



Published in final edited form as:

J Surg Oncol. 2023 August ; 128(2): 402–408. doi:10.1002/jso.27292.

Evaluation of Emergency Department Treat-and-Release Encounters After Major Gastrointestinal Surgery

Brian C. Brajcich, MD MS^{1,2}, Julie K. Johnson, MD MS¹, Jane L. Holl, MD, MPH³, Karl Y. Bilimoria, MD MS⁴, Meagan L. Shallcross, MPH⁵, Jeanette Chung, PhD⁴, Rachel Hae Soo Joung, MD¹, Cassandra B. Iroz, MS¹, David D. Odell, MD MMSc¹, David J. Bentrem, MD^{1,6}, Anthony D. Yang, MD MS⁴, Patricia D. Franklin, MD MBA MPH⁷, Jennifer M. Slota, BA¹, Casey M. Silver, MD¹, Ted Skolarus, MD³, Ryan P. Merkow, MD MS^{2,3}

¹Northwestern Quality Improvement, Research & Education in Surgery (NQUIRES), Northwestern Medicine, Chicago, IL

²Division of Research and Optimal Patient Care, American College of Surgeons, Chicago, IL

³Biological Sciences Division, The University of Chicago, Chicago, IL

⁴Department of Surgery, Indiana University School of Medicine, Indianapolis, IN

⁵Mathematica, Chicago, IL

⁶Surgical Service, Jesse Brown VA Medical Center, Chicago, IL

⁷Department of Medical Social Sciences, Northwestern University Feinberg School of Medicine, Chicago, IL

Abstract

Background and Objectives: Emergency department (ED) utilization after gastrointestinal cancer operations is poorly characterized. Our study objectives were to determine the incidence of, reasons for, and predictors of ED treat-and-release encounters after gastrointestinal cancer operations.

Methods: Patients who underwent elective esophageal, hepatobiliary, gastric, pancreatic, small intestinal, or colorectal operations for cancer were identified in the 2015–2017 Healthcare Cost and Utilization Project State Inpatient and State Emergency Department Databases for New York, Maryland, and Florida. The primary outcomes were the incidence of ED treat-and-release encounters and readmissions within 30 days of discharge.

Results: Among 51,527 patients at 406 hospitals, 4047 (7.9%) had an ED treat-and-release encounter and 5573 (10.8%) had an ED encounter with readmission. In total, 40.7% of ED encounters were treat-and-release encounters. ED treat-and-release encounters were most frequently for pain (12.0%), device/ostomy complaints (11.7%), or wound complaints (11.4%). ED treat-and-release encounters predictors included non-Hispanic Black race/ethnicity (OR 1.24,

Correspondence and Reprints: Ryan P. Merkow, M.D., M.S., Department of Surgery, The University of Chicago Medicine, 5841 S. Maryland Avenue, Chicago, IL 60637, Tel.: 773-834-6416, ryan.merkow@bsd.uchicago.edu.

Disclosures: The authors report no conflicts of interest or disclosures related to the content of this study.

95% CI 1.12–1.37) and Medicare (OR 1.27, 95% CI 1.16–1.40) or Medicaid (OR 1.82, 95% CI 1.62–2.40) coverage.

Conclusions: ED treat-and-release encounters are common after major gastrointestinal operations, making up nearly half of post-discharge ED encounters. The reasons for ED treat-and-release encounters differ from those for ED encounters with readmissions.

