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Preventable Emergency Department Visits Following Colorectal Surgery

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Abstract

BACKGROUND: The emergency department plays a common and critical role in the treatment of postoperative patients. However, many quality improvement databases fail to record these interactions. As such, our understanding of the prevalence and etiology of postoperative emergency room visits in contemporary colorectal surgery is limited. Visits with potentially preventable etiologies represent a significant target for quality improvement particularly in the current era of rapidly evolving postoperative and ambulatory care patterns.

OBJECTIVE: We aim to characterize postoperative emergency department visits and identify factors associated with these visits for potential intervention.

DESIGN: Retrospective cohort study

SETTING: Academic medical center, 2014–2018.

PATIENTS: Consecutive patients undergoing colectomy or proctectomy within the division of colorectal surgery at an academic medical center between 2014 and 2018

MAIN OUTCOME MEASURES: Frequency and indication for emergency department visits; clinical and sociodemographic factors associated with emergency department visits in the post-operative period.

RESULTS: From the 1763 individual operations, there were 207 emergency department visits from 199 patients (11%) within 30 days of discharge. Two thirds of emergency department visits led to readmission. Median [interquartile range] time to presentation was 8 [4–16] days. Median time in the emergency department was 7.8 [6–10.1] hours. One-third of visits were identified as potentially preventable, most commonly for pain (17%) and stoma complications (excluding dehydration) (13%). A primary language other than English was associated with any post-operative emergency department visit risk ratio (RR) [95% CI] 2.7[1.3–5.3] as well as a preventable visit RR 3.6 [1.7–8.0].

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LIMITATIONS: Single center study, retrospective review.

CONCLUSION: One-third of emergency department visits following colorectal surgery are potentially preventable. Special attention should be directed towards those patients who do not speak English as a primary language. See **Video Abstract** at <http://links.lww.com/DCR/Bxxx>.

SE PUEDEN EVITAR LAS VISITAS AL SERVICIO DE URGENCIA DESPUÉS DE UNA CIRUGÍA COLORECTAL?

Las unidades de emergencia tienen un rol fundamental en el periodo posterior a una cirugía. Sin embargo muchos de los registros en las bases de datos de estas secciones no son de buena calidad. Por esto analizar la prevalencia y etiología de las visitas post-operatorias en cirugía colorectal resulta ser bastante limitada. Para lograr una mejoría en la calidad es fundamental analizar las causas potencialmente evitables, especialmente al considerar la rápida evolución de los parámetros de medición actuales.

Nuestro objetivo es caracterizar las visitas postoperatorias al servicio de urgencias e identificar los factores asociados potencialmente evitables.

Estudio de cohorte retrospectivo.

Centro médico académico, 2014–2018.

Pacientes consecutivos sometidos a colectomía o proctectomía dentro de la división de cirugía colorrectal en un centro médico académico entre 2014 y 2018.

Frecuencia e indicación de las visitas al servicio de urgencias en el periodo post-operatorio: factores clínicos y sociodemográficos.

De 1763 operaciones individuales, hubo 207 visitas al departamento de emergencias de 199 pacientes (11%) en los 30 días posteriores al alta. Dos tercios de las visitas al servicio de urgencias dieron lugar a readmisiones. La mediana [rango intercuartílico] de tiempo hasta la presentación fue de 8 [4–16] días. La mediana de tiempo en el servicio de urgencias fue de 7,8 [6–10,1] horas. Un tercio de las visitas se identificaron como potencialmente evitables, más comúnmente dolor (17%) y complicaciones del estoma (excluida la deshidratación) (13%). En los pacientes con poco manejo del inglés se asoció con una mayor frecuencia razón de visitas al departamento de emergencias posoperatorias [IC del 95%] 2,7 [1,3–5,3], así como potencialmente evitables con un RR de 3,6 [1,7–8,0].

Estudio de un solo centro y revisión retrospectiva.

