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Increased Time to Operation is a Significant Risk Factor for Mortality in Patients Hospitalized with Chronic Gastrojejunal Ulcers: An Analysis of 8,525 Patients in National Inpatient Sample, 2005-2014

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Abstract

Background: Gastrojejunal ulcers (GJ ulcers) in post gastric- jejunal anastomosis such as Roux-en-Y gastric bypass are common. The objective of our study was to identify risk factors for mortality in patients emergently admitted with gastrojejunal ulcers.

Methods: A National Inpatient Sample-based retrospective cohort study from 2005-2014 was conducted on patients undergoing emergency admission for chronic gastrojejunal ulcers. Demographics, clinical data, and outcomes were collected. Multivariable logistic regression model was applied to find the risk

factors of mortality in operative and non-operative patients.

Results: A total of 8,525 patients with a diagnosis of chronic gastrojejunal ulcer were included in this study and divided into an adult cohort with patients ages 18-64 (n=6,005) and an elderly cohort ages 65+ (n = 2,520). 62% of adult and 44.7% of elderly patients were female. The adult mortality rate was 0.5% vs 1.9% in the elderly group. There was no significant difference in mortality between males and females. 50.9% of adult and 50.0% of elderly patients underwent operation. Non-operative patients were more likely to have had an invasive diagnostic procedure, in both the adult and elderly groups (89.9% and 90.0%, respectively). In operative patients, time to operation was associated with increased mortality in both the adult and elderly groups (OR=1.195, $P<0.001$ vs. OR=1.060, $P=0.035$, respectively). In adult patients undergoing operation, age was associated with mortality (OR=1.054, $P=0.041$). In elderly patients not undergoing operation, invasive diagnostic procedure was found to be associated with reduced mortality (OR=0.189, $P<0.009$).

Conclusion: Use of endoscopic procedures and early operation of patients requiring surgery are the keys to improving outcomes in patients with chronic gastrojejunal ulcers.

Keywords: gastro-jejunal ulcer, National Inpatients Sample (NIS), emergency admission, surgery, endoscopy, mortality

Introduction

Gastrojejunal ulcers (GJ ulcers) have been described as an iatrogenic disease that occurs at the anastomotic site between the gastric and jejunal mucosa.[1] As a result, surgeries that require anastomosis of the stomach and jejunum, such as the Roux-en-Y gastric bypass (RYGB), have a higher prevalence of GJ ulcers, with a noted incidence of gastrojejunal ulcers of 1-16% after RYGB.[2,3] Various factors have been identified to be associated with higher risk of GJ ulcer development, such as pre-operative hypertension, pre-existing *H. Pylori* infection, staple-line disruption, ischemia, non-steroidal anti-inflammatory (NSAID) medications, and smoking.[4–7] The pathophysiology of ulcer development can be attributed to mucosal damage secondary to NSAID use, *H. Pylori*, or poor mucosal perfusion resulting in increased acidic insult to the muscularis propria. Patients may present with epigastric or abdominal pain, nausea, vomiting, or bleeding.[2] Based on the pathogenesis of ulcers, prophylactic proton pump inhibitor (PPI) has become a common practice in reducing GJ ulcer incidence in post-operative patients, and medical treatment of symptomatic patients may include adding sucralfate to PPI treatment.[3,8,9] In the case of acute hemorrhage or perforation of a gastrojejunal ulcer, endoscopic or surgical intervention is required.[8]

The effective management of patients admitted for chronic gastrojejunal ulcer may ultimately play a role in their outcome. It is vital that clinicians are aware of the particular risk factors of this population that may dispose them to increased mortality when deciding how to treat them. In this study, we look at risk factors associated with mortality in patients admitted for chronic gastrojejunal ulcers.

Methods

This was a retrospective cohort study using data extracted from the National Inpatient Sample (NIS) on adult (ages 18-65 years) and elderly patients (ages 65+ years) who were emergently admitted with a diagnosis of chronic gastrojejunal ulcer. The sample was extracted from the NIS-2005-2014 database. The ICD-9 codes used to identify patients with chronic gastrojejunal ulcer were 534.4, chronic or unspecified gastrojejunal ulcer with hemorrhage; 534.5, chronic or unspecified gastrojejunal ulcer with perforation; 534.6, chronic or unspecified gastrojejunal ulcer with hemorrhage and perforation; 534.7, chronic or unspecified gastrojejunal ulcer with or without hemorrhage or perforation. The following characteristics of patients and hospitals were collected and analyzed: age, gender, race, income quartile, hospital location (rural vs. urban), health insurance (Medicare, Medicaid, private insurance, self-paid, and no charge), type of ulcer presentation (hemorrhagic, perforation, or both) invasive diagnostic status, surgical procedure status, days to first procedure, hospital length of stay (HLOS), total charges, and the associated comorbidities (deficiency anemias, chronic pulmonary disease, coagulopathy, hypertension, liver disease, fluid and electrolyte disorders, metastatic cancer, peptic ulcer, renal failure, and weight loss). A modified 5-item frailty index was calculated according to the following characteristics: diabetes mellitus, hypertension, chronic pulmonary disease, congestive heart failure, and functional health status. As previously noted in our other

NIS studies, since the information for functional health status was not recorded in the NIS database, the presence of renal failure, cancer, paralysis, coagulopathy or weight loss were considered as partial or total loss of functional health status.

Statistical Analysis

The National Inpatient Database is a nationally recognized collection of factors that can be studied within the context of patterns of care and health outcomes targeted for research. It is a broad database formed by the Agency for Healthcare Research and Quality (AHRQ) that uses weighting in the process of generating samples of discharges from community hospitals in the United States, excluding rehabilitation and long-term acute care facilities. Descriptive and analytical statistical indicators were used to present the findings. Mean, standard deviation (SD), and confidence interval at 95% (CI) were calculated for numerical variables. Stratifications of data based on sex, outcome and operation were used in the present study to analyze possible risk factors associated with chronic gastrojejunal ulcers. The comparisons were done using chi-square tests for categorical variables, and with two-sample t-tests for continuous variables. The behavior of different variables in predicting mortality was evaluated by multivariable logistic regression analysis with backward elimination. Subsequently, the model was adjusted for the following attributes of patients and hospitals: age, sex, race, income quartile, health care insurance, hospital location, modified 5-item frailty index, invasive diagnostic procedures, type of gastrojejunal ulcer and time to operation. P-values less than 0.05 were considered significant. All analyses were done using SPSS software version 24 (SPSS Inc., Chicago, IL) and R statistical software (Foundation for Statistical Computing, Vienna, Austria).

Results

Sex

A total of 8,525 patients with diagnosis of chronic gastrojejunal ulcer were included in this study and divided into an adult cohort with patients ages 18-64 (n=6,005) or an elderly cohort ages 65+ (n=2,520). Table 1 depicts the stratification of the adult and elderly cohorts by sex. The majority of patients with chronic GJ ulcer were females in the adult group (62.0%) and males in the elderly group (55.3%). The following comorbidities were significantly more prevalent in males than in females: alcohol abuse, congestive heart failure, coagulopathy, un/complicated diabetes, hypertension, lymphoma, metastatic cancer, solid tumor, peripheral vascular disorders, pulmonary circulation disorders, and renal failure. Additionally, it was found that men, on average, were older and had higher modified frailty index scores than their adult female counterparts. Contrarily, adult females had significantly higher rates of the following comorbidities: deficiency anemias, rheumatoid arthritis, chronic pulmonary disease, depression, hypothyroidism, fluid/electrolyte disorders, psychoses and other neurological disorders, and weight loss. In elderly males, the following comorbidities had significantly higher rates than the elderly female cohort: alcohol abuse, lymphoma, metastatic cancer, peripheral vascular disorders, renal failure, and solid tumors. Within the elderly female cohort, there were significantly higher rates of: rheumatoid arthritis, chronic pulmonary disease, depression, hypothyroidism, fluid/electrolyte disorder, psychoses and other neurological disorders, obesity, and pulmonary circulation disorders. Males in both the adult and elderly cohorts were more likely to undergo invasive or surgical procedures than females. There was no significant difference identified in mortality between males and females in both the adult and elderly cohorts (Table 1).