Keywords

Cancer; Surgical Oncology; Patient Readmission; Emergency Service; Hospital

INTRODUCTION

Postoperative readmission is an important measure of healthcare quality which may indicate poor care continuity and coordination. The Centers for Medicare and Medicaid Services (CMS) Hospital Readmission Reduction Program (HRRP) monitors readmission within 30 days of discharge for patients who were hospitalized for acute myocardial infarction, pneumonia, heart failure, total hip or knee replacement, or coronary artery bypass grafting surgery and levies financial penalties for poorly-performing hospitals. [1] Readmission rates for many other procedures are monitored by a number of other entities and are incorporated into hospital grading schemes, including the CMS Hospital Compare Star Ratings and the U.S. News and World Report hospital rankings. [2]

Unplanned readmissions are particularly common following major gastrointestinal operations for cancer, largely due to postoperative complications related to the complex nature of the procedures and the underlying frailty of patients with cancer. [3] Although undesirable, readmission after major surgery is often an appropriate response to an unavoidable complication rather than the result of poor discharge planning or patient education. [4] However, in the absence of a major complication that requires inpatient treatment, patients who seek care in the Emergency Department (ED) may be discharged after evaluation with or without treatment, a scenario commonly referred to as a “treat-and-release” encounter. While rates of post-discharge ED treat-and-release encounters for surgical patients are not currently part of any quality measure, they may represent an important target for surgical quality improvement.

The incidence of, and reasons for ED treat-and-release encounters are poorly characterized in the literature compared to inpatient readmissions, particularly for patients who have undergone major gastrointestinal surgery for cancer. [5],[6],[7] Several single-center studies of surgical patients, including patients undergoing bariatric and colorectal operations have demonstrated that at least half of post-operative ED visits are preventable. [8],[9] However, to our knowledge, a multicenter study of ED treat-and-release visits following major gastrointestinal operations has not been performed. Therefore, our study objectives were to determine the incidence of and reasons for ED treat-and-release encounters among this population and identify patient characteristics and clinical factors associated with ED treat-and-release encounters.

METHODS

Data Sources

Patient data were obtained from the Healthcare Cost and Utilization Project (HCUP), a collection of administrative healthcare databases maintained by the Agency for Healthcare Research and Quality (AHRQ). [10] Databases are released annually for participating states, and consist of the State Inpatient Database (SID), which contains inpatient encounters (including ED encounters resulting in inpatient admission), the State Emergency Department Database (SEDD), which contains ED encounters at hospital-affiliated EDs not associated with an inpatient admission, and the State Ambulatory Surgery Database (SASD), which contains ambulatory surgical encounters. [11] The state-level HCUP databases capture 100% of patient hospital encounters occurring in each state, and include patient characteristics, diagnoses, and procedures associated with each encounter. For this study, the 2015–2017 State Inpatient Database (SID) and State Emergency Department Database (SEDD) for New York, Maryland, and Florida were utilized. These states were selected due to the availability of data for the duration of the study period and their large, diverse populations. Records from the SID and SEDD were merged to identify all encounters associated with an individual patient. This study was exempt from institutional review board approval by the Northwestern University Institutional Review Board as it exclusively utilized publicly available de-identified patient data.

Study Population

The study population included all patients in the 2015–2017 SID database for the states of New York, Maryland, and Florida who underwent elective major gastrointestinal operations for cancer. An operation was defined as elective if it was performed during an inpatient admission which was not initiated through an ED encounter. Major gastrointestinal operations were identified using International Classification of Disease, Procedure Classification System (ICD-PCS) codes corresponding to resection of the esophagus, stomach, pancreas, liver, small bowel, colon, and rectum (Supplemental Table 1). [12] The indication for surgery was identified using International Classification of Diseases, Clinical Modification (ICD-CM) codes for gastrointestinal malignancy (Supplemental Table 2). Because the HCUP databases transitioned from ICD-9 to ICD-10 codes after the third quarter of 2015, encounters from January 2015 to September 2015 were identified using ICD-9 codes and encounters from October 2015 to December 2017 were identified using ICD-10 codes. Patients who died during surgical hospitalization (n=702), left against medical advice (n=61), or were discharged from the surgical hospitalization to another acute care hospital (n=178) were excluded. For patients who underwent multiple operations during the study period (e.g., reoperation for a complication or reversal of fecal diversion), hospitalization for the first eligible operation was considered as the index inpatient encounter.