Al menos un tercio de las visitas al servicio de urgencias después de una cirugía colorrectal son potencialmente evitables. Se debe prestar especial atención a los pacientes que no hablan inglés como idioma materno. Consulte **Video Resumen** en <http://links.lww.com/DCR/Bxxx>. (*Traducción —Dr. Gunther Bocic*)

Keywords

Emergency department; Limited English proficiency; Preventable; Readmission

INTRODUCTION

Emergency departments (ED) occupy increasing diagnostic and therapeutic roles within our healthcare system. While a number of patient, provider, systemic, and societal factors influence ED use, many conditions treated in the ED can be addressed in the outpatient setting.¹⁻³ ED visits following colorectal surgery are at least as frequent as readmissions to the hospital.^{2,4} Over the last decade, the Hospital Readmission Reduction Program has focused providers on decreasing readmissions. However, decreasing post-operative ED visits has not received the same attention.⁵ As such, it is important to know how often and for what reasons postoperative patients return to the ED and whether some visits are preventable. This is of particular importance in the context of evolving mechanisms for outpatient and post-operative care encounters.

Compared to other surgical procedures, patients undergoing colorectal resections are at high risk for unplanned readmissions.^{4,6,7} Adoption of enhanced recovery pathways (ERP) and tailored post-operative regimens for high risk patients, such as those with new ileostomies, have shown promise in reducing post-operative complications and readmissions.^{8,9} It is unknown whether similar measures can reduce post-operative ED visits following major colorectal surgery. Studies of post-operative ED utilization are scarce in part because registries such as the National Surgical Quality Improvement Project (NSQIP) do not capture ED interactions.^{2,4,10,11}

Therefore, the purpose of this investigation was to detail the prevalence, timing and etiology of ED visits following colorectal surgery in a contemporary colorectal practice. Additionally we sought to identify factors associated with return ED visits, particularly those deemed potentially preventable, as targets for quality improvement interventions.

MATERIALS AND METHODS

The hospital NSQIP database was queried for colorectal resections between 2014–2018 as defined by primary CPT code (4414–1, 44143–7, 44150, 44151, 44160, 44204–8, 44210, 4415–8, 44211, 44212, 45110–6, 45119–23, 45126, 45130, 45135, 45160, 45395, 45397, 45402, 45550). Only cases performed by members of the division of colorectal surgery at Beth Israel Deaconess Medical Center were selected as those surgeons shared a common enhanced recovery pathway. Inpatient deaths following the initial surgery were excluded.

The level of analysis was the individual surgery and post-operative course. The primary outcome of the study was ED visits within 30 days of discharge following the index operation. Secondary outcomes included potentially preventable ED visits and unplanned readmissions. The electronic medical record was queried for all emergency department visits at Beth Israel Deaconess Medical Center within 30 days from discharge following the index surgery. Patients are routinely seen at two and six weeks post-operatively following major colorectal surgery except when a new stoma is created which necessitates a nurse practitioner (NP) and wound ostomy continence nursing (WOCN) visit within the first week following discharge. Patient interactions and chief complaints were determined from review of provider notes. If a patient presented with a separate complaint to the ED

than was addressed in recorded visits than the presentation was deemed to have not been previously addressed in routine follow-up. Patient level NSQIP data was supplemented with information abstracted from the local electronic medical record. Patient preferred language is self-reported at patient registration. Driving distance to the hospital was calculated using the patient's ZIP code and median ZIP code income was determined from 2013–2017 American Community Survey Five-year Estimates.

Readmissions and ED visits were classified by primary and secondary etiology if applicable. Each ED visit was reviewed independently by two physicians and a judgment was made if the ED visit could have been prevented with an outpatient clinic visit with or without additional diagnostics and treatment. Specifically, reviewers were instructed that if the patient required an invasive procedure (excluding Foley catheter insertion, wound packing, or wound vac placement), intravenous medications or hydration beyond temporary treatment within the ED, or a change in discharge disposition then the ED could not be classified as “preventable.” Foley catheter placement and wound issues were not automatically deemed preventable and reviewers were instructed to evaluate the entire presentation including host and provider factors. In cases of disagreement a third reviewer examined the case. Inter-observer agreement was assessed by using Cohen's kappa coefficient. The kappa statistic is interpreted as follows: <0, poor agreement; 0 to 0.20, slight agreement; 0.21 to 0.40, fair agreement; 0.41 to 0.60, moderate agreement; 0.61 to 0.80, substantial agreement; and 0.81 to 1.00, almost perfect agreement.¹²

