



Research Prioritization Topic Brief

Topic 10: “Rural trauma care”

Compare the effectiveness of care delivery (e.g., local hospital care, trauma center care) on improving outcomes in patients living in rural communities who experience trauma.

PCORI Scientific Program Area: Addressing Health Disparities

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April 16, 2013

Introduction

Rural populations and health care providers are less prepared to treat trauma. Roughly 62.5 million people (about 20% of the US population) live in rural areas.¹ On average, rural populations have more older adults and children, higher unemployment and underemployment rates, and lower population density with higher percentages of poor, uninsured, and underinsured residents. Disparities in access to trauma care have been found in these vulnerable populations.² Health services in rural areas can differ from urban areas on many dimensions including, longer travel distances (on average); fewer physicians per capita, including specialists required for comprehensive trauma care; health care facilities with limited scopes of service. While these factors do not uniformly mean that there is lower access to care compared to urban areas, they can make it more challenging to deliver trauma care in rural areas.³⁻⁵



Access to advanced trauma care is lower in rural areas. Advanced trauma care is particularly lacking in rural areas. The American College of Surgeons Committee on Trauma (ACS-COT) has designated trauma centers into levels I-IV, with Level I or II trauma centers having the most comprehensive resources required to provide high-level trauma care, and Level I centers able to provide the highest level of care in addition to trauma education research and outreach.^{6,7} Trauma care at a Level I center has been shown to reduce risk of mortality in the severely injured by 25%.⁸ The most advanced trauma centers are not distributed evenly across the nation; approximately 45 million Americans do not live within one hour of the highest level of trauma care.¹ There is a marked rural-urban disparity in access; at least 31% of rural residents are more than an hour from a Level I-III trauma center compared to only 12% of urban residents.²

Burden on society

Risk factors for trauma are higher in rural areas. The characteristics of rural trauma suggest a higher injury severity due to injury mechanism and associated social and behavioral dynamics. For example, rural motor vehicular crashes are associated with increased driver speed and inappropriate use of protective devices such as helmets and seatbelts.^{9,10} In rural areas, there is also a higher prevalence of alcohol use while driving;¹¹ a higher prevalence of loaded unlocked firearms at home;¹² an increase in life-threatening/serious farm related-injuries due to exposure to agricultural machinery;¹³ and when injuries occur, there is the associated issue of prolonged discovery and extrication (period from discovery to treatment) times.^{11,14} As compared to trauma patients sustaining the same types of injuries treated in an urban or larger metropolitan hospital, rural hospitals have fewer resources (e.g., trauma surgeons, emergency physicians, sophisticated diagnostic radiology, and blood bank reserves).¹⁵



Rural populations are more likely to die and have major disease burden from trauma.

Trauma is the most common cause of death in people age 1-44, the third most common cause overall, and is one of the top 5 most costly conditions.^{16,17} While only 20% of our population reside in rural regions, more than 60% of the trauma deaths in America occur in these remote geographic segments of the country.¹³

Rural patients are more likely to experience preventable deaths due to trauma for several reasons. Esposito et al found that the time for discovery of the injury and transport from the location of the trauma to the hospital is twice as long, on average, in rural locations as in urban areas. Because the first 60 minutes post-injury (the “golden hour”) substantially predicts health outcomes, delays in receiving treatment can lead to worse outcomes. Initial contact with a physician in the emergency room averaged six times longer in rural locations than in urban settings. As a result, the crude death rate in rural settings was three times that of the urban areas.¹⁸ One study found that a significant portion of deaths occurred not on the way to the hospital, but in a rural hospital's emergency room.¹⁹ In other words, these victims managed to survive the distance to the hospital, but upon arrival, the hospital was unable to save them. The overall “possibly preventable” (as determined by the authors) death rate was double the urban rates in rural incidents. When stratified by phase of care, rate of possibly preventable death was three times greater for the emergency department phase in rural areas than in urban ones.¹⁸