Patient Characteristics

Patient characteristics captured in the SID and SEDD include age, sex, race/ethnicity, and primary payer. Elixhauser comorbidity variables were assigned based on the ICD-9-CM and ICD-10-CM codes associated with the index inpatient encounter using existing software

published by HCUP. [13],[14] All patients included in the study population had cancer based on ICD-CM codes; therefore, the solid organ tumor Elixhauser comorbidity variable was omitted and only the remaining 28 variables were included.

Outcomes

The primary study outcome was the occurrence of one or more ED treat-and-release encounters within 30 days of discharge from the index inpatient encounter. An ED treat-and-release encounter was defined as an ED encounter from which the patient was discharged (as opposed to admitted to an observation or inpatient unit). Secondary outcomes included the occurrence of any 30-day ED encounter, regardless of disposition from the ED; occurrence of 30-day ED encounters leading to inpatient readmission; and occurrence of 30-day ED encounters leading to observation admission. Encounters associated with ICD-9-CM codes (V58.0, V58.1, V58.11, V58.12, V66.1, V66.2, V67.1, V67.2) or ICD-10-CM codes (Z51.0, Z51.11, Z51.12) for maintenance antineoplastic therapy were not included in the primary or secondary endpoints, as these encounters were presumed to be planned readmissions for administration of adjuvant radiation or systemic therapy. For all ED encounters, the chief complaint for seeking ED care was classified based on the first associated ICD-9-CM or ICD-10-CM diagnosis code.

Statistical Analysis

Descriptive statistics are reported as number and percent for categorical variables, mean and standard deviation for normally distributed continuous variables, and median and interquartile range for non-normally distributed variables. Rates of the primary and secondary outcomes are reported for the overall study population and for each type of procedure. To assess predictors of ED treat-and-release encounters, a multivariable hierarchical logistic regression model was constructed. Patient age, sex, race/ethnicity, procedure type, primary payer, and 28 Elixhauser comorbidities were included in the model as fixed effects. A hospital identifier was included as a random effect to account for clustering of patients within hospitals. As a sensitivity analysis, analyses were replicated using ED encounters within 90 days of discharge. All tests of significance were two-sided, and a threshold of $p < 0.05$ was used to determine statistical significance. All analyses were performed using SAS, version 9.4 (SAS Institute, Cary, NC).

RESULTS

A total of 51,523 patients who underwent major gastrointestinal operations for cancer were identified at 406 hospitals. Of these, 2125 (4.1%) underwent esophagectomy, 3066 (6.0%) underwent gastrectomy, 6098 (11.8%) underwent pancreatectomy, 6035 (11.7%) underwent hepatobiliary resection, 1430 (2.8%) underwent small bowel resection, and 32,769 (63.6%) underwent colorectal resection. The characteristics of the patient population are shown in Table 1.

Among these patients, a total of 11,487 ED encounters occurred within 30 days of discharge, of which 4674 (40.7%) resulted in discharge, 6186 (53.8%) resulted in readmission to an inpatient unit, and 627 (5.5%) resulted in admission to an observation unit (Table 2). In

total, 9197 patients (17.9%) had at least one ED encounter within 30 days of discharge, with the number of ED encounters among these patients ranging from 1–7 (median, 1; IQR, 1–1) and the interval from discharge until their initial presentation to the ED ranging from 0–30 days (median, 7; IQR, 3–15). A total of 4043 patients (7.9%) had an ED treat-and-release encounter, including 283 of 2125 patients (13.3%) who underwent esophagectomy, 288 of 3066 patients (9.4%) who underwent gastrectomy, 552 of 6098 patients (9.1%) who underwent pancreatectomy, 108 of 1430 patients (7.6%) who underwent small bowel resection, 2376 of 32,769 patients (7.3%) who underwent colorectal resection, and 436 of 6035 patients (7.2%) who underwent hepatobiliary resection (Table 3).