Patient sociodemographics, medical history, operative and post-operative characteristics were described using mean (standard deviation) or median [interquartile range (IQR)] for continuous variables and counts (percentages) for categorical variables. Reason for ED visit and readmissions were presented as counts (percentages). Potential variables associated with ED visits within 30 days of discharge after index colectomy or proctectomy procedure were identified through review of the prior reports. To compare etiologies of ED visits between those that were deemed preventable versus not preventable, we performed Pearson's chi-squared tests. We used multinomial logistic regression to assess associations between initial preventable and non-preventable ED visits compared to no ED visits and a set of purposefully selected covariates. An available case analysis approach was used for this model. Model estimates are presented as risk ratios (RRs) and 95% confidence intervals. All analyses were completed using STATA software (version 16.0/SE;StataCorp LP, College Station, TX). Institutional review board exemption was granted and a waiver of consent granted prior to initiation of research (Protocol # 2019P000193).

RESULTS

A total of 1763 surgeries and post-operative courses were included in the analysis. Demographic information is summarized in Table 1. The mean age at surgery was 60 years and 52% of patients were female. Most patients (93%) reported English as their primary language and 39% of patients reported graduating college or possessing an advanced degree. Overall, 57% of patients had an ASA 2 and 87% 1 on a modified frailty index (mfi5) scale from 0–5.¹³ Neoplasm was the most common indication for surgery (56%) followed by inflammatory bowel disease (18%) and diverticulitis (17%). The majority of cases (79%)

were performed minimally invasively. Rectal resections comprised 15% of cases. Stoma creation occurred in 29% of cases. The median postoperative length of stay [IQR] was 4 days [2–6]. Only 6% of patients were discharged to a facility, however, over one-third of patients discharged home were prescribed visiting nursing services.

Of the 1763 individual surgeries, 199 (11%) of patients returned to the emergency department at the index hospital within 30 days of discharge. The etiologies for returning to the ED are listed in Table 2. The median time to presentation at the ED was 8 days. Eight patients presented twice. On average patients spent 8 [6–10] hours in the ED, the vast majority received lab work (96%), and more than half (55%) underwent CT scan (Table 3). Of these visits, 142 (69%) resulted in readmission to the hospital. The 30-day readmission rate was 11% and 65% of these were admitted from the ED at the index institution as opposed to directly from clinic, home, or another institution. Almost all readmissions recorded in the local NSQIP database were ultimately admitted to the operating institution. 37 of these patients initially sought care at a separate institution and were either transferred after admission (11/197) or transferred after presenting to an outside emergency room (26/137).

On multi-variable analysis, factors associated with non-preventable return to the ED included: patients who did not specify English as their primary language adjusted RR [95%CI] 2.7 [1.3–5.3], rectal surgery RR 2.1 [1.2–3.1], and a pre-operative ASA class 2 (Table 4). A primary language other than English was also significantly associated with a preventable ED visit RR 3.6 [1.6–7.9]. Notably, education level was excluded from the regression as the proportion of unknown values was significantly higher in those patients who did not return to the ED and this was thought to be secondary to ascertainment bias. No significant differences were observed between preventable and non-preventable ED visits in the proportion of weekday or daytime presentations (Table 3).

Two independent evaluators reviewed all ED visits and made a determination of whether the visit was potentially preventable with an outpatient clinic visit with or without further diagnosis or intervention in the outpatient setting. The two evaluators obtained substantial agreement reaching consensus for 81.2% (168/207) observations (Kappa=0.61, $p<0.00005$). Thirty-nine cases (18.8%) of disagreement were resolved by a third independent evaluation. Overall, 33% (69/207) of ED visits within 30 days of discharge were deemed potentially preventable. The majority of potentially preventable visits (84%) were not admitted. Notably, the proportion of visits related to stoma complications (including pouching difficulties and skin irritation but not dehydration) were higher in the potentially preventable visits (13 vs 1.4%) compared to non-preventable as were pain related visits (17.4% vs 2.2%). Readmissions among patients with potentially preventable ED visits were significantly shorter (median 2.5 days IQR [1–5]) as compared to other patients (4 days [2–8] $p=0.02$) reflecting a less serious etiology. In these “preventable” ED cases initial reviewer agreed in 8/11 cases or 73% of the time which is similar to the overall agreement rate of 81%.