Outcomes

The adult and elderly cohorts were stratified based on outcomes of survival versus mortality (Table 2). Mortality in the adult and elderly cohorts was 0.5% and 1.9%, respectively. Deceased patients in both the adult and elderly cohorts were found to have significantly higher rates of the following comorbidities compared to surviving patients: congestive heart failure, coagulopathy, fluid/electrolyte disorders, metastatic cancer, and weight loss. Deceased adult patients in particular had a higher prevalence of complicated diabetes, liver disease, psychoses, and renal failure. In those that survived, the adult cohort had higher rates of depression, while the elderly cohort had higher rates of deficiency anemias and hypertension. The deceased adult cohort was found to be significant for higher mean age and higher modified frailty index score than adult patients that survived. The survived elderly cohort had higher rates of invasive diagnostic procedures. However, deceased patients in both groups had a greater prevalence of surgical procedures, experienced longer HLOS, and had greater hospital costs (Table 2).

Operative vs. Non-Operative Management

Adult and elderly patients were stratified according to operative vs. non-operative management (Table 3). The prevalence of operative management in the adult and elderly cohorts was 50.9% and 50.0%, respectively. Patients that underwent operative management were more likely to have had GJ ulcers with perforation, increased time to invasive diagnostic procedure, higher hospital costs, longer HLOS and higher mortality. Additionally, operative patients experienced significantly higher rates of weight loss than those that survived. Operative adult patients experienced higher rates of fluid/electrolyte disorders while operative elderly patients experienced higher rates of coagulopathies. In contrast, patients that underwent nonoperative management had significantly higher rates of chronic blood loss and neurological disorders, and were more likely to have had an invasive diagnostic procedure performed. Nonoperative adults, in particular, also had a higher prevalence of alcohol abuse and deficiency anemias compared to operative adults (Table 3).

Mortality risk factors

A backward logistic regression analysis was performed to eliminate the least significant risk factors in order, until only the most significant factors were left (Table 4, Table 5). In those that underwent operation, one day of delay before operation was associated with a 19.5% increase in mortality in the adult patients (OR=1.195, 95%confidence interval: 1.102-1.295, $P<0.001$) and 6% in the elderly patients (OR=1.060, $P<0.05$). In adults that underwent operation, one-year older age was associated with a 5.4% increased mortality risk (OR=1.054, $P<0.05$) and increased modified frailty index score was associated with a 56.4% increased mortality risk (OR=1.564, $P<0.05$) (Table 4). In elderly patients that were managed non-operatively, invasive diagnostic procedures were inversely associated with mortality (OR=0.189, $P<0.05$) (Table 5).

Discussion

Time to Operation

Our study found that in patients admitted emergently with a primary diagnosis of chronic gastrojejunal ulcer requiring operation, increased time to operation was associated with increased mortality. Based on our data, every day of delay to operation increased the odds of mortality by 19.5% in adults and 6% in the elderly groups. This general finding of increased time to operation being associated with poor outcomes is supported by many studies in the literature, and has been noted in various NIS studies.[10–14] In a retrospective review of patients undergoing emergent colorectal procedures, McGillicuddy et. al found that delay to operation was associated with increased in-hospital mortality.[15] Meschino et. al. performed a study on operative timing for patients undergoing emergent general surgery, and found that time to operation greater than 72 hours was associated with increased risk of complications.[16] McIsaac et. al found that delay of urgent or emergency surgery is associated with increased mortality in a broad range of surgical conditions, including those related to general surgery.[17] A nationwide cohort study performed by Buck et al. on Danish patients with perforated peptic ulcer found that every hour of delay from admission to surgery was associated with a 2.4% decreased probability of survival compared to the previous hour.[18] Potential causes of increased mortality in patients with prolonged time before operation has been discussed in the literature. Surapaneni et. al noted that increased perforation-to-operation time allowed for more bacterial contamination and proliferation, which worsens prognosis.[19] In addition, a study by Lunevicius and Morkevicius on outcomes following laparoscopic repair of perforated duodenal ulcers found that delayed presentation > 9 hours was associated with increase in suture leakage rate, which can also negatively impact prognosis.[20] Potential causes for increased time to operation have also been noted in the literature. Noguiera et. al discussed possible causes, including difficulty accessing hospitals in rural communities and patient referrals from smaller, distant hospitals requiring transportation, prolonging time to operation.[21] In a study on time to operation and mortality in patients requiring emergent laparotomy, Barbosa et. al noted the time required to obtain imaging such as a CT scan can increase time to operation, resulting in increased mortality.[22] Based on our findings and the literature, patients with chronic gastrojejunal ulcer requiring operation should be taken to the OR with minimal delay to reduce mortality.

Invasive Diagnostic Procedures

Our study found that invasive diagnostic procedures performed on elderly non-operative patients was associated with decreased odds of mortality. Accurate diagnosis of an operative vs. non-operative ulcer may serve as one method of protecting patients from the risk of surgery, especially in the elderly population, who are more

susceptible to postoperative morbidity and mortality, as noted by Turrentine et. al.[23] Esophagogastroduodenoscopy (EGD) has been noted as the gold standard and plays a key role in diagnosing ulcers.[24] Di Palma et. al performed a study on marginal ulcer development following RYGB, and found that of the 6.9% (n=195) of RYGB patients that presented with marginal ulcer diagnosed via invasive endoscopic visualization, only 1% (n=28) of the patients had a chronic marginal ulcer that required surgery.[25] This study demonstrates the importance of endoscopy in deciding whether operation is truly necessary in managing marginal ulcers, which can ultimately decrease morbidity and mortality due to surgery related complications.

Endoscopy has also been proven as an effective method in the treatment of symptomatic ulcers. A meta-analysis performed by Laine and McQuaid which discussed endoscopic therapy for bleeding ulcers found that if active bleeding or non-bleeding visible vessels are seen, endoscopic therapy is warranted, with effective endoscopic therapy options including thermal therapy, sclerosant therapy, clips, and thrombin/fibrin glue.[26] In the case of recurrent bleeding ulcers following initial endoscopic control, endoscopic retreatment was found to reduce the future need for surgery and was associated with fewer complications than surgery, without increasing risk of death compared to surgical management.[27] Case studies have demonstrated endoscopic suturing as a method to control bleeding marginal ulcers.[28,29] In treating marginal ulcers refractory to maximal medical therapy, Barola et. al found endoscopic suturing to be effective, along with the use of fully covered self-expandable metal stents in patients where suturing of the marginal ulcers compromised gastric outlet diameter.[30] Diagnosis of gastrojejunal ulcers using invasive diagnostic procedures such as endoscopy enable stratification of ulcer severity in the context of presenting symptoms, which can guide medical vs. endoscopic vs. operative management, resulting in potentially decreased morbidity and mortality by minimizing the use of surgical intervention.