The burden of trauma continues after hospitalization. In 2000, injury accounted for \$326 billion dollars in lost productivity alone in the United States.²⁰ In addition, for the 1.7 million traumatic brain injuries that occur each year, a third result in death, and about 125,000 result in permanent damage and disability.²¹ Those who survive to discharge frequently need additional health care services such as home health, physical; occupational; and speech therapy, skilled nursing, and acute rehabilitation. Clinically appropriate courses of



treatment for traumatic brain injury and many other traumatic injuries have demonstrated that these services are particularly important and should be assessed as part of clinical comparative effectiveness of treatment.²² However, research has determined rural patients are less likely to receive such comprehensive outpatient therapy services.²³

Options for addressing the issue

Rural trauma is a high-impact target for improving trauma outcomes. There are many components to this problem from a prehospital, perihospital, and post-acute care treatment that lend themselves to patient centered outcomes research. These include:

- injury prevention education,
- pre-hospital resuscitation and triage management,
- improved resource allocation at Critical Access Hospitals,
- more accessible trauma resuscitation and treatment education,
- consultation via telemedicine (for example: bridging workforce gaps by improving relationships with higher-level trauma centers via telemedicine),
- development of improved regional trauma systems and studying the improvement of care,
- addressing out-of-hospital patient death and disability, and
- evaluating rural disparities in
 - access to comprehensive trauma center care, and
 - access to some rehabilitation sources shown to improve patients' functional status

In an attempt to decrease the impact of the limited resources available at rural hospitals, many states have organized their regional trauma systems to ease transfers of injured patients from non-trauma center hospitals to higher levels of care. Statewide regional trauma systems have demonstrated improvement in injury-related mortality as compared



to states will less developed trauma systems.²⁴ Currently, 9 states and districts lack a statewide trauma system, and of the remaining 42 states, only 24 have state-funded trauma systems.²⁵

Telemedicine may be a helpful resource. Telemedicine is a strategy that has improved many aspects of medical care, including trauma in rural areas. It was initially found to be beneficial in the military as an aid in resuscitation.²⁶ In a study conducted in rural Mississippi, telemedicine resulted in improved evaluation and management of trauma patients and more efficient and timely transfer of severely injured patients with decreased costs.²⁷ Further, this technology may be expanded upon as tele-presence in trauma surgery—a remote trauma or specialist surgeon could be connected to the rural operating room with video of the injury to provide real time guidance in surgical decision making. Approaches like this could help address the relatively lower supply of surgical specialists in rural communities, which is a workforce issue with no immediate or quick solutions.

Potential for new information to improve care and patient-centered outcomes rapidly

There are many opportunities for study and rapid implementation of these improvements.

Efforts to improve the maldistribution of surgeons and other trauma caregivers and limited access to resources could address the rural-urban divide in trauma outcomes. Study and implementation of the transfer arrangements from centers with fewer resources and the effect on survival are critical to determine if our current paradigm is effective in rural areas and ways to improve. The frequently preventable causes of rural trauma deaths suggest there is value in targeting research, policy, and providers to improve education, the delivery of preliminary trauma care, and in-hospital trauma care in rural environments, and ultimately, patient-centered outcomes.



Trauma outcome data are rich and underused. The ACS-COT has been integrally involved in standardizing and creating efficient trauma systems. *The Guideline for Field Triage* provides pre-hospital care providers with algorithms to recognize injured patients who are most likely to benefit from specialized trauma center resources.⁸ The Rural Trauma Team Development Course is designed to teach rural receiving facilities the fundamental elements of injury resuscitation, utilization of the available resources, and regional system relationships.²⁸ The ACS-COT also serves as a verification committee to optimize trauma care in the United States and audits trauma center verification level as outlined in the *Resources for Optimal Care of the Injured Patient*.²⁹ Trauma diagnosis, outcome, and hospital characteristic data are collected across trauma centers within the National Trauma Databank, which can be accessed for comparative effectiveness research.

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