Interactions between the patient and providers prior to ED presentation occurred in 48% and 58% of non-preventable and potentially preventable visits, respectively. The majority

of this contact was either scheduled follow-up unrelated to the presenting complaint or by telephone. Only 9% of non-preventable and 3% of potentially preventable had an in-person visit with a provider and in the two cases of potentially preventable cases both were with a primary care physician (PCP) rather than a member of the surgical team.

DISCUSSION

The role of the emergency department within healthcare is rapidly expanding.³ However, relatively few studies have characterized ED visits following colorectal surgery.^{2,4,10,11} Our results demonstrate that emergency department visits following colorectal surgery are common and consume significant time and resources. Patients spend approximately 8 hours in the emergency department whether they require admission or not and the majority undergo cross-sectional imaging. One-third of visits are potentially preventable with outpatient management and the language barrier is a target for quality improvement. Of the two-thirds of ED visits deemed non-preventable, the majority (95%) required readmission. This suggests a low rate of ED treatment rescuing patients from readmission but indicates that the ED functions in a diagnostic fashion despite most ED visits occurring in the daytime or on a weekday when other outpatient resources are available.

Pain, stoma complications (including pouching difficulties and skin irritation but not dehydration), and SSI were the most common etiologies of potentially preventable post-operative ED visits in this cohort. A study by Wood & colleagues examining postoperative ED visits following colorectal surgery in Canada, also identified SSI as a leading cause of potentially preventable ER visits although their proportion of visits with SSI was much higher (35% vs 10%) potentially due to a higher rate of open surgery.² Stoma complications were less common as a reason for presentation to the ED while overall readmission rates and ED use rates were similar between the Canadian cohort and our study. This data suggests that SSI remains a worthy target for intervention to avoid unexpected return to care. Novel paradigms such as remote photography monitoring have been developed to address this issue although broad effectiveness remains to be determined.¹⁴

Several variables associated with ED visits from this study such as rectal surgery, frailty, increased length of stay, and unexpected return to the OR are in line with contemporary studies examining readmission following colorectal surgery.^{2,7,15,16} While NSQIP data is one of the leading surgical quality improvement databases, there are some limitations to the data collected including many socioeconomic factors known to influence outcomes.¹⁷ In our cohort, a primary language other than English was strongly associated with not only a post-operative ED visit but also a potentially preventable one. This is consistent with previous studies in pediatric and non-surgical populations demonstrating that limited English proficiency is associated with poor understanding of discharge instructions and increased risk of repeat presentation to an ED.^{18,19} However, this finding is not universal. Several studies examining vascular, surgical oncology, and emergency general surgery have not found a significant difference in adverse post-operative outcomes for non-English primary speakers.^{20,21}

The association of non-English primary speaking to preventable ED visit is stronger than its association to any ED visit. Thus, it is likely that poor communication during transition of care contributes to preventable ED visits. Within our institution all discharge instructions to non-English speaking patients are reviewed with the patient via an interpreter. This points to either the insufficiency of a single discharge instruction review via translator and alludes to systemic barriers to receiving outpatient care for non-primary English speakers exceeding the effects of education and insurance status. While further research is required to delineate these barriers, it is reasonable to assume that accessibility to the care team and intermediate levels of care is more difficult for patients who are non-primary English speakers. Notably, issues often associated with reduced quality of care such as a weekend or nighttime presentation were not significantly associated with preventable visits.²² As such, we are currently evaluating our patient education material and are working to improve methods for delivery including video lectures and providing translation for unique patient documents such as prescriptions. Finally, we have engaged in an overall quality assessment of our care of patients who are non-primary English speakers to highlight deficiencies in not only quality of care but also objective outcomes such as leak rate and resection margins.

Colorectal surgery has been a leader in developing multi-disciplinary enhanced recovery pathways to improve outcomes such as length of stay, complications, and readmissions.²³ This study demonstrates that postoperative ED visits are common and that a significant proportion of these visits may be preventable. These preventable visits occur in approximately 4% of cases which is a similar frequency as postoperative UTIs and are a worthy target for quality improvement.²⁴ It is notable that either routine follow-up or phone contact with a provider prior to ED presentation was common, however, in-person visits related to the complaint leading to ED presentation were rare. This finding demonstrates the need for additional post-discharge monitoring strategies, including remote methods, targeted at common and preventable etiologies of ED visits.²⁵ Additionally, reducing preventable ED visits may not be a function of more routine follow-up such as scheduled phone-calls but perhaps rely on improving accessibility to advanced diagnostic services and timely evaluation outside of the ED. Furthermore determining which methods of follow-up are less effective with patients with limited English proficiency is critical to the success of these programs and a subject of future research.