The most common chief complaints for ED treat-and-release encounters included pain (12.0%), device or ostomy complaints (11.8%), wound complaints (11.4%), renal or genitourinary complaints (8.6%) and gastrointestinal complaints other than obstruction or ileus (7.7%) (Table 4). In contrast, the most common chief complaints for ED encounters with inpatient readmission included wound complications (21.7%), gastrointestinal complaints other than obstruction or ileus (15.0%), obstruction or ileus (10.8%), sepsis (7.8%), and renal or genitourinary problems (7.0%).

On adjusted analysis, ED treat-and-release encounters within 30 days were less common among older patients (OR 0.99 per year of age, 95% CI 0.99–0.99, $p < 0.001$) and more common among non-Hispanic Black patients compared with non-Hispanic White patients (OR 1.24, 95% CI 1.12–1.38, $p < 0.001$) (Table 5). Patients whose primary payer was Medicare (OR 1.27, 95% CI 1.16–1.40, $p < 0.001$), Medicaid (OR 1.82, 95% CI 1.62–2.04, $p < 0.001$), or other (OR 1.40, 95% CI 1.16–1.70, $p < 0.001$) were more likely to have ED treat-and-release encounters than privately insured patients. Patients who underwent esophageal (OR 1.85, 95% CI 1.60–2.13, $p < 0.001$), gastric (OR 1.29, 95% CI 1.13–1.48, $p < 0.001$), and pancreatic operations (OR 1.26, 95% CI 1.13–1.40, $p < 0.001$) were more likely than patients who underwent colorectal operations to have ED treat-and-release encounters. Patients who underwent hepatobiliary (OR 0.93, 95% CI 0.76–1.15, $p = 0.52$) and small bowel operations (OR 1.01, 95% CI 0.82–1.23, $p = 0.96$) were less likely to have ED treat-and-release encounters compared to patients who underwent colorectal operations. Sensitivity analyses evaluating 90-day post-discharge outcomes demonstrated similar findings to the primary analysis (Supplemental Tables 3–5).

DISCUSSION

Postoperative ED encounters are common after major gastrointestinal cancer operations; however, ED treat-and-release visits for this population are poorly characterized in the literature. This study shows that nearly 1 in 5 patients who have undergone a major gastrointestinal operation for cancer have a postoperative ED encounter within 30 days of discharge. Furthermore, over 40% of these ED encounters were treat-and-release encounters. Some ED encounters result in inpatient admission due to the need for ongoing monitoring or treatment. Other ED encounters are necessary, as some patients require urgent diagnostic testing to assess for serious postoperative complications, such as pulmonary embolism or anastomotic leak. However, existing single-center studies have shown that a significant percentage of postoperative ED visits are preventable. [8],[9]

While ED encounters with inpatient readmission were most frequently due to wound complications or gastrointestinal complaints, ED treat-and-release encounters were most frequently for pain or complaints related to a device (e.g., surgical drain) or ostomy. This highlights a potential target for reducing the frequency of these encounters through improved expectation setting regarding postoperative pain, prescription of adequate analgesia, and the availability of easy, reliable ways for patients to have their pain addressed without an ED encounter. Additionally, improving education and self-care for ostomies and devices (e.g., surgical drains) and providing basic instruction and resources for troubleshooting problems could also reduce the frequency of ED treat-and-release encounters. As ED resources are limited, preventing unnecessary encounters may result in improved access to emergent care by decreasing reliance on the ED for post-operative evaluation and management.

This study also suggests that ED treat-and-release encounters disproportionately affect vulnerable patient populations already known to experience healthcare disparities, such as Black and Hispanic patients and patients who are not privately insured. There are several potential explanations for this finding, including that patients from underserved communities and patients with poor literacy or limited English proficiency are known to receive inferior discharge planning. [15],[16],[17] Additionally, these patients may not have access to comparable home care in the form of family members or paid healthcare personnel. Unfortunately, due to the limitations of the HCUP databases used in this study, hospital characteristics and additional patient demographic factors, such as education level and income, were not available. Nevertheless, the results of this study suggest that ED encounters after surgery represent further evidence of healthcare disparities.