Age and Mortality

Our study found that in the adult cohort, age was associated with increased odds of mortality in patients that underwent operation. Furthermore, the rate of overall mortality from GJ ulcer in the elderly group was almost four times that of the adult group (1.9% vs. 0.5%, Table 2). Much of the current literature indicates that older age is associated with an increased risk of mortality, which supports our finding.[31–36] Christensen et. al found that in patients with perforated or bleeding peptic ulcers, increased age was associated with mortality independent of comorbidities.[37] Ciftci and Erozgen identified that age older than 60 was an independent risk factor for mortality in patients with perforated peptic ulcer with a significant odds ratio of 5.99.[38] Furthermore, a retrospective analysis performed by Goudar et al. found that patient age greater than 50 years old was associated with increased risk of morbidity and mortality in patients with perforated peptic ulcers.[39]

In addition to surgery causing a general increase in mortality, potential causes of this age-mortality relationship could be related to the preceding factors that initiated the ulcers in the first place, such as smoking. Smoking is a known cause of marginal ulcers, as noted in a retrospective study on gastrojejunal anastomosis complications by Fringeli and colleagues, where 75% of patients who developed marginal ulcers were smokers.[40] Ross et al. studied causes of mortality in patients who had peptic-ulcer surgery, and found that, of the patients who had surgery, 80% of were smokers, and much of the mortality seen in the group was due to smoking-associated disease rather than direct surgical causes.[41] As a result, the age-mortality association with operation may be due to not only the surgical causes of increased mortality with age, but also may be due to concurrent complications of marginal ulcer risk factors such as smoking. The literature demonstrates that patients in our adult cohort who required operation are susceptible to the association of age and mortality following operation.

HLOS

Our study found that increased HLOS was associated with increased mortality in both the adult and elderly groups, although this was not significant in our regression model (Table 2). Increased HLOS is known in the literature to be associated with increased mortality. For example, Lingsma et. al demonstrated that in a study of over four million admissions, patients in the upper quartile of HLOS were found to have a higher odds ratio of mortality of 1.45 (OR=95%, 1.43-1.47) compared to those in the lowest quartile.[42] In addition, many NIS studies have demonstrated HLOS as a significant risk factor for mortality in patients requiring emergent admission for other surgical conditions including hemorrhoids, duodenal ulcers, ventral hernias.[43–51] Although not significant in our regression model, HLOS continues to be

an important quantitative measure that has an impact on patient outcomes.

Strengths and Limitations

The primary strength of this study is its use of a national inpatient database utilizing a large patient sample across a large spectrum of hospital settings, geographies, and patient demographics. This large, diverse sample size increases the strength of our analysis and findings. A weakness of this retrospective study is that we are unable to delve deeper into the exact timelines and causes of mortality of patients in our cohorts that would enable pinpointing precise variables that could have contributed to mortality on a case-by-case basis. Some considerations include providing information on the types of surgeries performed to delineate specific risk factors associated with a specific surgical procedure. Additionally, we could consider specific HLOS timelines, such as 2 days HLOS vs. 10 days HLOS and their associated risk for mortality. Future studies could consider looking into these specific variables that may contribute to mortality.

Conclusion

Our study found that in patients with a primary diagnosis of chronic gastrojejunal ulcer who were admitted emergently and underwent operation, increased time to operation was associated with mortality in both adult and elderly patients, and age, as well as an increased modified frailty index score, was associated with increased mortality in adult patients. In patients who did not undergo operation, invasive diagnostic procedures were found to be a protective factor in reducing mortality in the elderly. Early stratification of ulcer severity using invasive diagnostic procedures such as endoscopy and taking operative patients to the operating room without delay are essential in reducing mortality and improving outcomes in patients with chronic gastrojejunal ulcers.

Table 1. Characteristics of emergency admitted patients with the primary diagnosis of chronic gastrojejunal ulcer. Data was stratified according to **sex categories**, NIS 2005-2014.

		Adult, N (%)			Elderly, N (%)		
		N=6,005			N=2,520		
		Male	Female	p	Male	Female	p
All Cases		2,279 (38.0%)	3,726 (62.0%)		1,394 (55.3%)	1,126 (44.7%)	
Race	**White**	1,536 (78.5%)	2,647 (81.1%)	**<0.001**	989 (81.8%)	811 (83.4%)	**0.008**
	Black	172 (8.8%)	344 (10.5%)		72 (6.0%)	80 (8.2%)	
	Hispanic	142 (7.3%)	174 (5.3%)		64 (5.3%)	42 (4.3%)	
	Asian/Pacific Islander	43 (2.2%)	19 (0.6%)		49 (4.1%)	24 (2.5%)	
	Native American	8 (0.4%)	10 (0.3%)		5 (0.4%)	5 (0.5%)	
	Other	56 (2.9%)	69 (2.1%)		30 (2.5%)	10 (1.0%)	
Income Quartile	**Quartile 1**	478 (21.3%)	899 (24.6%)	**<0.001**	301 (22.0%)	268 (24.2%)	0.5
	Quartile 2	589 (26.3%)	1,023 (27.9%)		342 (25.0%)	274 (24.7%)	
	Quartile 3	631 (28.1%)	1,019 (27.8%)		363 (26.6%)	293 (26.4%)	
	Quartile 4	545 (24.3%)	720 (19.7%)		361 (26.4%)	274 (24.7%)	
Insurance	**Private Insurance**	1,325 (58.4%)	1,991 (53.6%)	**<0.001**	128 (9.2%)	87 (7.7%)	0.4
	Medicare	475 (20.9%)	709 (19.1%)		1,232 (88.4%)	1,020 (90.7%)	
	Medicaid	198 (8.7%)	564 (15.2%)		12 (0.9%)	9 (0.8%)	
	Self-Pay	165 (7.3%)	271 (7.3%)		6 (0.4%)	2 (0.2%)	
	No Charge	16 (0.7%)	30 (0.8%)		2 (0.1%)	1 (0.1%)	
	Other	91 (4.0%)	153 (4.1%)		14 (1.0%)	6 (0.5%)	