There are several limitations in this study. Retrospective assessment of the “preventability” of an ED visit does not capture the multitude of concerns and time pressures that providers and patients may be under during the postoperative period. The operating surgeon did not participate in judging preventability for cases and as such reviewers may not have fully understood the nuances of each case or patient nor the exact resource and personnel availability for each patient. Additionally, systems of care possess local variation and therefore the generalizability of this single center study in an urban referral center may be limited. Nevertheless, it is critical to find cases of potential preventability as these serve as opportunities for intervention and quality improvement. Previous studies examining readmissions following surgery have used similar methods of review and determination with roughly equivalent interrater reliability.^{16,26} The proportion of readmissions determined to be preventable in these studies was 21% and 39% as compared to our rate of 33% potentially preventable post-operative ED visits for which no literature comparisons were found.

Another limitation of this study is that emergency department visits were only captured at the hospital where the index surgery was performed. Zafar & colleagues demonstrated that 20% readmissions following major cancer surgery are not readmitted to the same hospital.²⁷ Therefore, it is likely that we have underestimated the incidence of post-operative ED visits. In our analysis, the proportion of transferred patients in non-preventable ED visits (19%) is much higher than in preventable visits (6%). It is common practice to transfer post-operative patients back to the index hospital, especially if a serious complication (i.e. non-preventable visit) is expected. Therefore it is possible that our study not only underestimates ED visits but may be skewed towards underestimating potentially preventable ED visits.

CONCLUSION

Our findings demonstrate that post-operative ED visits within 30 days after discharge following colorectal surgery are both common and time-consuming. Approximately one-third of these ED visits are potentially preventable. Pain and stoma-related complaints are more common in those visits thought to be preventable. Primary non-English language is strongly associated with a potentially preventable ED visit and points to a need for improved transition of care and follow-up in these patients. Emergency departments are essential diagnostic and therapeutic components of a healthcare system and thus will always play a role in postoperative care. Nevertheless, there is likely a subpopulation of patients, especially those who are primary non-English speakers, whose postoperative complications can be addressed in the outpatient setting without an ED visit.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Demographic and clinical characteristics of patients undergoing colorectal resection.

Characteristic		No ED Visit N=1,564 (89%)	Not Preventable N=133 (7.7%)	Preventable N=66 (3.7%)	p-value
Female		812 (51.9%)	68 (51.1%)	40 (60.6%)	0.37
Age	<50	383 (24.5%)	32 (24.1%)	23 (34.8%)	0.32
	50–59	375 (24.0%)	24 (18.0%)	15 (22.7%)	
	60–69	398 (25.4%)	36 (27.1%)	13 (19.7%)	
	70+	408 (26.1%)	41 (30.8%)	15 (22.7%)	
BMI	<20	100 (6.4%)	11 (8.3%)	3 (4.5%)	0.42
	20–25	493 (31.5%)	40 (30.1%)	23 (34.8%)	
	25–30	544 (34.8%)	41 (30.8%)	25 (37.9%)	
	30–35	268 (17.1%)	24 (18.0%)	6 (9.1%)	
	35–40	108 (6.9%)	9 (6.8%)	4 (6.1%)	
	40+	51 (3.3%)	8 (6.0%)	5 (7.6%)	
Diagnosis	Neoplasm	889 (56.8%)	69 (51.9%)	34 (51.5%)	0.02
	IBD	272 (17.4%)	36 (27.1%)	17 (25.8%)	
	Diverticulitis	271 (17.3%)	13 (9.8%)	12 (18.2%)	
	Other	132 (8.4%)	15 (11.3%)	3 (4.5%)	
Proctectomy		203 (13.0%)	39 (29.3%)	18 (27.3%)	<0.001
Stoma creation		417 (26.7%)	64 (48.1%)	31 (47.0%)	<0.001
Approach	Laparoscopic	950 (61.1%)	74 (55.6%)	39 (59.1%)	0.17
	Robotic	298 (19.2%)	19 (14.3%)	11 (16.7%)	
	Open	234 (15.0%)	31 (23.3%)	12 (18.2%)	
	Conversion to Open	74 (4.8%)	9 (6.8%)	4 (6.1%)	
ASA	1–2	913 (58.4%)	46 (34.6%)	42 (63.6%)	<0.001
	3–4	651 (41.6%)	87 (65.4%)	24 (36.4%)	
	0	840 (53.7%)	53 (39.8%)	38 (57.6%)	0.02
Modified Frailty Index	1	536 (34.3%)	52 (39.1%)	22 (33.3%)	
	2	168 (10.7%)	23 (17.3%)	5 (7.6%)	
	3	20 (1.3%)	5 (3.8%)	1 (1.5%)	
Post-op LOS >4 days		528 (33.8%)	79 (59.4%)	32 (48.5%)	<0.001
Unexpected Return to OR		54 (3.5%)	26 (19.5%)	5 (7.6%)	<0.001
Discharge disposition	Home	980 (62.7%)	50 (37.6%)	27 (40.9%)	<0.001
	Home with services	490 (31.3%)	65 (48.9%)	33 (50.0%)	
	Rehabilitation facility	94 (6.0%)	18 (13.5%)	6 (9.1%)	
Antibiotics on discharge		205 (13.1%)	25 (18.8%)	8 (12.1%)	0.17
Ostomy Rx on Discharge*		146 (9.3%)	28 (21.1%)	13 (19.7%)	<0.001
Non-white race		345 (22.1%)	18 (13.8%)	17 (25.8%)	0.06
Non-English primary language		92 (5.9%)	13 (9.8%)	12 (18.2%)	<0.001

