Failure to rescue and disparities in emergency general surgery

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ABSTRACT

Background: Racial and socioeconomic disparities are well documented in emergency general surgery (EGS) and have been highlighted as a national priority for surgical research. The aim of this study was to identify whether disparities in the EGS setting are more likely to be caused by major adverse events (MAEs) (e.g., venous thromboembolism) or failure to respond appropriately to such events.

Methods: A retrospective cohort study was undertaken using administrative data. EGS cases were defined using International Classification of Diseases, Ninth Revision, Clinical Modification diagnostic codes recommended by the American Association for the Surgery of Trauma. The data source was the National Inpatient Sample 2012-2013, which captured a 20%-stratified sample of discharges from all hospitals participating in the Healthcare Cost and Utilization Project. The outcomes were MAEs, in-hospital mortality, and failure to rescue (FTR).

Results: There were 1,345,199 individual patient records available within the National Inpatient Sample. There were 201,574 admissions (15.0%) complicated by an MAE, and 12,006 of these (6.0%) resulted in death. The FTR rate was therefore 6.0%. Uninsured patients had significantly higher odds of MAEs (adjusted odds ratio, 1.16; 95% confidence interval, 1.13-1.19), mortality (1.28, 1.16-1.41), and FTR (1.20, 1.06-1.36) than those with private insurance. Although black patients had significantly higher odds of MAEs (adjusted odds ratio, 1.14; 95% confidence interval, 1.13-1.16), they had lower mortality (0.95, 0.90-0.99) and FTR (0.86, 0.80-0.91) than white patients.

Conclusions: Uninsured EGS patients are at increased risk of MAEs but also the failure of health care providers to respond effectively when such events occur. This suggests that MAEs and FTR are both potential targets for mitigating socioeconomic disparities in the setting of EGS.

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Introduction

Racial and socioeconomic disparities are increasingly recognized as important public health issues in the United States.[1] It has been estimated that racial disparities account for 83,000 excess deaths[2] and cost over $250 billion[3] every year. Disparities have been demonstrated across a range of surgical settings and highlighted as a national priority for surgical research.[4]

Emergency general surgery (EGS) encompasses a group of patients presenting with acute surgical conditions. This population is particularly important as they are at higher risk of medical error, complications, and death than elective surgical patients.[5-8] The proportion of EGS patients that experience complications in hospital has been estimated at between 15% and 50%.[7,9] A number of studies have found that EGS patients are more likely to be uninsured or from minority racial groups.[10] It has also been reported that lack of insurance and black race are independent predictors of death after an EGS diagnosis.[11,12]

Health care disparities are typically explored using administrative data sets, and previous studies have been limited to using in-hospital mortality as their primary outcome.[11,13-16] However, it is unclear whether this outcome truly reflects differences in surgical care, as many in-hospital deaths are unavoidable.[17] One potential solution is to use "failure to rescue" (FTR), which is an emerging quality metric that has been shown to be more sensitive to differences in health care quality.[18] FTR occurs when a patient dies as a result of a major adverse event (MAE) that developed in hospital and so could reflect failure to promptly recognize and treat developing complications.[19] For example, the survival of a patient with postoperative pneumonia might depend on regular measurement of vital signs, early nursing recognition of deterioration, assessment by a doctor with sufficient experience to reach the correct diagnosis, prompt administration of antibiotics, and careful monitoring for signs of subsequent deterioration. It is therefore possible that FTR could be one mechanism leading to disparities in the EGS setting.

The aim of this study was to identify whether disparities in the EGS setting are more likely to be caused by MAEs (e.g., venous thromboembolism) or failure to respond appropriately to such events. We hypothesized that disparities in EGS outcomes can be partially explained by differences in FTR.

Methods

A retrospective cohort study was undertaken using administrative data. The study was approved by the Partners Healthcare Institutional Review Board (reference 2015P001722).

Data source

The National Inpatient Sample (NIS) is maintained by the Healthcare Cost and Utilization Project and is the largest publicly accessible all-payer patient database in the United States. Between 2012 and 2013, the NIS captured a 20%-stratified sample of discharges from all hospitals participating in the Healthcare Cost and Utilization Project. There are approximately 6 million inpatient episodes recorded within the NIS each year, which can be weighted to provide estimates for around 35 million hospital admissions.

Case selection

All cases within the NIS were extracted that had a primary diagnosis consistent with the EGS definition provided by the American Association for the Surgery of Trauma.[20] These diagnoses are presented in Appendix 1. Cases were identified using a previously published list of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnostic codes.[21] Patients transferred between institutions were excluded to avoid inpatient episodes being inappropriately duplicated within the data set.

Variables and outcomes

The patient-level characteristics were age, sex, race, payment source, median household income, admission source, weekend admission, and disease severity. Charlson Comorbidity Index has been shown to predict mortality in the EGS population[22] and was determined from ICD-9-CM codes using the ICDPIC module in Stata.[23] Disease severity is a variable provided within the NIS and estimates mortality risk along a four-point scale using all-patient–refined diagnosis-related groups. The hospital-level characteristics were geographic region, rural location, teaching status, and hospital bed size.

The outcomes were MAEs, mortality, and FTR. MAEs were identified from ICD-9-CM codes used for this purpose by other studies[21]: cerebrovascular accident, pneumonia, pulmonary embolus, acute respiratory distress syndrome, renal failure, urinary tract infection, myocardial infarction, sepsis, septic shock, and cardiac arrest. The full list of ICD-9-CM codes used to define MAEs is available in an earlier publication.[24] There are a number of operational definitions of FTR used within the patient safety literature, which are fundamentally similar but are based in different patient groups and use different MAEs to define their denominator and numerator populations.[25] In common with all earlier definitions, FTR was defined as the odds of in-hospital mortality after an MAE: (mortality amongst cases with coded MAEs)/(all cases with coded MAEs).

Statistical analyses

Categorical variables were compared using chi-square tests and continuous variables with Wilcoxon rank-sum tests. Outcomes were adjusted for patient- and hospital-level factors using multivariable logistic regression. The covariates were age, sex, race, payer status, Charlson Comorbidity Index, weekend admission, median household income, and hospital bed size. Raw data were presented from the NIS