Hospital Location	Rural	155 (6.8%)	291 (7.8%)	0.070	140 (10.0%)	100 (8.9%)	0.3
	Urban: Non-Teaching	955 (41.9%)	1,630 (43.7%)		587 (42.1%)	502 (44.6%)	
	Urban: Teaching	1,169 (51.3%)	1,805 (48.4%)		667 (47.8%)	524 (46.5%)	
Comorbidities	AIDS	2 (0.1%)	2 (0.1%)	0.6	0 (0%)	0 (0%)	
	Alcohol Abuse	285 (12.5%)	269 (7.2%)	**<0.001**	93 (6.7%)	26 (2.3%)	**<0.001**
	Deficiency Anemias	369 (16.2%)	760 (20.4%)	**<0.001**	240 (17.2%)	213 (18.9%)	0.2
	Rheumatoid Arthritis	26 (1.1%)	124 (3.3%)	**<0.001**	33 (2.4%)	53 (4.7%)	**0.001**
	Chronic Blood Loss	364 (16.0%)	632 (17.0%)	0.3	294 (21.1%)	224 (19.9%)	0.4
	Congestive Heart Failure	137 (6.0%)	104 (2.8%)	**<0.001**	205 (14.7%)	177 (15.7%)	0.4
	Chronic Pulmonary Disease	240 (10.5%)	566 (15.2%)	**<0.001**	263 (18.9%)	249 (22.1%)	**0.044**
	Coagulopathy	141 (6.2%)	169 (4.5%)	**0.005**	98 (7.0%)	93 (8.3%)	0.2
	Depression	319 (14.0%)	924 (24.8%)	**<0.001**	100 (7.2%)	171 (15.2%)	**<0.001**
	Diabetes, Uncomplicated	491 (21.5%)	536 (14.4%)	**<0.001**	345 (24.7%)	258 (22.9%)	0.2
	Diabetes, Chronic Complications	76 (3.3%)	80 (2.1%)	**0.005**	63 (4.5%)	41 (3.6%)	0.2
	Drug Abuse	107 (4.7%)	187 (5.0%)	0.5	7 (0.5%)	8 (0.7%)	0.5
	Hypertension	1,086 (47.7%)	1,374 (36.9%)	**<0.001**	924 (66.3%)	781 (69.4%)	0.1
	Hypothyroidism	124 (5.4%)	480 (12.9%)	**<0.001**	131 (9.4%)	231 (20.5%)	**<0.001**
	Liver Disease	130 (5.7%)	175 (4.7%)	0.080	44 (3.2%)	38 (3.4%)	0.7
	Lymphoma	8 (0.4%)	4 (0.1%)	**0.040**	17 (1.2%)	2 (0.2%)	**0.002**
	Fluid/Electrolyte Disorders	480 (21.1%)	881 (23.6%)	**0.020**	382 (27.4%)	352 (31.3%)	**0.034**
	Metastatic Cancer	55 (2.4%)	41 (1.1%)	**<0.001**	64 (4.6%)	31 (2.8%)	**0.016**
	Other Neurological Disorders	91 (4.0%)	271 (7.3%)	**<0.001**	84 (6.0%)	94 (8.3%)	**0.024**
	Obesity	498 (21.9%)	739 (19.8%)	0.060	90 (6.5%)	103 (9.1%)	**0.012**
	Paralysis	19 (0.8%)	18 (0.5%)	0.090	13 (0.9%)	15 (1.3%)	0.3
	Peripheral Vascular Disorders	94 (4.1%)	66 (1.8%)	**<0.001**	135 (9.7%)	68 (6.0%)	**<0.001**
	Psychoses	102 (4.5%)	337 (9.0%)	**<0.001**	27 (1.9%)	41 (3.6%)	**0.009**
	Pulmonary Circulation Disorders	30 (1.3%)	29 (0.8%)	**0.040**	32 (2.3%)	52 (4.6%)	**0.001**
	Renal Failure	143 (6.3%)	138 (3.7%)	**<0.001**	281 (20.2%)	149 (13.2%)	**<0.001**
	Solid Tumor	37 (1.6%)	32 (0.9%)	**0.007**	74 (5.3%)	37 (3.3%)	**0.014**
	Peptic Ulcer	0 (0%)	1 (0.0%)	0.9	0 (0%)	0 (0%)	
	Valvular Disease	56 (2.5%)	86 (2.3%)	0.7	121 (8.7%)	113 (10.0%)	0.2
	Weight Loss	142 (6.2%)	326 (8.7%)	**<0.001**	118 (8.5%)	113 (10.0%)	0.1
Gastric Ulcer	With Hemorrhage	2,036 (89.3%)	3,014 (80.9%)	**<0.001**	1,322 (94.8%)	1,039 (92.3%)	**0.029**
	With Perforation	222 (9.7%)	680 (18.3%)		65 (4.7%)	80 (7.1%)	
	With Hem and Perf	21 (0.9%)	32 (0.9%)		7 (0.5%)	7 (0.6%)	
Other Factors	Invasive Diagnostic Procedure	1,475 (64.7%)	2,326 (62.4%)	0.070	940 (67.4%)	764 (67.9%)	0.8
	Surgical Procedure	1,191 (52.3%)	1,866 (50.1%)	0.1	746 (53.5%)	515 (45.7%)	**<0.001**
	Invasive or Surgical Procedure	2,186 (95.9%)	3,520 (94.5%)	**0.012**	1,338 (96.0%)	1,057 (93.9%)	**0.015**
	Deceased	16 (0.7%)	17 (0.5%)	0.2	30 (2.2%)	17 (1.5%)	0.2
		Mean (SD)	**Mean (SD)**	**P**	**Mean (SD)**	**Mean (SD)**	**P**
	Age, Years	49.22 (10.48)	47.00 (10.63)	**<0.001**	75.46 (7.43)	74.87 (7.77)	0.054

Other Factors	**Modified Frailty Index Score**	1.10 (1.04)	0.88 (0.97)	**<0.001**	1.67 (1.04)	1.66 (1.09)	0.7
	Time to Invasive Diagnostic Procedure, Days	1.08 (1.30)	1.17 (1.43)	0.070	1.45 (1.75)	1.48 (1.67)	0.7
	Time to Surgical Procedure, Days	0.97 (1.50)	0.86 (1.86)	0.1	1.49 (3.48)	1.41 (2.38)	0.6
	Hospital Length of Stay, Days	4.49 (5.00)	4.74 (4.81)	0.060	5.32 (5.83)	5.36 (4.75)	0.8
	Total Charges, Dollars	36,828 (54,274)	38,717 (56,146)	0.2	42,542 (65,875)	39,857 (45,585)	0.2

Table 2. Characteristics of emergency admitted patients with the primary diagnosis of chronic gastrojejunal ulcer. Data was classified according to **outcome categories**, NIS 2005-2014.

		Adult, N (%)			Elderly, N (%)		
		N=6,002			N=2,521		
		Survived	Deceased	p	Survived	Deceased	p
All Cases		5,969 (99.5%)	33 (0.5%)		2,474 (98.1%)	47 (1.9%)	
Sex, Female		3,706 (62.1%)	17 (51.5%)	0.2	1,109 (44.8%)	17 (36.2%)	0.2
Race	**White**	4,154 (80.1%)	26 (83.9%)	0.8	1,767 (82.6%)	34 (81.0%)	0.3
	Black	514 (9.9%)	2 (6.5%)		150 (7.0%)	2 (4.8%)	
	Hispanic	315 (6.1%)	1 (3.2%)		101 (4.7%)	5 (11.9%)	
	Asian/Pacific Islander	61 (1.2%)	1 (3.2%)		72 (3.4%)	1 (2.4%)	
	Native American	18 (0.3%)	0 (0%)		10 (0.5%)	0 (0%)	
	Other	124 (2.4%)	1 (3.2%)		40 (1.9%)	0 (0%)	
Income Quartile	**Quartile 1**	1,364 (23.2%)	11 (34.4%)	0.5	555 (22.8%)	14 (29.8%)	0.3
	Quartile 2	1,604 (27.3%)	8 (25.0%)		608 (25.0%)	8 (17.0%)	
	Quartile 3	1,642 (28.0%)	8 (25.0%)		642 (26.4%)	15 (31.9%)	
	Quartile 4	1,260 (21.5%)	5 (15.6%)		625 (25.7%)	10 (21.3%)	
Insurance	**Private Insurance**	3,303 (55.5%)	10 (30.3%)	**0.048**	214 (8.7%)	1 (2.1%)	0.5
	Medicare	1,171 (19.7%)	11 (33.3%)		2,208 (89.3%)	45 (95.7%)	
	Medicaid	755 (12.7%)	7 (21.2%)		20 (0.8%)	1 (2.1%)	
	Self-Pay	435 (7.3%)	3 (9.1%)		8 (0.3%)	0 (0%)	
	No Charge	45 (0.8%)	1 (3.0%)		3 (0.1%)	0 (0%)	
	Other	243 (4.1%)	1 (3.0%)		20 (0.8%)	0 (0%)	
Hospital Location	**Rural**	442 (7.4%)	4 (12.1%)	0.3	234 (9.5%)	6 (12.8%)	0.6
	Urban: Non-Teaching	2,573 (43.1%)	11 (33.3%)		1,068 (43.2%)	21 (44.7%)	
	Urban: Teaching	2,954 (49.5%)	18 (54.5%)		1,172 (47.4%)	20 (42.6%)	
Comorbidities	**AIDS**	4 (0.1%)	0 (0%)	0.9	0 (0%)	0 (0%)	
	Alcohol Abuse	549 (9.2%)	4 (12.1%)	0.5	117 (4.7%)	2 (4.3%)	0.9
	Deficiency Anemias	1,121 (18.8%)	8 (24.2%)	0.4	451 (18.2%)	2 (4.3%)	**0.011**
	Rheumatoid Arthritis	149 (2.5%)	1 (3.0%)	0.5	84 (3.4%)	2 (4.3%)	0.6
	Chronic Blood Loss	992 (16.6%)	4 (12.1%)	0.6	512 (20.7%)	6 (12.8%)	0.1