Further characterization of ED treat-and-release encounters is necessary to fully understand the specific drivers behind these encounters and to what degree they may truly be preventable. A 2011 survey-based study performed by the Centers for Disease Control demonstrated that nearly 80% of patients who presented to the ED stated that they did so because of a lack of access to other providers, a higher percentage than those who stated that they went to the ED due to the seriousness of their medical condition. [18] Most frequently, the reason cited for these patients' inability to access other providers was because their doctor's office was not open. It is expected that this trend would hold true for post-surgical patients, who likely rely on the ED for problems which occur after discharge when they are unable to access their surgical team in a timely or reliable fashion. A recently published qualitative study interviewed patients and clinicians about barriers to post-discharge continuity of care following gastrointestinal cancer operations. [19] In this study, patients remarked that they felt unprepared to handle various scenarios which arose in the post-discharge setting, and additionally had difficulty establishing contact with their care team in moments of need. Additional quantitative data are necessary to truly characterize the extent of preventable ED treat-and-release visits. However, preventable ED treat-and-release encounters are likely a problem which must be addressed to improve post-discharge care for surgical patients and reduce unnecessary utilization of the healthcare system. This study provides preliminary data demonstrating the incidence of these encounters and serves as a first step in characterizing what may be an important quality improvement target.

Despite its strengths, this study has several limitations which should be considered when interpreting its findings. First, this is an observational study, and therefore only association, not causality, can be derived from the findings. Second, operations performed for gastrointestinal cancer are complex and highly morbid and the findings of this study are therefore likely not applicable to less complex surgeries. Third, this study was not designed to directly assess which ED encounters were preventable with specific additional resources. Finally, the HCUP databases consist of administrative data and have limitations in terms of accuracy and specificity. Because each ED encounter has a billing record, the accuracy of the primary outcome (incidence of ED encounters) will be quite high. However, the diagnoses associated with each readmission encounter are dependent on the accuracy and specificity of the ICD-CM codes which are applied and the billing practices at individual hospitals.

In conclusion, ED treat-and-release encounters are common after major gastrointestinal operations for cancer. Over 40% of post-discharge ED encounters are treat-and-release encounters, and these encounters are more common among patients who are known to experience other healthcare disparities. Given the reasons for the ED visit, many of these ED treat-and-release encounters may be preventable with improved post-discharge monitoring and education.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Funding:

This study was supported by a grant from the Agency for Healthcare Research and Quality (K12HS026385) and the American Cancer Society (IRG-18-163-24). BCB is supported by the American College of Surgeons as part of the Clinical Scholars in Residence Program and by a grant from the National Cancer Institute (T32CA247801). KYB is supported by the Agency for Healthcare Research and Quality (5R01HS024516) and by a grant from the Health Care Services Corporation. RHJ and CMS are supported by a grant from the National Cancer Institute (T32CA247801). DDO is supported by a grant from the National Cancer Institute (K07CA216330). RPM is supported by a grant from the Agency for Healthcare Research and Quality (K12HS026385) and the American Cancer Society (IRG-18-163-24).

REFERENCES

1. Centers for Medicare & Medicaid Services. Hospital Readmissions Reduction Program (HRRP) Archives. 2020; <http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/HRRP-Archives>. Accessed April 15, 2021.
2. Bilimoria KY, Birkmeyer JD, Burstin H, et al. Rating the raters: an evaluation of publicly reported hospital quality rating systems. *NEJM Catalyst*. 2019;5(4).
3. Zafar SN, Shah AA, Nembhard C, et al. Readmissions After Complex Cancer Surgery: Analysis of the Nationwide Readmissions Database. *J Oncol Pract*. 2018;14(6):e335–e345. [PubMed: 29894662]
4. Merkow RP, Ju MH, Chung JW, et al. Underlying reasons associated with hospital readmission following surgery in the United States. *JAMA*. 2015;313(5):483–495. [PubMed: 25647204]
5. Kocher KE, Nallamotheu BK, Birkmeyer JD, Dimick JB. Emergency department visits after surgery are common for Medicare patients, suggesting opportunities to improve care. *Health Aff (Millwood)*. 2013;32(9):1600–1607. [PubMed: 24019365]

