Outcomes in Acute Care Surgery Based On Hospital Size: A National Inpatient Sample Analysis

Vikram Bhatt, MD[1,2], Mitchell Cahan, MD, MBA, FACS[1]

[1]University of Massachusetts Chan Medical School [2]Saint Mary's Hospital

Introduction

- The increasing complexity of the healthcare system has allowed for an increasing variety of hospitals for patients to seek care
  - This can be separated by hospital size as well as the communities they serve
- Our aim is to understand the differences in outcomes in acute care surgery between the community hospital setting (CHS) and the non-community, academic hospital setting (AHS)

Methods

- The National Inpatient Sample database (NIS) from 2016-2019
- Individuals with diagnosis that needed acute care surgery were identified using the ICD-10 coding system
  - Including patients with cholecystitis, appendicitis, gastric and duodenal perforation, pancreatitis, diverticulitis, necrotizing soft tissue infections, and small bowel obstruction
- Patients were separated into two groups, CHS and AHS, based on their NIS bed size distinction
  - CHS defined as a hospital bed size les than 200 in rural and urban non-teaching hospital or less than 450 in an urban teaching hospital
- Exclusion: Age < 18 years, Elective procedures
- Univariate and multivariate analysis was performed as appropriate using Stata v15.1

Results

- 1,015,853 individuals with a diagnosis needing acute care surgery
- Individuals in a CHS had a shorter length of stay (LOS) compared to AHS
- Individuals in the AHS had a higher odds of mortality, respiratory complications, postoperative infection, postoperative shock, as well as ileus
- Specific acute care diagnoses contributed most to the disparity between the CHS and AHS groups
  - Namely appendicitis, pancreatitis, cholecystitis, and small bowel obstruction

Table 1: Univariate Analysis Comparing AHS and CHS Groups

Variable	AHS	CHS	P value
Total individuals	485,805	530,048	-
Age (years) Mean ± Std dev	56.3 ± 18.2	56.5 ± 18.3	<0.01
Length of Stay (days) Mean ± Std dev	6.1 ± 8.3	5.1 ± 6.2	<0.01
Race: White	307,062 (63%)	342,332 (65%)	-
Medicare/Medicaid	255,461 (58%)	301,634 (57%)	-
Non-routine Discharge	132,066 (27%)	134,330 (25%)	-
Elixhauser Comorbidity Index Mean ± Std dev	3.0 ± 2.2	2.9 ± 2.2	<0.01

Table 2: Multivariate Analysis of the AHS group compared to the CHS group

Variable	Odds Ratio (95% CI)	P value
Mortality in AHS	1.32 (1.29-1.36)	<0.01
Mortality in CHS	0.76 (0.74-0.78)	<0.01
Respiratory Complications in AHS	1.21 (1.20-1.23)	<0.01
Postoperative Shock in AHS	1.53 (1.37-1.70)	<0.01
Ileus in AHS	1.05 (1.03-1.07)	<0.01
Postoperative Infection in AHS	1.27 (1.21-1.32)	<0.01

Results cont.

- Individuals in the AHS had an increased Elixhauser comorbidity score compared to CHS
- Individuals in the AHS were shown to have an increased presenting risk of mortality compared to the CHS group
- The CHS group showed a significantly increased odds of individuals transferring to another acute care hospital

Discussion/Conclusions

- There is an increased likelihood of morbidity as well as mortality in patients with a diagnosis that need acute care surgery in a non-community, academic hospital setting compared to a community hospital setting
- These outcomes can likely be explained by the increased Elixhauser comorbidity score as well as the increased acuity at the time of presentation in the AHS group compared to the CHS group
- Our study has several strengths as well as some noted limitations
  - The NIS database does not provide clinical factors that could be used to further assess the acuity of individuals on presentation
  - Inherent bias can exist from studies drawn from large databases such as NIS
  - Definitions based on bed size has limitations, e.g. smaller urban settings
  - Future studies utilizing institutional level data can help to overcome these limitations

References

- HCUP National Inpatient Sample (NIS). In: Project HCaU, ed. Rockville, MD: Agency for Healthcare Research and Quality; 2016-2019.
- Alluri RK, Leland H, Heckmann N. Surgical research using national databases. *Ann Transl Med.* 2016;4(20):393.
- Fazzalari A, Pozzi N, Alfego D, et al. Treatment of appendicitis: Do Medicaid and non-Medicaid-enrolled patients receive the same care? *Surgery.* 2019;166(5):793-799.
- Fazzalari A, Pozzi N, Alfego D, et al. Treatment of Acute Cholecystitis: Do Medicaid and Non-Medicaid Enrolled Patients Receive the Same Care? *J Gastrointest Surg.* 2020;24(4):939-948.