	Congestive Heart Failure	235 (3.9%)	5 (15.2%)	**0.001**	365 (14.8%)	17 (36.2%)	**<0.001**
	Chronic Pulmonary Disease	799 (13.4%)	6 (18.2%)	0.4	501 (20.3%)	11 (23.4%)	0.5
	Coagulopathy	300 (5.0%)	10 (30.3%)	**<0.001**	182 (7.4%)	9 (19.1%)	**0.002**
	Depression	1,239 (20.8%)	2 (6.1%)	**0.049**	267 (10.8%)	4 (8.5%)	0.8
	Diabetes, Uncomplicated	1,024 (17.2%)	3 (9.1%)	0.3	594 (24.0%)	9 (19.1%)	0.4
	Diabetes, Chronic Complications	150 (2.5%)	4 (12.1%)	**0.010**	102 (4.1%)	2 (4.3%)	0.7
	Drug Abuse	292 (4.9%)	1 (3.0%)	0.9	14 (0.6%)	1 (2.1%)	0.2
	Hypertension	2,444 (40.9%)	13 (39.4%)	0.8	1,685 (68.1%)	21 (44.7%)	**<0.001**
	Hypothyroidism	599 (10.0%)	3 (9.1%)	0.9	359 (14.5%)	3 (6.4%)	0.1
	Liver Disease	297 (5.0%)	8 (24.2%)	**<0.001**	78 (3.2%)	4 (8.5%)	0.060
	Lymphoma	12 (0.2%)	0 (0%)	0.9	18 (0.7%)	1 (2.1%)	0.3
Comorbidities	**Fluid/Electrolyte Disorders**	1,342 (22.5%)	18 (54.5%)	**<0.001**	707 (28.6%)	27 (57.4%)	**<0.001**
	Metastatic Cancer	92 (1.5%)	4 (12.1%)	**0.002**	89 (3.6%)	7 (14.9%)	**<0.001**
	Other Neurological Disorders	358 (6.0%)	4 (12.1%)	0.1	177 (7.2%)	1 (2.1%)	0.2
	Obesity	1,233 (20.7%)	3 (9.1%)	0.1	189 (7.6%)	4 (8.5%)	0.7
	Paralysis	35 (0.6%)	1 (3.0%)	0.1	27 (1.1%)	1 (2.1%)	0.4
	Peripheral Vascular Disorders	157 (2.6%)	3 (9.1%)	0.060	197 (8.0%)	7 (14.9%)	0.080
	Psychoses	431 (7.2%)	6 (18.2%)	**0.016**	67 (2.7%)	1 (2.1%)	0.9
	Pulmonary Circulation Disorders	59 (1.0%)	0 (0%)	0.9	80 (3.2%)	4 (8.5%)	0.070
	Renal Failure	274 (4.6%)	7 (21.2%)	**<0.001**	420 (17.0%)	10 (21.3%)	0.4
	Solid Tumor	67 (1.1%)	2 (6.1%)	0.060	107 (4.3%)	4 (8.5%)	0.1
	Peptic Ulcer	1 (0.0%)	0 (0%)	0.9	0 (0%)	0 (0%)	
	Valvular Disease	141 (2.4%)	1 (3.0%)	0.5	232 (9.4%)	2 (4.3%)	0.3
	Weight Loss	457 (7.7%)	10 (30.3%)	**<0.001**	221 (8.9%)	10 (21.3%)	**0.004**
Gastric Ulcer	**With Hemorrhage**	5,021 (84.1%)	24 (72.7%)	0.1	2,327 (94.1%)	35 (74.5%)	**<0.001**
	With Perforation	896 (15.0%)	8 (24.2%)		134 (5.4%)	11 (23.4%)	
	With Hem and Perf	52 (0.9%)	1 (3.0%)		13 (0.5%)	1 (2.1%)	
Other Factors	**Invasive Diagnostic Procedure**	3,781 (63.3%)	18 (54.5%)	0.3	1,679 (67.9%)	25 (53.2%)	**0.033**
	Surgical Procedure	3,030 (50.8%)	25 (75.8%)	**0.004**	1,225 (49.5%)	36 (76.6%)	**<0.001**
	Invasive or Surgical Procedure	5,672 (95.0%)	31 (93.9%)	0.6	2,352 (95.1%)	43 (91.5%)	0.2
		Mean (SD)	**Mean (SD)**	**P**	**Mean (SD)**	**Mean (SD)**	**P**
	Age, Years	47.80 (10.63)	53.64 (9.29)	**0.002**	75.17 (7.60)	76.37 (6.96)	0.2
	Modified Frailty Index Score	0.96 (1.00)	1.64 (1.03)	**<0.001**	1.66 (1.06)	1.85 (1.10)	0.2
	Time to Invasive Diagnostic Procedure, Days	1.12 (1.33)	3.41 (5.14)	0.080	1.45 (1.70)	2.19 (2.36)	0.1
	Time to Surgical Procedure, Days	0.88 (1.60)	3.46 (6.88)	0.080	1.41 (3.01)	2.85 (4.51)	0.080
	Hospital Length of Stay, Days	4.59 (4.64)	13.64 (19.61)	**0.012**	5.20 (5.02)	12.30 (13.24)	**<0.001**
	Total Charges, Dollars	37,130 (49,531)	192,606 (303,284)	**0.006**	39,830 (54,141)	121,137 (135,427)	**<0.001**

Table 3. Characteristics of emergency admitted patients with the primary diagnosis of chronic gastrojejunal ulcer. Data was stratified according to **Operation status,** NIS 2005-2014.

