rates in more than half of US states

October 22 2018

States with poor access to a comprehensive trauma center have more deaths occurring before injured patients' arrival at a hospital, compared with states that have better access. Furthermore, this frequency of prehospital deaths contributes to higher overall trauma-related mortality, according to new research findings presented today at the American College of Surgeons Clinical Congress 2018. Overall, more than half (28 states) have an above-average prehospital death burden, reported researchers from Brigham and Women's Hospital, Boston.

"We know faster transportation time to a trauma center saves lives, but we didn't know about the regional differences in trauma center access," said Zain G. Hashmi, MD, who helped conduct the study as a research fellow at Brigham and Women's and is now a general surgery resident at Sinai Hospital, Baltimore. "Despite a major decline in in-hospital mortality for high-risk trauma since 1970, there has been little emphasis at the national level on improving the prehospital death rate due to trauma."

Timely access to a trauma center is critical to achieve the goal of "Zero Preventable Deaths After Injury," recommended in a 2016 report of the National Academies of Sciences, Engineering and Medicine (NASEM)[1] and championed by the American College of Surgeons. According to the Centers for Disease Control and Prevention (CDC), trauma is the leading cause of death in Americans younger than age 45, and 214,000 people die from injuries each year.[2]

Under the direction of senior investigator Adil H. Haider, MD, MPH, FACS, Dr. Hashmi and colleagues sought to obtain more information about what Dr. Hashmi called "the big black box" of prehospital trauma care. They analyzed 1.95 million trauma deaths in U.S. adults (ages 15 and older) reported to the CDC between 1999 and 2016, nationally and by state. Restricting trauma to blunt injuries (such as those due to falls, motor vehicle collisions, or assault with a blunt object) and penetrating injuries (gunshot and stab wounds, punctures, and so on), the investigators excluded trauma deaths due to drowning, burns, and other causes.

The researchers compared the frequency of deaths occurring in-hospital with those occurring before hospital arrival. Using previously published data,[3] they also calculated the proportion of each state's population with timely access to a Level I or Level II trauma center, which is equipped and staffed to provide 24-hour care for patients with life-threatening injuries. They measured access to the trauma center by ground or air transport within 45 minutes of injury and within the more conventional "golden hour," a limited timeframe for getting a trauma patient to definitive care within an hour of the injury for the best chance of survival before shock causes damage to organs.

To estimate access and proximity to a trauma center, the research team developed a novel metric called the prehospital:in-hospital death (PH:IH) ratio, which is the number of prehospital trauma deaths divided by the number of in-hospital trauma deaths. States with a higher-than-average PH:IH ratio and age-adjusted mortality rate received the classification of "high prehospital death burden."

Overall, the largest percentage of trauma deaths occurred before hospital arrival (49 percent), compared with 42 percent of in-hospital deaths, according to the study abstract. (The remaining 9 percent were dead-on-arrival, nursing home, and hospice deaths, which the researchers

excluded from analysis.) The national average PH:IH ratio was 1.18, and the average age-adjusted mortality rate was 44.4 per 100,000 population based on U.S. census data.

An association existed between states with a high prehospital death burden and a lower proportion of the state's population with 1-hour access to a Level I or II trauma center, Dr. Hashmi reported. Only 63.2 percent of the population in high prehospital burden states had timely access to care versus 90.2 percent among the remaining states.

If all states had the same PH:IH ratio as did the states in the quartile with the best trauma center access, 7,601 prehospital trauma deaths could be prevented per year, the researchers estimated.

The 28 states identified as having a high prehospital death burden are Alabama, Alaska, Arizona, Arkansas, Colorado, Florida, Georgia, Idaho, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nevada, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, South Carolina, South Dakota, Texas, Utah, West Virginia, Wisconsin, and Wyoming.

The reasons why these states have worse prehospital death burden are unknown but likely varied, Dr. Hashmi said.

Senior investigator Dr. Haider said two major themes emerged from this study. "First, there is tremendous potential for saving lives by improving prehospital care and access to trauma centers. Second, to undertake these improvements, we need high-quality, detailed data from the point of injury through recovery and rehabilitation," he said. "That's where we can make the greatest impact in saving lives and ensuring meaningful functional outcomes after injury."

The researchers recommend that states with a high prehospital death

burden improve their access to care, such as by shortening patient transport times, optimizing placement of trauma centers, and by improving the quality of prehospital care.

They also agreed with the NASEM recommendation[1] to establish a national integrated trauma data repository that can track individual patient outcomes across the continuum of trauma care, including prehospital data, and efforts by the ACS Committee on Trauma to meet those recommendations. These efforts include establishing a national trauma system that links data across the continuum of injury care, from the prehospital phase to rehabilitation. As many of the states affected by this issue have a large rural population, an innovative solution to optimize access to care in an inclusive trauma system with high quality prehospital care will be critical.

More information: 1. Berwick D, Downey A, Cornett E, eds; National Academies of Sciences, Engineering, and Medicine. A National Trauma Care System: Integrating Military and Civilian Trauma Systems to Achieve Zero Preventable Deaths After Injury. Washington, DC: National Academies Press; 2016. www.nap.edu/23511. Accessed September 4, 2018.

2. Centers for Disease Control and Prevention. Key injury and violence data. www.cdc.gov/injury/wisqars/overview/key_data.html. Updated May 8, 2018. Accessed September 4, 2018.

3. Branas CC, MacKenzie EJ, Williams JC, et al. Access to trauma centers in the United States. *JAMA*. 2005;293(21):2626-2633.

Provided by American College of Surgeons