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Extending surgeon response times in tier 2 traumas does not adversely affect patient outcomes

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ABSTRACT

Background: The presence of a trauma surgeon during patient resuscitations is required at most American College of Surgeons–verified trauma centers despite little evidence showing improved patient outcomes in the less-than-critically injured (Tier 2) trauma patients. This study was designed to identify the impact of extending required surgeon response times on outcomes in tier 2 trauma patients.

Methods: An American College of Surgeons–verified level 2 trauma center extended the maximum allowed surgeon response time for tier 2 activations from 60 min to 120 min on November 1, 2011. Surgeon response time and patient outcomes of the retrospective control group (January 1, 2008-October 31, 2011) were then compared with the prospective test group (November 1, 2011-December 31, 2014). Primary outcomes included mortality and hospital length of stay (HLOS). Secondary outcomes were emergency department length of stay, and time from ED arrival to CT scan. A subset analysis of all patients evaluated by a surgeon within 60 min of arrival versus those evaluated by a surgeon after 60 min was also performed.

Results: The control and test groups were composed of 757 and 792 patients, and their mean injury severity score was 9.0 and 6.0, respectively. Emergency department length of stay showed a statistically significant increase of 12 min, whereas HLOS was unchanged throughout the study. Mortality was not significantly different between the groups. Subset analysis revealed a median surgeon arrival time of 15 min in the <60-min group and 85 min in the >60-min group, whereas the injury severity score, HLOS, and mortality were not significantly different between these subsets. No correlation existed between these outcomes and surgeon arrival time.

Meeting presentations: Preliminary versions of this study were presented at the 62nd Annual Meeting of the Indiana Chapter of the American College of Surgeons, April 17, 2015, in Carmel, Indiana and at the Eighth Annual Southwest Trauma and Acute Care Symposium, November 11, 2016, in Scottsdale, Arizona.

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Conclusions: Doubling required surgeon response time in tier 2 trauma patients does not produce negative outcomes in this patient group. Mandatory surgeon response times in similar patient groups can be re-evaluated to allow for greater flexibility of a limited surgeon workforce while still providing safe care.

Introduction

Since the birth of the first trauma centers almost 50 y ago, the American College of Surgeons (ACS) Committee on Trauma has been instrumental in guiding their development. The Committee on Trauma published its first formal outline of traumatic injury care in 1976 with the release of *Optimal Hospital Resources for Care of the Seriously Injured*.[1,2] Studies have shown improved survival rates when critically injured patients are taken to ACS-verified or state-designated trauma centers along with improved outcomes when in-house board-certified surgeons are present.[3-5] Subsequently, the demand for health-care resources and staff is expected to increase, whereas the supply of general surgeons per population has decreased more than 25% from 1981 to 2005.[6,7] Thus, accurate determination of which patients need a trauma surgeon—and how quickly—is critical in addressing these issues.

Khetarpal *et al*.[8] found the presence of a trauma surgeon on the trauma team at an ACS-verified level I trauma center reduces resuscitation time and time to incision for emergent operations, yet their presence yielded no measurable impact on patient mortality, regardless of whether the trauma surgeons were on "in-house" or "out-house" call. Similar results have been presented in other studies, contradicting the findings of previous research.[5,9,10] In addition, little research exists to support institutionally mandated surgeon response times, specifically in less-than-critically injured trauma patients. Researchers from pediatric surgery have shown a lack of necessity for a pediatric surgeon to assess a less-than-critically injured child.[11-13] These patients are often identified as tier 2 traumas. Most institutions now require a trauma surgeon to assess these patients within a certain time limit on patient arrival, often 60 min for tier 2 traumas. This requirement may be seen as a burden, particularly in institutions with overwhelming trauma numbers or at verified centers with a limited number of surgeons providing trauma call coverage. Therefore, a prospective study was designed to examine the hypothesis that extending required trauma surgeon response time for less-than-critically injured (tier 2) trauma patients would not adversely affect patient outcomes.

Methods

This study was conducted at an urban, ACS-verified adult and pediatric level II trauma center serving a catchment area of 1.32 million residents in 19 counties in northeastern Indiana and northwestern Ohio. Currently, the trauma service evaluates and treats approximately 3200 trauma patients per year. The study design compared a retrospective control group with a prospective test group. The control group included all tier 2 trauma patients, adult and pediatric, presenting to the Lutheran Hospital emergency department during the 46-mo time period including January 1, 2008 through October 31, 2011. Institutional guidelines for this group required assessment of the patient by a board-certified surgeon within 60 min of the patient's arrival in the ED. The test group consisted of all Tier 2 trauma patients presenting to the Lutheran Hospital ED during the 38 mo time period of November 1, 2011 through December 31, 2014. For this group, guidelines mandated the presence of a board-certified surgeon within 120 min of the patient's arrival to the ED. Initial trauma resuscitations were guided by Advanced Trauma Life Support-trained emergency medicine attending physicians before surgeon arrival. Other than required surgeon response time, no other trauma activation criteria, protocols, or staffing were changed before or during the prospective period. This study was IRB approved, and a waiver of informed consent was obtained.

All patients meeting the institutional trauma criteria for tier 2 activations (Table 1) were included in this study. Patients who were originally classified as tier 2 activations but were subsequently upgraded to tier 1 activations or downgraded to tier 3 activations were excluded from this study as these numbers were small and unlikely to affect the outcomes. In addition, any patients initiating a tier 2 activation without a recorded surgeon response time were excluded from the study. Data regarding all trauma activations are recorded in the Lutheran Hospital Trauma Registry, and this registry was used for the study. Data points analyzed included surgeon response time, injury severity score (ISS), age, gender, injury type (blunt or penetrating), emergency department length of stay (ED LOS), time from ED arrival to CT scan, time from ED arrival to operating room, hospital length of stay (HLOS), and patient mortality.

Statistical methods used nonparametric Mann–Whitney U test for continuous data due to a nonnormal distribution of the surgeon response times (Figure). Chi-square test was used for categorical data. Biserial and Pearson correlations were applied as appropriate for nominal and continuous variables (mortality and LOS, respectively). Bivariate logistic regression was applied as well. Comparisons between ISS, sex, age, ED LOS, HLOS, time to CT scan, ED to OR time, and mortality for the control and test groups were completed. Further subset analyses were performed on patients with a trauma surgeon arrival time of <61 min and 61-120 min. Medians for the data are reported without confidence intervals in concordance with nonparametric analyses. Statistical evaluations were performed using SPSS 23 (IBM) and statistics in "R" 2.15.0.

Results

During the control period (January 1, 2008-October 31, 2011) a total of 1047 patients presented as tier 2 trauma activations,