		Adult, N (%)			Elderly, N (%)		
		N=6,007			N=2,521		
		No Operation	Operation	p	No Operation	Operation	p
All Cases		2,949 (49.1%)	3,058 (50.9%)		1,260 (50.0%)	1,261 (50.0%)	
Sex, Female		1,860 (63.1%)	1,866 (61.0%)	0.1	611 (48.5%)	515 (40.8%)	**<0.001**
Race	**White**	2,028 (79.5%)	2,155 (80.8%)	0.1	893 (82.9%)	908 (82.2%)	0.7
	Black	264 (10.3%)	252 (9.4%)		75 (7.0%)	77 (7.0%)	
	Hispanic	161 (6.3%)	155 (5.8%)		49 (4.5%)	57 (5.2%)	
	Asian/Pacific Islander	23 (0.9%)	39 (1.5%)		35 (3.2%)	38 (3.4%)	
	Native American	12 (0.5%)	6 (0.2%)		7 (0.6%)	3 (0.3%)	
	Other	64 (2.5%)	61 (2.3%)		18 (1.7%)	22 (2.0%)	
Income Quartile	**Quartile 1**	683 (23.6%)	694 (23.0%)	0.3	295 (23.7%)	274 (22.3%)	0.5
	Quartile 2	781 (27.0%)	831 (27.6%)		295 (23.7%)	321 (26.1%)	
	Quartile 3	786 (27.2%)	866 (28.8%)		332 (26.6%)	325 (26.4%)	
	Quartile 4	644 (22.3%)	621 (20.6%)		325 (26.1%)	310 (25.2%)	
Insurance	**Private Insurance**	1,550 (52.7%)	1,766 (57.9%)	**0.005**	113 (9.0%)	102 (8.1%)	0.060
	Medicare	616 (20.9%)	568 (18.6%)		1,113 (88.3%)	1,140 (90.5%)	
	Medicaid	401 (13.6%)	361 (11.8%)		13 (1.0%)	8 (0.6%)	
	Self-Pay	224 (7.6%)	214 (7.0%)		3 (0.2%)	5 (0.4%)	
	No Charge	24 (0.8%)	22 (0.7%)		3 (0.2%)	0 (0%)	
	Other	127 (4.3%)	117 (3.8%)		15 (1.2%)	5 (0.4%)	
Hospital Location	**Rural**	238 (8.1%)	208 (6.8%)	0.1	132 (10.5%)	108 (8.6%)	0.2
	Urban: Non-Teaching	1,250 (42.4%)	1,337 (43.7%)		533 (42.3%)	556 (44.1%)	
	Urban: Teaching	1,461 (49.5%)	1,513 (49.5%)		595 (47.2%)	597 (47.3%)	
Comorbidities	**AIDS**	3 (0.1%)	1 (0.0%)	0.3	0 (0%)	0 (0%)	
	Alcohol Abuse	295 (10.0%)	259 (8.5%)	**0.040**	61 (4.8%)	58 (4.6%)	0.7
	Deficiency Anemias	606 (20.5%)	523 (17.1%)	**<0.001**	237 (18.8%)	216 (17.1%)	0.2
	Rheumatoid Arthritis	72 (2.4%)	78 (2.6%)	0.7	36 (2.9%)	50 (4.0%)	0.1
	Chronic Blood Loss	597 (20.2%)	399 (13.0%)	**<0.001**	283 (22.5%)	235 (18.6%)	**0.017**
	Congestive Heart Failure	114 (3.9%)	127 (4.2%)	0.5	187 (14.8%)	195 (15.5%)	0.6
	Chronic Pulmonary Disease	401 (13.6%)	405 (13.2%)	0.6	273 (21.7%)	239 (19.0%)	0.090
	Coagulopathy	138 (4.7%)	172 (5.6%)	0.1	74 (5.9%)	117 (9.3%)	**0.001**
	Depression	608 (20.6%)	635 (20.8%)	0.8	140 (11.1%)	131 (10.4%)	0.5
	Diabetes, Uncomplicated	493 (16.7%)	534 (17.5%)	0.4	291 (23.1%)	312 (24.7%)	0.3
	Diabetes, Chronic Complications	86 (2.9%)	70 (2.3%)	0.1	57 (4.5%)	47 (3.7%)	0.3
	Drug Abuse	158 (5.4%)	136 (4.4%)	0.1	7 (0.6%)	8 (0.6%)	0.8
	Hypertension	1,188 (40.3%)	1,272 (41.6%)	0.3	863 (68.5%)	843 (66.9%)	0.3
	Hypothyroidism	296 (10.0%)	308 (10.1%)	0.9	176 (14.0%)	186 (14.8%)	0.5
	Liver Disease	151 (5.1%)	154 (5.0%)	0.8	40 (3.2%)	42 (3.3%)	0.8
	Lymphoma	5 (0.2%)	7 (0.2%)	0.6	7 (0.6%)	12 (1.0%)	0.2
	Fluid/Electrolyte Disorders	626 (21.2%)	735 (24.0%)	**0.009**	351 (27.9%)	383 (30.4%)	0.1

Comorbidities	Metastatic Cancer	47 (1.6%)	49 (1.6%)	0.9	49 (3.9%)	47 (3.7%)	0.8
	Other Neurological Disorders	208 (7.1%)	154 (5.0%)	**0.001**	105 (8.3%)	73 (5.8%)	**0.013**
	Obesity	589 (20.0%)	648 (21.2%)	0.2	91 (7.2%)	102 (8.1%)	0.4
	Paralysis	22 (0.7%)	15 (0.5%)	0.2	18 (1.4%)	10 (0.8%)	0.1
	Peripheral Vascular Disorders	87 (3.0%)	73 (2.4%)	0.1	95 (7.5%)	109 (8.6%)	0.3
	Psychoses	231 (7.8%)	208 (6.8%)	0.1	37 (2.9%)	31 (2.5%)	0.4
	Pulmonary Circulation Disorders	31 (1.1%)	28 (0.9%)	0.5	36 (2.9%)	48 (3.8%)	0.1
	Renal Failure	135 (4.6%)	146 (4.8%)	0.7	205 (16.3%)	225 (17.8%)	0.2
	Solid Tumor	29 (1.0%)	40 (1.3%)	0.2	60 (4.8%)	51 (4.0%)	0.3
	Peptic Ulcer	0 (0%)	1 (0.0%)	0.9	0 (0%)	0 (0%)	
	Valvular Disease	70 (2.4%)	72 (2.4%)	0.9	110 (8.7%)	124 (9.8%)	0.3
	Weight Loss	197 (6.7%)	271 (8.9%)	**0.002**	93 (7.4%)	138 (10.9%)	**0.002**
Gastric Ulcer	With Hemorrhage	2,843 (96.4%)	2,207 (72.2%)	**<0.001**	1,241 (98.5%)	1,121 (88.9%)	**<0.001**
	With Perforation	85 (2.9%)	819 (26.8%)		15 (1.2%)	130 (10.3%)	
	With Hem and Perf	21 (0.7%)	32 (1.0%)		4 (0.3%)	10 (0.8%)	
Other Factors	Invasive Diagnostic Procedure	2,650 (89.9%)	1,152 (37.7%)	**<0.001**	1,134 (90.0%)	570 (45.2%)	**<0.001**
	Deceased	8 (0.3%)	25 (0.8%)	**0.004**	11 (0.9%)	36 (2.9%)	**<0.001**
		Mean (SD)	Mean (SD)	P	Mean (SD)	Mean (SD)	P
	Age, Years	47.84 (10.68)	47.84 (10.59)	0.9	75.06 (7.67)	75.33 (7.51)	0.3
	Modified Frailty Index Score	0.95 (1.00)	0.98 (1.01)	0.1	1.67 (1.04)	1.67 (1.08)	0.9
	Time to Invasive Diagnostic Procedure, Days	1.06 (1.10)	1.30 (1.89)	**<0.001**	1.28 (1.22)	1.84 (2.40)	**<0.001**
	Hospital Length of Stay, Days	3.58 (3.04)	5.67 (5.99)	**<0.001**	4.16 (3.04)	6.52 (6.76)	**<0.001**
	Total Charges, Dollars	25,900	49,586	**<0.001**	28,737	53,924	**<0.001**
		(26,828)	(71,101)		(28,954)	(74,195)	

Table 4. Backward logistic regression analysis to evaluate the **associations between mortality and different factors** in emergency admitted patients with the primary diagnosis of chronic gastrojejunal ulcer and **undergoing an operation**. Mortality was the dependent variable. NIS 2005-2014.

	Adult Operation		Elderly Operation	
	N=2,767	p	N=1,144	p
	OR (95% CI)		OR (95% CI)	
Time to Operation, Days	1.195 (1.102, 1.295)	<0.001	1.060 (1.004, 1.119)	0.035
Modified Frailty Index Score	1.564 (1.074, 2.279)	0.020	Removed Via Backward Elimination	
Age, Years	1.054 (1.002, 1.109)	0.041		
Sex, Female	Removed Via Backward Elimination			
Invasive Diagnostic Procedure				
Type of Gastrojejunal Ulcer				
Race				
Income Quartile				
Insurance				
Hospital Location				

Table 5. Backward logistic regression analysis to evaluate the **associations between mortality and different factors** in emergency admitted patients with the primary diagnosis of chronic gastrojejunal ulcer and **not undergoing an operation**. Mortality was the dependent variable. NIS 2005-2014.