6. Hansen DG, Fox JP, Gross CP, Bruun JS. Hospital readmissions and emergency department visits following laparoscopic and open colon resection for cancer. *Dis Colon Rectum*. 2013;56(9):1053–1061. [PubMed: 23929014]
7. Brown CS, Yang J, Meng Z, Henderson J, Dimick JB, Telem DA. Trends in emergency department utilization following common operations in New York State, 2005–2014. *Surg Endosc*. 2020;34(5):1994–1999. [PubMed: 31300908]
8. Khouri A, Alvarez R, Matusko N, Varban O. Characterizing the preventable emergency department visit after bariatric surgery. *Surg Obes Relat Dis*. 2020;16(1):48–55. [PubMed: 31744733]
9. Eustache J, Hopkins B, Trepanier M, et al. High incidence of potentially preventable emergency department visits after major elective colorectal surgery. *Surg Endosc*. 2022;36(4):2653–2660. [PubMed: 33959806]
10. Healthcare Cost and Utilization Project (HCUP). HCUP Databases. In: Agency for Healthcare Research and Quality, ed. Rockville, MD2015–2017.
11. Mutter R, Stocks C. Using Healthcare Cost and Utilization Project (HCUP) data for emergency medicine research. *Ann Emerg Med*. 2014;64(5):458–460. [PubMed: 25669700]
12. World Health Organization. International Classification of Diseases. 2021; <http://www.who.int/standards/classifications/classification-of-diseases>. Accessed April 15, 2021.
13. Elixhauser A, Steiner C, Harris DR, Coffey RM. Comorbidity measures for use with administrative data. *Med Care*. 1998;36(1):8–27. [PubMed: 9431328]
14. Agency for Healthcare Research and Quality. Elixhauser Comorbidity Software Refined for ICD-10-CM. 2020; http://hcup-us.ahrq.gov/toolssoftware/comorbidityicd10/comorbidity_icd10.jsp. Accessed July 23, 2020.
15. Martino SC, Elliott MN, Hambarsoomian K, et al. Racial/Ethnic Disparities in Medicare Beneficiaries' Care Coordination Experiences. *Med Care*. 2016;54(8):765–771. [PubMed: 27116106]
16. Choe AY, Thomson JE, Unaka NI, et al. Disparity in Nurse Discharge Communication for Hospitalized Families Based on English Proficiency. *Hosp Pediatr*. 2021;11(3):245–253. [PubMed: 33531376]
17. Kripalani S, Jackson AT, Schnipper JL, Coleman EA. Promoting effective transitions of care at hospital discharge: a review of key issues for hospitalists. *J Hosp Med*. 2007;2(5):314–323. [PubMed: 17935242]
18. Gindi RM, Black LI, Cohen RA. Reasons for Emergency Room Use Among U.S. Adults Aged 18–64: National Health Interview Survey, 2013 and 2014. *Natl Health Stat Report*. 2016(90):1–16.
19. Brajcich BC, Shallcross ML, Johnson JK, et al. Barriers to Post-Discharge Monitoring and Patient-Clinician Communication: A Qualitative Study. *J Surg Res*. 2021;268:1–8. [PubMed: 34274626]

SYNOPSIS

ED treat-and-release encounters are common after major gastrointestinal cancer surgery. This study shows that ED treat-and-release encounters are common after major gastrointestinal cancer surgery and that reasons for ED treat-and-release encounters are different than those for ED encounters with readmission.

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Table 1.