Characteristic		No ED Visit N=1,564 (89%)	Not Preventable N=133 (7.7%)	Preventable N=66 (3.7%)	p-value
Education	Did not finish high school	71 (4.5%)	5 (3.8%)	7 (10.6%)	<0.001
	High school or some college	560 (35.8%)	68 (51.1%)	24 (36.4%)	
	College Graduate	595 (38.0%)	57 (42.9%)	31 (47.0%)	
	Other	102 (6.5%)	2 (1.5%)	3 (4.5%)	
	Unknown	236 (15.1%)	1 (0.8%)	1 (1.5%)	
Insurance Payor	Medicaid	190 (12.1%)	17 (12.8%)	12 (18.2%)	0.14
	Medicare	568 (36.3%)	62 (46.6%)	19 (28.8%)	
	Private	777 (49.7%)	52 (39.1%)	34 (51.5%)	
	Other	29 (1.9%)	2 (1.5%)	1 (1.5%)	

* Ostomy Rx on discharge refers to any medication other than dietary fiber prescribed to modulate output.

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Table 2:

Etiologies of Emergency Room Visits

Indication for visit †	Total ED visits n=207	Not Preventable n=138 (67%)	Preventable n=69 (33%)
Ileus/nausea and vomiting	25 (12%)	21 (15%)	4 (6%)
Intra-abdominal abscess or leak	26 (13%)	24 (17%)	2 (3%)
Superficial surgical site infection (SSTI)	16 (8%)	9 (7%)	7 (10%)
Dehydration	16 (8%)	13 (9%)	3 (4%)
Bleeding	17 (8%)	10 (7%)	7 (10%)
Pain related	15 (8%)	3 (2%)	12 (17%)
Stoma complications *	11 (5%)	2 (1%)	9 (13%)
Small bowel obstruction	18 (9%)	18 (13%)	0
Urinary tract infection or retention	7 (3%)	4 (3%)	3 (4%)
Wound complication (excluding SSTI)	2 (1%)	0	2 (3%)
Urinary retention	3 (2%)	1 (1%)	2 (3%)
Cardiac	1 (1%)	1 (1%)	0
Electrolyte abnormality	2 (1.0%)	2 (1%)	0
Medical issue related to surgery	22 (11%)	16 (12%)	6 (9%)
Medical issue unrelated to surgery	19 (9%)	11 (8%)	8 (12%)
Other	7 (3%)	3 (2%)	4 (6%)

† p-value of comparison of distribution of etiologies between not-preventable and preventable. p<0.001

* pouching difficulties, appliance supplies, skin irritation

Table 3:

Characteristics of Emergency Room Visits

ED Visit Characteristic	Total ED visits n=207	Not preventable n=138 (67%)	Preventable n=69 (33%)	p-value
Repeat Visits	8 (4%)	5 (4%)	3 (4%)	0.80
Days from Discharge	8 [4–16]	7 (3–15)	9 (5–17)	0.48
Time in ED hours	8 [6–10]	8 [6–10]	7 [5 – 10]	0.27
Weekend Visit	64 (30%)	46 (33%)	18 (26%)	0.29
Daytime Visit (8a-5p)		69 (50%)	26 (38%)	0.09
Transfer from other facility	30 (15%)	26 (19%)	4 (6%)	0.01
Laboratory Studies	198 (96%)	134 (97%)	64 (93%)	0.15
CT scan in ED	114 (55%)	94 (68%)	20 (29%)	<0.001
Admitted from ED	142 (69%)	131 (95%)	11 (16%)`	<0.001
Any prior practice contact	106 (51%)	66 (48%)	40 (58%)	0.17

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Table 4.

Multinomial logistic regression of factors associated with ED visits.

Characteristic		No ED Visit N=1,564	Not Preventable N=133	Preventable N=66
Female		-	1.18 [0.80–1.75]	1.62 [0.95–2.78]
Age	<50	-	-	-
	50–59	-	0.69 [0.37–1.31]	0.62 [0.29–1.30]
	60–69	-	0.80 [0.40–1.59]	0.58 [0.24–1.37]
	70+	-	0.71 [0.31–1.61]	0.65 [0.22–1.94]
BMI	<20	-	-	-
	20–25	-	1.03 [0.47–2.29]	1.90 [0.53–6.75]
	25–30	-	1.04 [0.46–2.34]	2.2 [0.61–7.93]
	30–35	-	1.15 [0.48–2.74]	1.07 [0.25–4.65]
	35–40	-	0.83 [0.29–2.37]	1.68 [0.34–8.24]
	40+	-	1.73 [0.56–5.33]	5.2 [1.07–25.2]
Diagnosis	Neoplasm	-	-	-
	IBD	-	1.3 [0.71–2.37]	0.83 [0.37–1.89]
	Diverticulitis	-	0.72 [0.37–1.44]	1.45 [0.70–3.02]
	Other	-	1.17 [0.60–2.29]	0.51 [0.14–1.78]
Rectal resection		-	2.05 [1.17–3.59]	1.77 [0.81–3.90]
Stoma creation		-	1.29 [0.74–2.24]	1.28 [0.59–2.77]
Approach	Laparoscopic	-	-	-
	Robotic	-	0.74 [0.40–1.36]	0.65 [0.3–1.39]
	Open	-	0.97 [0.58–1.62]	0.97 [0.47–2.04]
	Conversion to Open	-	0.83 [0.36–1.92]	0.95 [0.31–2.98]
ASA	>2	-	1.9 [1.2–3.0]	0.70 [0.38–1.31]
	0	-	-	-
	1	-	1.59 [0.95–2.67]	1.25 [0.64–2.45]
Modified Frailty Index	2	-	1.90 [0.97–3.74]	0.93 [0.31–2.80]
	3	-	2.26 [0.68–7.54]	0.77 [0.08–7.28]
Post-op LOS >4 days		-	1.53 [0.97–2.42]	1.59 [0.81–2.94]
Unexpected Return to OR		-	5.58 [3.10–10.1]	1.86 [0.66–5.24]
Discharge disposition	Home	-	-	-
	Home with services	-	1.04 [0.62–1.75]	1.65 [0.81–3.39]
	Rehab	-	0.77 [0.35–1.71]	2.3 [0.70–7.61]
Antibiotics on discharge		-	1.01 [0.59–1.71]	0.60 [0.27–1.38]
Ostomy Rx on Discharge		-	1.41 [0.82–2.42]	1.50 [0.72–3.13]
Non-white race		-	0.57 [0.32–1.00]	1.12 [0.59–2.15]
Non-English primary language		-	2.65 [1.32–5.32]	3.6 [1.64–7.92]
Insurance Payor	Medicaid	-	-	-
	Medicare	-	1.31 [0.63–2.72]	0.79 [0.29–2.14]
	Private	-	1.02 [0.53–1.94]	1.10 [0.47–2.16]
	Other	-	0.73 [0.13–4.02]	0.85 [0.10–7.31]