	Adult Non-Operation		Elderly Non-Operation	
	N=2,947	p	N=1,260	p
	OR (95% CI)		OR (95% CI)	
Invasive Diagnostic Procedure	0.295 (0.059, 1.476)	0.1	0.189 (0.055, 0.656)	**0.009**
Age, Years	1.077 (0.989, 1.172)	0.090	**Removed Via Backward Elimination**	
Modified Frailty Index Score	**Removed Via Backward Elimination**			
Type of Gastrojejunal Ulcer				
Hospital Length of Stay, Days				
Sex, Female				
Race				
Income Quartile				
Insurance				
Hospital Location				

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References

1. Ellis K. Gastrojejunal Ulcer. *Radiology*. 1958;71(2):187-196. doi:10.1148/71.2.187

2. Boules M, Chang J, Haskins IN, et al. Endoscopic management of post-bariatric surgery complications. *World J Gastrointest Endosc*. 2016;8(17):591-599. doi:10.4253/wjge.v8.i17.591

3. Azagury DE, Abu Dayyeh BK, Greenwalt IT, Thompson CC. Marginal ulceration after Roux-en-Y gastric bypass surgery: characteristics, risk factors, treatment, and outcomes. *Endoscopy*. 2011;43(11):950-954. doi:10.1055/s-0030-1256951

4. Jordan JH, Hocking MP, Rout WR, Woodward ER. Marginal ulcer following gastric bypass for morbid obesity. *Am Surg*. 1991;57(5):286-288.

5. Bhayani NH, Oyetunji TA, Chang DC, Cornwell EE, Ortega G, Fullum TM. Predictors of marginal ulcers after laparoscopic Roux-en-Y gastric bypass. *J Surg Res*. 2012;177(2):224-227. doi:10.1016/j.jss.2012.06.003

6. Schreiner MA, Fennerty MB. Endoscopy in the obese patient. *Gastroenterol Clin North Am*. 2010;39(1):87-97. doi:10.1016/j.gtc.2009.12.009

7. Rasmussen JJ, Fuller W, Ali MR. Marginal ulceration after laparoscopic gastric bypass: an analysis of predisposing factors in 260 patients. *Surg Endosc*. 2007;21(7):1090-1094. doi:10.1007/s00464-007-9285-x

8. Steinemann DC, Bueter M, Schiesser M, Amygdalos I, Clavien PA, Nocito A. Management of anastomotic ulcers after Roux-en-Y gastric bypass: results of an international survey. *Obes Surg*. 2014;24(5):741-746. doi:10.1007/s11695-013-1152-3

9. Ardila-Gatas J, Pryor A. Endoscopic approach for the treatment of bariatric surgery complications. *Mini-Invasive Surg*. 2020;2020. doi:10.20517/2574-1225.2019.69

10. Levy L, Smiley A, Latifi R. Mortality in Emergently Admitted Patients with Empyema: An Analysis of 18,033 Patients. *Kos J Surg*. Published online December 2021.

11. Levy L, Smiley A, Latifi R. Independent Predictors of In-Hospital Mortality in Patients Undergoing Emergency Admission for Arterial embolism and Thrombosis in the USA: A 10-Year National Dataset. *Kos J Surg*. Published online December 2021.

12. Idris M, Smiley A, Patel S, Latifi R. Risk Factors for Mortality in Emergently Admitted Patients with Acute Gastric Ulcer: An Analysis of 15,538 Patients in National Inpatient Sample, 2005-2014. *Int J Environ Res Public Health*. 2022;19(23):16263. doi:10.3390/ijerph192316263

13. Elgar G, Smiley P, Smiley A, Feingold C, Latifi R. Age Increases the Risk of Mortality by Four-Fold in Patients with Emergent Paralytic Ileus: Hospital Length of Stay, Sex, Frailty, and Time to Operation as Other Risk Factors. *Int J Environ Res Public Health*. 2022;19(16):9905. doi:10.3390/ijerph19169905

14. Levy L, Smiley A, Latifi R. Adult and Elderly Risk Factors of Mortality in 23,614 Emergently Admitted Patients with Rectal or Rectosigmoid Junction Malignancy. *Int J Environ Res Public Health*. 2022;19(15):9203. doi:10.3390/ijerph19159203

15. McGillicuddy EA, Schuster KM, Davis KA, Longo WE. Factors predicting morbidity and mortality in emergency colorectal procedures in elderly patients. *Arch Surg Chic Ill 1960*. 2009;144(12):1157-1162. doi:10.1001/archsurg.2009.203

16. Meschino MT, Giles AE, Rice TJ, et al. Operative timing is associated with increased morbidity and mortality in patients undergoing emergency general surgery: a multisite study of emergency general services in a single academic network. *Can J Surg J Can Chir*. 2020;63(4):E321-E328. doi:10.1503/cjs.012919

17. McIsaac DI, Abdulla K, Yang H, et al. Association of delay of urgent or emergency surgery with mortality and use of health care resources: a propensity score-matched observational cohort study. *CMAJ Can Med Assoc J J Assoc Medicale Can*. 2017;189(27):E905-E912. doi:10.1503/cmaj.160576

18. Buck DL, Vester-Andersen M, Møller MH, Danish Clinical Register of Emergency Surgery. Surgical delay is a critical determinant of survival in perforated peptic ulcer. *Br J Surg*. 2013;100(8):1045-1049. doi:10.1002/bjs.9175

19. Surapaneni S, S R, Reddy A VB. The Perforation-Operation time Interval; An Important Mortality Indicator in Peptic Ulcer Perforation. *J Clin Diagn Res JCDR*. 2013;7(5):880-882. doi:10.7860/JCDR/2013/4925.2965

20. Lunevicius R, Morkevicius M. Risk factors influencing the early outcome results after laparoscopic repair of perforated duodenal ulcer and their predictive value. *Langenbecks Arch Surg*. 2005;390(5):413-420. doi:10.1007/s00423-005-0569-0

21. Noguiera C, Silva AS, Santos JN, et al. Perforated peptic ulcer: main factors of morbidity and mortality. *World J Surg*. 2003;27(7):782-787. doi:10.1007/s00268-003-6645-0

22. Barbosa RR, Rowell SE, Fox EE, et al. Increasing time to operation is associated with decreased survival in patients with a positive FAST examination requiring emergent laparotomy. *J Trauma Acute Care Surg*. 2013;75(1 Suppl 1):S48-52. doi:10.1097/TA.0b013e31828fa54e

23. Turrentine FE, Wang H, Simpson VB, Jones RS. Surgical risk factors, morbidity, and mortality in elderly patients. *J Am Coll Surg*. 2006;203(6):865-877. doi:10.1016/j.jamcollsurg.2006.08.026

24. Malik TF, Gnanapandithan K, Singh K. Peptic Ulcer Disease. In: *StatPearls*. StatPearls Publishing; 2022. Accessed February 21, 2022. http://www.ncbi.nlm.nih.gov/books/NBK534792/

25. Di Palma A, Liu B, Maeda A, Anvari M, Jackson T, Okrainec A. Marginal ulceration following Roux-en-Y gastric bypass: risk factors for ulcer development, recurrence and need for revisional surgery. *Surg Endosc*. 2021;35(5):2347-2353. doi:10.1007/s00464-020-07650-0