Characteristics of Patients in the Study Population

Characteristic	Overall (N=51,523)	Esophagus (n=2125)	Stomach (n=3066)	Pancreas (n=6098)	Hepatobiliary (n=6035)	Small bowel (n=1430)	Colorectal (n=32,769)	P Value
Age, mean (SD), y	65.4 (12.7)	64.3 (9.8)	65.5 (12.9)	66.2 (11.6)	62.5 (12.7)	63.2 (13.2)	65.9 (13.0)	<0.001
Sex, n (%)								
Male	26,409 (51.3)	1713 (80.6)	1670 (54.5)	3073 (50.4)	3073 (50.9)	657 (49.5)	16,223 (49.5)	<0.001
Female	25,114 (48.7)	412 (19.4)	1396 (45.5)	3025 (49.6)	2962 (49.1)	773 (54.1)	16,546 (50.5)	
Race/ethnicity, n (%)								
Non-Hispanic White	35,272 (68.5)	1705 (80.2)	1495 (48.8)	4369 (71.7)	3896 (64.6)	980 (68.5)	22,827 (69.7)	<0.001
Non-Hispanic Black	5729 (11.1)	109 (5.1)	502 (16.4)	557 (9.1)	686 (11.4)	186 (13.0)	3689 (11.3)	
Hispanic	5019 (9.7)	125 (5.9)	450 (14.7)	478 (7.8)	556 (9.2)	127 (8.9)	3283 (10.0)	
Other/unknown	5503 (10.7)	186 (8.8)	619 (20.2)	694 (11.4)	897 (14.9)	137 (9.6)	2970 (9.1)	
Primary payer, n (%)								
Medicare	27,245 (52.9)	1053 (49.6)	1568 (51.1)	3407 (55.9)	2721 (45.1)	692 (48.4)	17,804 (54.3)	<0.001
Medicaid	4085 (7.9)	169 (8.0)	406 (13.2)	360 (5.9)	603 (10.0)	139 (9.7)	2408 (7.4)	
Private insurance	18,824 (36.5)	856 (40.3)	1015 (33.1)	2125 (34.9)	2546 (42.2)	561 (39.2)	11,721 (35.8)	
Other ^a	1369 (2.7)	47 (2.2)	77 (2.5)	206 (3.4)	165 (2.7)	38 (2.7)	836 (2.6)	
Elixhauser comorbidities, n (%) ^b								
None	6349 (12.3)	143 (6.7)	383 (12.5)	436 (7.2)	556 (9.2)	176 (12.3)	4655 (14.2)	<0.001
1 to 2	23,062 (44.8)	890 (41.9)	1346 (43.9)	2435 (39.9)	2716 (45.0)	648 (45.3)	15,027 (45.9)	
3 or more	22,112 (42.9)	1092 (51.4)	1337 (43.6)	3227 (52.9)	2763 (45.8)	606 (42.4)	13,087 (39.9)	

Abbreviations: SD, standard deviation

^aIncludes self-pay, encounters with no charge, and other government programs (e.g., Indian Health Services, Department of Veterans Affairs), Department of Corrections, foreign nationals, worker's compensation, auto insurance.

^bIncludes 28 of 29 Elixhauser comorbidities; solid organ tumor was excluded as this comorbidity was present for all patients in the study population by definition.

Table 2.

Disposition Destination for All Emergency Department Encounters within 30 Days of Discharge from Index Hospitalization

Disposition	Overall (N=11,487)	Esophagus (n=728)	Stomach (n=730)	Pancreas (n=1727)	Hepatobiliary (n=1324)	Small Bowel (n=339)	Colorectal (n=6639)	P Value
Discharge, n (%)	4674 (40.7)	346 (47.5)	331 (45.3)	628 (36.4)	503 (38.0)	129 (38.1)	2737 (41.2)	<0.001
Observation, n (%)	627 (5.5)	41 (5.6)	36 (4.9)	91 (5.3)	92 (7.0)	16 (4.7)	351 (5.3)	
Inpatient readmission, n (%)	6186 (53.8)	341 (46.8)	363 (49.7)	1008 (58.4)	729 (55.1)	194 (57.2)	3551 (53.5)	

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Table 3.

