



HHS Public Access

Author manuscript

Ann Emerg Med. Author manuscript; available in PMC 2016 February 16.

Published in final edited form as:

Ann Emerg Med. 2016 January ; 67(1): 68–70. doi:10.1016/j.annemergmed.2015.06.025.

Cost Savings in Trauma Systems: The Devil's in the Details

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In this issue of *Annals*, Zocchi et al¹ use a statewide administrative database to address the issue of costs and outcomes among hospitalized patients with minor and moderate injuries.¹ They reach 2 important conclusions about trauma patients without serious injuries: there is no demonstrable survival benefit from admission to major trauma centers, and the adjusted costs of care are higher at major trauma centers.

Because trauma care ranks second in total US health care spending² and is responsible for approximately 10% of US medical expenditures,³ there are major policy implications related to the care of injured patients. Among patients with serious injuries, the survival benefit of major trauma centers^{4–7} and the increased cost of care at these centers^{8–10} are not disputed. However, the potential outcome benefit and related costs of treating less seriously injured patients in major trauma centers have received relatively little attention. Because injury is common and more than 95% of injured patients transported to emergency departments (EDs) are not seriously injured,¹¹ patients with mild to moderate injuries constitute a large volume of patients using emergency care and an important aspect of optimizing value (the balance of quality, outcomes, and costs) in trauma systems. If there is no benefit of treating patients with less serious injuries in major trauma centers (as suggested in this study), then such expensive mismatches in patient care represent financial waste and reduce the value of trauma systems.

This article makes an important contribution to trauma research and health policy by addressing the question, Can we potentially save money in trauma systems without compromising outcomes by redirecting patients with minor to moderate injuries away from major trauma centers? The authors have done an excellent job in addressing the limitations of the available data by using sophisticated analytic methods and thoughtful discussion of the study challenges. However, there are several important questions implicit in the study that should be considered before an attempt is made to redesign trauma care for patients with minor to moderate injuries: (1) are there nonmortality benefits of treating less seriously injured patients in major trauma centers?; (2) do trauma centers really cost more than other hospitals for patients with minor to moderate injuries?; (3) if so, why?; and (4) can we determine in advance which patients can safely be treated at nontrauma centers?

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The question about potential nonmortality benefits of major trauma centers remains unclear. Particularly for less seriously injured patients, the answer to this question is unknown. Mortality was used as the primary health outcome in this study because it is a long-standing health outcome measure in trauma research and was available in the administrative data. However, mortality is a relatively crude outcome measure, especially for patients without serious injuries. Although the authors found no survival benefit of care at major trauma centers among this patient group, we cannot exclude the possibility that other benefits exist (eg, fewer missed injuries, fewer complications, better functional outcomes, faster return to work). It is possible that trauma centers provide higher quality of care for all types of injured patients, even if such quality is not measurable through survival differences. Such potential benefits of trauma centers should be considered in the context of important health policy decisions.

This study suggests that trauma center care does cost more than similar care at nontrauma hospitals for patients without serious injuries, with some important caveats. First, it is unclear how similar the trauma center and nontrauma center patients were in the study. Whereas a typical trauma center patient was likely to be a male aged 15 to 34 years, with Medicaid or uninsured, a typical nontrauma center patient was a woman aged 55 years or older, with Medicare insurance (see their Table 1). The trauma center patient was more likely to have an intracranial injury or skull fracture from a motor vehicle crash, whereas the non-trauma center patient was more likely to have a lower extremity fracture from a fall (see their Table 2). Although the authors used a well-designed multivariable model to account for confounding, differences in observed patient characteristics raise concerns about potential differences in unobserved characteristics that could confound the results. The second caveat is that because cost information was not available for patients discharged from the ED, the study only included admitted patients, representing a minority of injured patients seeking emergency care. It is possible that inclusion of injured patients discharged from the ED would show even more potential for savings (ie, if the adjusted cost differences extend to nonadmitted patients). On the other hand, differences in admission practices between trauma and nontrauma centers could have biased the results. For example, if trauma centers tend to admit sicker—and more costly—patients than nontrauma centers, then trauma center costs may appear higher because of uncontrolled confounding. The authors address these concerns by comparing admission rates between trauma versus nontrauma hospitals and by evaluating differences in ED patient case mix. However, limitations of the data set preclude definitive answers.

If trauma centers do cost more for similar, nonseriously injured patients, we must understand why before making broad policy recommendations. The authors detail several potential explanations, including more intensive clinical management, higher negotiated prices, and trauma activation fees. Another consideration is the expense of operating high-resource hospitals with 24-hour availability of specialized services. Although these services are intended for use among the most severely injured patients, the costs of sustaining such resources are likely passed on to all patients, regardless of injury severity. Because trauma centers are already financially challenged,¹² loss of additional revenue may further jeopardize this important resource and force some centers to close. However, we live in an era in which the status quo for medical care is no longer sustainable. All aspects of the

health care system will be tasked with adapting to a more efficient, financially sustainable model of care, including trauma systems.

If further research confirms that trauma centers cost more for nonseriously injured patients and that such patients have equivalent outcomes at nontrauma hospitals, there would need to be an effective mechanism for determining in advance which patients can be safely treated at nontrauma centers. Although it would appear that routing all patients without serious injuries to nontrauma hospitals is a more efficient and less expensive model of care, implementing such a model is unfortunately quite complicated. One key factor is that injury severity is not known before ED arrival. For injured patients presenting through the 911 system, emergency medical services use national field triage guidelines to direct patients to different types of hospitals according to their risk of being seriously injured.¹³ However, the triage guidelines are only moderately sensitive for identifying seriously injured patients^{14,15} and must contend with other factors affecting hospital selection (eg, patient preference, hospital proximity).¹⁶ For injured patients seeking care outside the 911 system, hospital selection is often driven by patient experience, suggestions from family and friends, perceived quality differences, convenience, and insurance-based financial incentives and disincentives. Universally directing all injured patients to nontrauma hospitals risks limiting access to major trauma centers for those most likely to benefit from such care. A compromise might be to implement more effective bidirectional interhospital transfer practices after the severity of injury and clinical management needs are established, providing higher-level care for seriously injured patients and lower-level care for less seriously injured patients.

The authors are to be commended for contributing to a line of research with the potential to save money without compromising patient outcomes. As the most established model of regionalized health care, trauma systems provide an illustrative example for planning other regionalized care systems. However, re-engineering regionalized care systems is complicated, with many details that must be considered. Measuring the entire perspective of regionalized care, including costs, quality, outcomes, and the potential for unintended consequences, provides an opportunity to truly optimize such systems for value.

Acknowledgments

Funding and support: The authors have stated that no such relationships exist and provided the following detail: Dr. Newgard is supported by a grant from the Agency for Healthcare Research and Quality (R01HS023796) to study the value of emergency care in injured older adults.

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