Physiologic Trauma Triage Criteria in Adult Trauma Patients: Are They Effective in Saving Lives by Transporting Patients to Trauma Centers?

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BACKGROUND: Trauma triage criteria have been in place for many years and were updated in 1999 by the American College of Surgeons. We are unaware of any studies that have directly examined the ability of these criteria to reduce short-term mortality by transporting patients to trauma centers rather than to noncenters.

STUDY DESIGN: Retrospective observational cohort study of adult patients meeting physiologic triage criteria who were transported to 9 regional (Level I) trauma centers, 21 area (Level II) trauma centers, and 119 noncenters in New York in 1996 to 1998. For each triage criterion and for one or more of the criteria, odds ratios and their confidence intervals for mortality in regional and area trauma centers versus noncenters and odds ratios and their confidence intervals for mortality in regional centers versus area centers and noncenters were used to measure performance.

RESULTS: Patients in regional trauma centers had considerably lower mortality than patients in area trauma centers and noncenters for two individual triage criteria and for patients with one or more triage criteria (odds ratio, 0.75; 95% CI, 0.63–0.90 for one or more criteria). Also, patients with head injuries who were treated in regional centers had notably lower mortality than patients in other hospitals (odds ratio, 0.67; 95% CI, 0.53–0.85).

CONCLUSIONS: In New York, regional trauma centers exhibit considerably lower mortality than area trauma centers or noncenters for adult patients meeting specific physiologic triage criteria. It is important that population-based trauma systems with data from centers and noncenters be developed for the purpose of evaluating and redesigning trauma systems. (J Am Coll Surg 2005;200: 584–592. © 2005 by the American College of Surgeons)

In the last 2 to 3 decades, numerous regional and statewide trauma systems have been created to optimize quality of care and outcomes for severely injured patients. An essential component of a trauma system involves evaluation of patients at the scene by emergency medical technicians to determine if their injuries meet specified trauma triage criteria that indicate they would be best served by being transported to a trauma center. Trauma triage criteria were most recently updated by the American College of Surgeons (ACS) in 1999,[1] and some states have tailored these criteria to meet their specific needs. The New York State criteria are very similar to the ACS criteria. One difference is that New York also has a triage criterion for pulse rate.[2]

Numerous studies have attested to the value of formal trauma systems in saving lives. Some of these studies have used data from trauma registries, which typically include only trauma centers, to demonstrate reductions in mortality rates.[3-5] Other studies have used administrative data from all hospitals in a region to compare mortality rates before and after the institution of a trauma system,[6-9] explored differences in mortality rates in states with and without trauma systems[10,11] or examined individual triage criteria to determine if they are associated with higher mortality rates or other adverse outcomes.[12-15]

Competing interests declared: None.

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Abbreviations and Acronyms

ACS = American College of Surgeons
ED = emergency department
GCS = Glasgow Coma Scale
NYSTR = New York State Trauma Registry

Although there is ample evidence that trauma systems are effective and save lives,[3-11] we are not aware of any studies that have compared mortality rates in centers and noncenters for patients meeting triage criteria to evaluate the effectiveness of these criteria. This is important because if patient outcomes at noncenters are equivalent to outcomes at trauma centers for some triage criterion, those patients are being "overtriaged," resulting in excess cost and resource consumption.

This study examines the effectiveness of individual and collective physiologic trauma triage criteria by comparing mortality rates for patients who are treated in centers and noncenters. The purpose is to determine whether patients flagged for triage have considerably lower mortality rates when treated at trauma centers than when treated at noncenters. Some of the triage criteria included in both the ACS and in New York State protocols classify patients as to whether they should have been treated at a regional or area center based on criteria that are not readily available to prehospital personnel. Criteria examined in this study are limited to those physiologic criteria that are readily identifiable and are most usable at time of transport for determining where to triage the patient.

A secondary objective is to compare mortality rates at Level I centers and Level II centers (called regional trauma centers and area trauma centers, respectively). This is of interest because current triage criteria direct ambulances to transport specific patients to "trauma centers" regardless of level, and because New York has a very large number of trauma centers, which impacts on the average number of seriously injured trauma patients treated at each center. Consequently, some trauma centers may not have the opportunity to achieve the benefits that generally are associated with treating large volumes of patients.[16,17]

Also, for physiologic triage criteria that are associated with lower mortality rates in trauma centers, the study enables us to estimate extent of "undertriaging" (transporting patients to noncenters when they would experience considerably better outcomes in trauma centers).

METHODS

Database

The database used in the study is the New York State Trauma Registry (NYSTR) for the years 1996 to 1998. The NYSTR is maintained by the New York State Department of Health, in conjunction with its State Trauma Advisory Committee, a group of surgeons, emergency medicine physicians, trauma nurse coordinators, and other health care professionals dedicated to improving access to, and quality of, trauma care in the state. The system includes all 48 trauma centers in the state and all noncenters, except those in New York City and 8 others outside of New York City. For purposes of this study, data were limited to the regions outside of New York City so that every region was represented by both centers and noncenters. There were 9 regional (Level I) centers, 21 area (Level II) centers, and 119 noncenters that treated the 5,419 patients in the study.

Patients in this study include inpatients and patients who died in the emergency department. Inpatients in the Registry are primarily patients with a highest Abbreviated Injury Score[18] of at least 3 (an Injury Severity Score of at least 9).[19] Data in the Registry come from three sources: ambulance data from prehospital care reports, emergency department (ED) data, and inpatient data from New York's Statewide Planning and Research Cooperative System, which are confirmed using audits from regional trauma centers. ED data include an indication of whether the patient expired in the ED or was admitted to the hospital. ED data also contain important physiologic risk factors, such as systolic blood pressure, Glasgow Coma Scale (GCS) components, and information on intubation and ventilatory assistance. Prehospital care reports indicate which triage criteria were met and contain various transport times.

Patients

Patients in the study included all adult (13 years old or older) patients outside of New York City in the Registry who were identified in prehospital care reports as having met one or more of the physiologic triage criteria, were transported directly to a hospital without visiting the ED of another hospital, and either died in the ED or were admitted to the hospital. Patients who were found to have flat vital signs at presentation to the ED were omitted from the study.