26. Laine L, McQuaid KR. Endoscopic therapy for bleeding ulcers: an evidence-based approach based on meta-analyses of randomized controlled trials. *Clin Gastroenterol Hepatol Off Clin Pract J Am Gastroenterol Assoc*. 2009;7(1):33-47; quiz 1-2. doi:10.1016/j.cgh.2008.08.016

27. Lau JYW, Sung JJY, Lam Y hoi, et al. Endoscopic Retreatment Compared with Surgery in Patients with Recurrent Bleeding after Initial Endoscopic Control of Bleeding Ulcers. *N Engl J Med*. 1999;340(10):751-756. doi:10.1056/NEJM199903113401002

28. Jirapinyo P, Watson RR, Thompson CC. Use of a novel endoscopic suturing device to treat recalcitrant marginal ulceration (with video). *Gastrointest Endosc*. 2012;76(2):435-439. doi:10.1016/j.gie.2012.03.681

29. Barola S, Magnuson T, Schweitzer M, et al. Endoscopic Suturing for Massively Bleeding Marginal Ulcer 10 days Post Roux-en-Y Gastric Bypass. *Obes Surg*. 2017;27(5):1394-1396. doi:10.1007/s11695-017-2621-x

30. Barola S, Fayad L, Hill C, et al. Endoscopic Management of Recalcitrant Marginal Ulcers by Covering the Ulcer Bed. *Obes Surg*. 2018;28(8):2252-2260. doi:10.1007/s11695-018-3162-7

31. Nath H, Smiley A, Latifi R. Nonlinear Association of Hospital Length of Stay and In-hospital Mortality of Elderly Patients Admitted Emergently for Colon Cancer: Analysis of 40,421 Patients. *J Am Coll Surg*. Published online November 2021. doi:10.1016/j.jamcollsurg.2021.08.086

32. Levy L, Smiley A, Latifi R. Mortality Risk Factors in Patients Admitted with the Primary Diagnosis of Tracheostomy

Complications: An Analysis of 8026 Patients. *Int J Environ Res Public Health*. 2022;19(15):9031. doi:10.3390/ijerph19159031

33. Lee JS, Smiley A, Latifi R. Predictors of In-Hospital Mortality in Non-Elderly Adult Patients Emergently Admitted with Rhabdomyolysis: A 10-Year Analysis of 27,688 Patients from the National Inpatient Sample. *Surg Technol Int*. 2022;41:sti41/1618. doi:10.52198/22.STI.41.GS1618

34. Lee J, Smiley A, Latifi R. Predictors of In-Hospital Mortality in Nonelderly Adult Patients Emergently Admitted with Rhabdomyolysis: A 10-Year Analysis of 32,140 Patients from the National Inpatient Sample. *J Am Coll Surg*. 2022;235:S90-S90. doi:10.1097/01.XCS.0000893644.92161.e2

35. Gatzoflias S, Smiley A, Latifi R. Risk Factors of Mortality in Emergency Admission of Phlebitis and Thrombophlebitis in Elderly Patients: A Retrospective Cohort of 8,911 Patients. *J Am Coll Surg*. 2021;233:e237. doi:10.1016/j.jamcollsurg.2021.08.645

36. Hirani R, Smiley A, Latifi L, Latifi R. The Risk of Mortality in Geriatric Patients with Emergent Gastroparesis is 7-fold Greater than that in Adult Patients: An Analysis of 27,000 Patients. *Surg Technol Int*. 2022;40:85-95. doi:10.52198/22.STI.40.GS1566

37. Christensen S, Riis A, Nørgaard M, Sørensen HT, Thomsen RW. Short-term mortality after perforated or bleeding peptic ulcer among elderly patients: a population-based cohort study. *BMC Geriatr*. 2007;7:8. doi:10.1186/1471-2318-7-8

38. Ciftci F, Erözgen F. Patients With Perforated Peptic Ulcers: Risk Factors for Morbidity and Mortality. *Int Surg*. 2018;103(11-12):578-584. doi:10.9738/INTSURG-D-15-00180.1

39. Goudar B, Telkar S, Lamani S, Shirbur S, Ambi U, Hosalli V. Perforated Peptic Ulcer Disease: Factors Predicting The Mortality And Morbidity In A Tertiary Care Centre In Southern India. *Internet J Surg*. 2010;27(2).

40. Fringeli Y, Worreth M, Langer I. Gastrojejunal Anastomosis Complications and Their Management after Laparoscopic Roux-en-Y Gastric Bypass. *J Obes*. 2015;2015:698425. doi:10.1155/2015/698425

41. Ross AH, Smith MA, Anderson JR, Small WP. Late mortality after surgery for peptic ulcer. *N Engl J Med*. 1982;307(9):519-522. doi:10.1056/NEJM198208263070902

42. Lingsma HF, Bottle A, Middleton S, Kievit J, Steyerberg EW, Marang-van de Mheen PJ. Evaluation of hospital outcomes: the relation between length-of-stay, readmission, and mortality in a large international administrative database. *BMC Health Serv Res*. 2018;18:116. doi:10.1186/s12913-018-2916-1

43. Smiley A, Levy L, Latifi R. Risk Factors for Mortality in Patients with Ventral Hernia Admitted Emergently: An Analysis of 48,539 Adult Patients. *Surg Technol Int*. 2021;39:183-190.

44. Levy L, Smiley A, Latifi R. Independent Predictors of In-Hospital Mortality in Elderly and Non-elderly Adult Patients Undergoing Emergency Admission for Hemorrhoids. *Am Surg*. 2022;88(5):936-942. doi:10.1177/00031348211060420

45. Lin N, Smiley A, Goud M, Lin C, Latifi R. Risk Factors of Mortality in Patients Hospitalized With Chronic Duodenal Ulcers. *Am Surg*. 2022;88(4):764-769. doi:10.1177/00031348211054074

46. Latifi R, Levy L, Reddy M, Okumura K, Smiley A. Delayed Operation as a Major Risk Factor for Mortality Among Elderly Patients with Ventral Hernia Admitted Emergently: An Analysis of 33,700 Elderly Patients. *Surg Technol Int*. 2021;39:206-213. doi:10.52198/21.STI.39.HR1520

47. Lo K, Smiley A, Latifi R. Longer stay in Hospital is the Risk Factor for Mortality whereas Surgery is the Protective Factor in Patients with Blood in Stool. 6(2).

48. Khandehroo B, Smiley A, Feingold C, Patel S, Latifi R. The Risk of Mortality in Geriatric Patients with Emergent Regional Enteritis is 12-fold Greater than that in Adult Patients: Female Sex, Hospital Length of Stay and Surgery As other Risk Factors of Mortality. 2022;6(2).

49. Elgar G, Smiley A, Latifi R. Major Risk Factors for Mortality in Elderly and Non-Elderly Adult Patients Emergently Admitted for Blunt Chest Wall Trauma: Hospital Length of Stay as an Independent Predictor. *Int J Environ Res Public Health*. 2022;19(14):8729. doi:10.3390/ijerph19148729

50. Lobao A, Smiley A, Latifi R. Longer Hospital Length of Stay and Emergency Surgical Intervention are Associated with Lower Rates of Mortality In Elderly Patients with Ruptured Abdominal Aortic Aneurysm: An Analysis of 7,214 Patients. *Surg Technol Int*. 2022;41:sti41/1625. doi:10.52198/22.STI.41.GS1625

51. Newbury D, Smiley A, Latifi R. Predictors of In-hospital Mortality in Nonelderly Patients Admitted with Bleeding Gastritis: A Retrospective Cohort of 8,874 Patients. *J Am Coll Surg*. 2021;233:e3. doi:10.1016/j.jamcollsurg.2021.08.009