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Continued rationale of why hospital mortality is not an appropriate measure of trauma outcomes

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Abstract

BACKGROUND: We hypothesized that standardized withdrawal of care (WOC) practices and an aggressive long-term acute care facility (LTAC) discharge protocol could change hospital mortality and national ranking among trauma centers.

STUDY DESIGN: Patients who died while admitted to the trauma service at a level 1 trauma center were classified as either an "LTAC candidate" or "not a LTAC candidate" at 4 time points before death.

RESULTS: A total of 216 patients died, and 48% had WOC. Hospital mortality was 3.3%. More than 26% of these qualified as LTAC candidates. The aggressive LTAC discharge protocol reduced hospital mortality by .9%. This was sufficient to move a trauma center into a lower quartile on the National Trauma DataBank benchmark report for 2009.

CONLUSIONS: It is possible to reduce hospital mortality and improve quality ranking with standardized WOC and LTAC discharge protocols. This highlights the importance of measuring outcomes beyond discharge.

The process of evaluating and comparing the quality and performance of individual health care facilities is constantly evolving. Medicare mandated the collection of health care quality measures as part of the Hospital Inpatient Quality Reporting program and incentivized reporting by paying higher rates to hospitals that complied in 2003. In 2010, the pilot study of the Trauma Quality Improvement Program (TQIP) was published, showing that it is feasible to create a national benchmarking program for trauma centers.[1] TQIP is modeled after the National Surgical Quality Improvement Program and would use data from the National Trauma Data Bank (NTDB) to provide risk adjusted quality improvement measures to trauma institutions.[1]

Hospital mortality is the principal measure of quality in major trauma outcome studies, including those by the NTDB. TQIP will also track mortality and rank programs accordingly.[1] Although hospital mortality is an objective and accessible figure, its use as a benchmark for assessing the quality of care provided is questionable.[2–5] Studies have repeatedly shown a substantial post-discharge mortality risk attributable to traumatic injury and have pressed for the inclusion of longer-term mortality data to be considered in these benchmarking programs.[3–5]

Furthermore, hospital mortality rates presently disregard the impact of the withdrawal of care (WOC) practice at the individual hospitals. Recent studies have found that 40% to 80% of trauma patients who die in the hospital do so after a decision to withdraw care.[6] Standardized WOC practices within and between level 1 trauma centers are lacking and

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variability in WOC practices reflect regional, institutional, and individual physician and patient/family opinions and preferences regarding end of life care.[3,6–10]

This study explores 3 linked hypotheses regarding the ability to embellish a level 1 trauma center's mortality rate using a standardized WOC practice and an aggressive long-term acute care (LTAC) discharge protocol. First, we hypothesized that individual intensivists practicing in our institution's trauma intensive care unit (ICU) have significantly different WOC practices. Next, we speculated that if WOC was not offered to patients/families, there would be a subset of patients who would have the potential to survive to hospital discharge. This potential was defined by standard physiological parameters that would qualify and permit the transfer of such patients to an LTAC. Finally, we conjectured that establishing an aggressive LTAC discharge protocol for this subset of patients would significantly reduce our hospital mortality rate and consequently improve our institution's national ranking as part of the NTDB benchmark report.

Methods

This study is a retrospective chart review of all adult patients consecutively admitted to the trauma service at a regional level 1 trauma center over a 3-year period from January 2007 to December 2009. All patients who died during their admission to the trauma service were identified, and data were collected including patient age, sex, race, insurance status, injury severity score, ICU length of stay, whether or not death occurred after WOC, the primary attending on service in the trauma ICU during hospital stay, and the attending of record responsible for WOC. The Institutional Review Board at our institution reviewed and approved this study.

To investigate the difference in WOC practices between trauma intensivists, we identified a subset of patients who died after the withdrawal of life support (most often pressor support and/or ventilator support). Life support was withdrawn by the critical care team only after a discussion between an attending intensivist and the patient's surrogate decision maker occurred in which the surrogate requested the discontinuation of life-sustaining care. Five trauma intensivists were on service during the study period and are represented as attendings 1 to 5 in this dataset. The "other" category refers to a group of 3 surgical attendings who covered the trauma ICU on holidays/special circumstances but did not typically provide care to the study population. We determined the number of WOC events that each intensivist was responsible for based on the previously described documentation. A chi-square test was performed to determine whether the frequency of withdrawal was significantly different between intensivists. A P value less than or equal to .05 was considered significant.

Next, we set out to identify those patients who met LTAC discharge criteria at some point during their hospitalization before their eventual deaths. Patients were classified as either an "LTAC candidate" or "not a LTAC candidate" on hospital days 4, 7, and 14 and the day before death. After consulting with multiple LTACs in the region, this designation was based on the following eligibility criteria: no pressor requirement, acceptable ventilator settings, no need for intracranial pressure (ICP) monitoring, no need for heparin/insulin drips, no new arrhythmia, no acidosis (defined as pH $<$7.3 on arterial blood gas measurement), no need for continuous veno-venous hemofiltration (CVVH), and no transfusion of blood products. A patient meeting all of the previously described criteria over the previous 48 hours was designated an "LTAC candidate," whereas failure to meet all of these resulted in a designation of "not a LTAC candidate."

We then retrospectively applied a hypothetical standardized "zero WOC" policy and an aggressive LTAC discharge protocol whereby all "LTAC candidates" would be discharged immediately. Because these "LTAC candidates" would be discharged before their deaths, we subtracted the total number of "LTAC candidates" from the total number of deaths and calculated adjusted hospital mortality rates. Adjusted hospital mortality rates were determined for the individual time points described earlier (ie, 4, 7, and 14 days). An overall adjusted mortality rate was calculated based on the aggregate of "LTAC candidates" at the 3 individual time points and/or the day before death. The adjusted hospital mortality rates were then compared with our institution's actual hospital mortality rate for the 3-year period reviewed by this study. Absolute and relative reductions in hospital mortality were calculated. The overall adjusted mortality rate was then applied to the 2009 NTDB benchmark report for level 1 trauma centers with 401 to 600 beds to determine whether the calculated reductions in mortality would translate into a change in comparative percentile position of a level 1 trauma center according to hospital mortality.

Results

Patient characteristics

A total of 6,494 adult patients were admitted to the trauma service of our level 1 regional trauma center over the 3-year study period. The mortality rate over this time period was 3.3%. Of the 216 patients who died during their hospital stay, the mean age and Injury Severity Score (ISS) were 55 and 30, respectively. Patient characteristics and demographics are shown in Table 1.

Evaluation of withdrawal practices

Care was withdrawn before 104 of the 216 (48%) deaths in this study. Despite a high incidence of WOC overall, we found significant variation in withdrawal practices between individual trauma intensivists at our institution. Participation in WOC ranged from $<$1% to 32% (P = .004) among the 5 intensivists on service in the trauma ICU during the study period.