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Cost burden and mortality in rural emergency general surgery transfer patients

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ABSTRACT

Background: Recent articles have suggested regionalization of some emergency general surgery (EGS) problems to tertiary referral centers. We sought to characterize the clinical and cost burden of such transfers to our tertiary referral center.

Materials and methods: Data were collected retrospectively for nine EGS diagnoses for patients admitted to the EGS service during calendar years 2015 and 2016. Patients were grouped as inpatient transfers (IPTs), Emergency Department transfers (EDTs), or local admissions (LAs). Demographic data, length of stay at originating site, insurance status, Charlson Comorbidity Index, and all relevant financial data were obtained.

Results: Six hundred sixty-three patients were reviewed: 93 IPTs, 343 EDTs, and 227 LAs. IPTs required longer lengths of stay (7.0 d compared to 4.0 d for EDTs and 3.0 d for LAs), higher median direct costs, and higher case mix index, which produced a higher median revenue but averaged a median net loss (−$264 compared to +$2436 for EDTs and +$3125 for LAs). The IPTs had higher median comorbidities (Charlson Comorbidity Index 3.5 *versus* 2.9 for EDTs and 2.0 for LAs), age (62 y *versus* 58 for EDTs and 52 for LAs), and mortality rate (7.5% *versus* 2.3% for EDTs and 0.4% for LAs).

Conclusions: Patients who present to a tertiary care EGS service as an IPT from another hospital have more comorbidities, higher mortality rate, and result in a financial loss. These data suggest the need for adequate risk adjustment in quality assessment of tertiary referral center outcomes and the need for increased financial reimbursement for the care of these patients.

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Introduction

Acute care surgery (ACS) is an expanded specialty practice of trauma surgeons committed to also caring for the acutely ill noninjured surgical patients.[1,2] Emergency general surgery (EGS) has become a major pillar of ACS.[3,4] A novel, standardized grading system of EGS diagnoses has now been developed by the American Association for the Surgery of Trauma based on International Classification of Diseases Ninth Revision codes to allow objective measurement of illness severity, outcome prediction, and a research agenda dedicated to this unique field of surgery.[5]

EGS has offered general surgeons broad, new cognitive and technical challenges, which have been reported to require greater resources and to be associated with worse outcomes as compared to elective and even trauma surgery.[6-9] The annual cost of EGS care in the United States was estimated at $28.4 billion in 2010 and is expected to rise to as much as $41.2 billion annually by 2060.[10] As the population ages, the need for EGS is expected to increase.[11] Studies have shown that outcomes correlate with the volume of surgical cases and surgeon experience.[8,12] Thus, regionalization of EGS, where more complex patients are identified and transferred to larger and higher volume tertiary centers of care, has been proposed to enhance access, optimize outcomes, and support community surgeons, particularly in the context of regional surgeon shortages.[3,11,13] Surgeons and healthcare leaders must work to optimize quality and minimize cost to achieve the greatest value in emergency surgical care.

EGS patients will sometimes require transfer to a higher level of care. Optimal patient type and timing for transfer will vary across hospitals, and no published standards exist for such decision-making. Furthermore, the financial cost of EGS patient transfer is unknown. Patient transport from rural areas to tertiary centers can be both time and resource intensive. Value-based integrated healthcare demands that healthcare leaders and surgeons understand the factors associated with economic implications of EGS transfers.[11,14-18] We hypothesize that hospitalized patients transferred after inpatient admission elsewhere are associated with higher healthcare utilization and worse outcomes compared to those transferred from outside emergency departments (EDs) or admitted directly to the tertiary center.

Methods

This IRB-approved retrospective review of data was performed at a 945-bed ACS-verified level I trauma center and tertiary referral center in Kentucky from January 1, 2015 to January 1, 2017. All adult patients (age $\geq$ 18 y) admitted with one of the following diagnoses were included in the study: bowel obstruction, appendicitis, pancreatitis, hernia, ischemia, volvulus, diverticular disease, perforation, and peritonitis. The diagnoses selected were the top nine by volume on our EGS service. Data were obtained by discharge diagnosis code from our hospital billing/coding database. Elective and trauma patients were excluded. Patients were divided into three categories based on admission source. Local admissions (LAs) were defined as patients admitted from our ED, urgent care, or primary care clinics related to our institution. Patients transferred from other facilities were categorized as either ED transfers (EDTs) if they were transferred from another facility's ED to our institution's ED, or as inpatient transfers (IPTs) if they were transferred from an inpatient floor at another facility to an inpatient bed at our hospital. IPTs included IPTs from long term acute care facilities.

For all patients, demographics (age, race, gender, and zip code of residence), facility of origin, length of stay at facility of origin, interventions performed before transfer, payer group (Medicaid, Medicare, managed care, and other/self-pay), Charlson Comorbidity Index, disposition upon arrival, length of stay, and discharge disposition. Financial data collected were case mix index, revenue, direct cost, contribution margin, indirect cost, and net gain/loss (Revenue-Direct Costs = Contribution Margin; Contribution Margin-Indirect Cost = Net Gain/Loss). Discharge disposition, including mortality, was collected either from our institution's financial database or from chart review. Interventions at referring facility and our facility included all endoscopic, laparoscopic, and open surgical procedures that were identified through chart review from our electronic health record.

Clinical and financial outcomes were compared across admission source groups using chi-square or Kruskal–Wallis nonparametric tests. Significance was set at $P < 0.05$. Statistical tests were performed using SPSS version 23 (IBM Corp, Armonk, NY).

Results

There were 663 patients included in this study. Of these, 227 were LAs, 343 were EDTs, and 93 were IPTs (Table 1). Patients were transferred from 68 counties within Kentucky. EDTs were received from 43 counties, and IPTs were received from 41 hospitals (Figure). Patients were also received from nine other states. Of the 93 IPTs, 79 had sufficient data in their transfer paperwork to track time at the referring hospital before being transferred, with an average time in the referring hospital of 125 h. Of the 93 IPTs, 40 (43%) required surgical intervention after transfer, and 22 (24%) were operated upon at the referring hospital before transfer. Prior interventions were well documented and ranged from colonoscopy to multiple exploratory laparotomies. Of these 22 IPTs with prior interventions, 12 (55%) required another intervention at our facility. The most common diagnoses for transfer patients were obstruction (45%) and pancreatitis (22%) for IPTs, obstruction (37%) and appendicitis (18%) for EDTs, and obstruction (44%) and appendicitis (26%) for LAs (Table 1).

IPTs were associated with more comorbidities compared to EDTs and LAs (Charlson Comorbidity Index of 3.50 *versus* 2.9 for EDTs and 2.0 for LAs $P < 0.001$). IPTs were significantly older (62 y.o. *versus* 58 y.o. for EDTs and 52 y.o. for LAs, $P < 0.001$). IPTs were significantly more likely to have Medicare or Medicaid insurance (94% *versus* 85% and 66%, $P < 0.001$). IPTs also had a higher incidence of in-hospital mortality (7.5% *versus* 2.3% for EDTs and 0.4% for LAs, $P = 0.002$). In the IPT group, patients with obstruction (10%) and pancreatitis (10%)