Rates of Emergency Department Encounters within 30 Days of Discharge from Index Hospitalization

Encounter Type	Overall (N=51,523)	Esophagus (n=2125)	Stomach (n=3066)	Pancreas (n=6098)	Hepatobiliary (n=6035)	Small Bowel (n=1430)	Colorectal (n=32,769)	P Value
Any ED encounter, n (%)	9197 (17.9)	534 (25.1)	586 (19.1)	1374 (22.5)	1059 (17.6)	272 (19.0)	5375 (16.4)	<0.001
ED treat-and- release encounter, n (%)	4043 (7.9)	283 (13.3)	288 (9.4)	552 (9.1)	436 (7.2)	108 (7.6)	2376 (7.3)	<0.001
ED encounter with observation, n (%)	612 (1.2)	38 (1.8)	33 (1.1)	89 (1.5)	91 (1.5)	16 (1.1)	345 (1.1)	<0.001
ED encounter with inpatient readmission, n (%)	5572 (10.8)	298 (14.0)	330 (10.8)	907 (14.9)	663 (11.0)	174 (12.2)	3200 (9.8)	<0.001

Abbreviations: ED, emergency department

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Table 4.

Most Frequent Diagnoses Associated with 30-Day Post-Discharge Emergency Department Encounters by Disposition Destination

Discharge/Treat-and-Release (N=4674)		Observation Stay (N=627)		Inpatient Readmission (N=6186)	
Diagnosis	n (%)	Diagnosis	n (%)	Diagnosis	n (%)
Pain	560 (12.0)	Pain	96 (15.3)	Wound complaint	1341 (21.7)
Device or ostomy complaint	549 (11.8)	Device or ostomy complaint	51 (8.1)	Non-obstructive gastrointestinal problem	927 (15.0)
Wound complaint	532 (11.4)	Non-obstructive gastrointestinal problem	50 (8.0)	Obstruction or ileus	666 (10.8)
Renal or genitourinary problem	404 (8.6)	Wound complaint	47 (7.5)	Sepsis	481 (7.8)
Non-obstructive gastrointestinal problem	358 (7.7)	Neurological problem	46 (7.3)	Renal or genitourinary problem	432 (7.0)

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Table 5.

Patient and Disease Characteristics Associated with 30-Day Post-Discharge Emergency Department Treatment-and-Release Encounters

Characteristic	Odds Ratio (95% CI) ^a	P Value
Age, per year	0.99 (0.99–0.99)	<0.001
Sex		
Male	1 (Reference)	-
Female	0.99 (0.93–1.06)	0.85
Race/ethnicity		
Non-Hispanic White	1 (Reference)	-
Non-Hispanic Black	1.24 (1.12–1.38)	<0.001
Hispanic	1.09 (0.97–1.22)	0.17
Other/unknown	0.91 (0.80–1.02)	0.11
Primary payer		
Medicare	1.27 (1.16–1.40)	<0.001
Medicaid	1.82 (1.62–2.04)	<0.001
Private insurance	1 (Reference)	-
Other ^b	1.40 (1.16–1.70)	<0.001
Operation type		
Esophageal	1.85 (1.60–2.13)	<0.001
Gastric	1.29 (1.13–1.48)	<0.001
Hepatobiliary	0.93 (0.76–1.15)	0.52
Pancreatic	1.26 (1.13–1.40)	<0.001
Small bowel	1.01 (0.82–1.23)	0.96
Colorectal	1 (Reference)	-

Abbreviations: ED, emergency department; CI, confidence interval

^aOdds ratios report the odds of experiencing one of more emergency department encounter with discharge within 30 days of discharge. Models included age, sex, race/ethnicity, procedure type, payer, and 28 of 29 Elixhauser comorbidities (excluding solid organ tumor).

^bIncludes self-pay, encounters with no charge, and other government programs (e.g., Indian Health Services, Department of Veterans Affairs), Department of Corrections, foreign nationals, worker's compensation, auto insurance.