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Acute Pancreatitis: Presentation and Outcomes at a Safety Net Hospital



Andrew Zhang, BA, Sindhura Kolli, MBS, Disha Panchal, BA,
and Nisha Narula, MD*

Department of Surgery, Rutgers, New Jersey Medical School, Newark, New Jersey

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ABSTRACT

Introduction: Although acute pancreatitis is common and much is known about its management, further research could lead to targets identified for improvements in care. This study aimed to analyze factors, both medical and socioeconomic, associated with morbidity and mortality at a safety net hospital.

Methods: This was a retrospective review of patients with acute pancreatitis admitted between 2015 and 2022. Variables were collected from the electronic medical record and primary outcomes of interest were morbidity and mortality. Standard statistics were used for analysis.

Results: Of the 404 patients that met inclusion criteria, the average age was 48 y, 46% were female, the majority were English speaking, most were Black, and the majority had public insurance. Four percent of patients died and 19.6% had a complication within 30 d. Most patients were admitted to medicine. Public insurance or self-pay status was associated with complications, as was presence of comorbidities and interventional radiology consultation. Surgery and interventional radiology consultation, among other factors, were associated with mortality. Thirty-nine percent of patients with gallstone pancreatitis underwent cholecystectomy. Many patients were started on antibiotics, and of those, 44.1% had no clear indication.

Conclusions: This study reveals novel factors associated with morbidity and mortality in patients with acute pancreatitis, as well as demonstrating that best practices are not uniformly practiced. The study provides further areas of study, including investigations into best pathways for consultations of services and admission service, interventions for at risk patients to improve morbidity and mortality, and how to reduce inappropriate antibiotic use.

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Introduction

Acute pancreatitis is one of the most common inpatient gastrointestinal diagnoses¹ and its incidence is increasing.² In the United States there are about 13–45 cases of acute

pancreatitis per 100,000 people, with about 275,000 hospital admissions annually.³ There are many causes of acute pancreatitis but the most common are gallstones in 40%–70% of cases and alcohol in 25%–35% of cases.⁴ Less typical etiologies can include medications, toxins, cancer, obstructive

* Corresponding author. Rutgers, New Jersey Medical School, 185 South Orange Avenue, Medical Science Building, Room G-506, Newark, NJ 07103.

E-mail address: Nn422@njms.rutgers.edu (N. Narula).

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processes, hypertriglyceridemia, trauma, hypercalcemia, autoimmune diseases, infection, ischemia, iatrogenic reasons, and idiopathic causes.^{2,5} The severity of pancreatitis can range from mild to severe, with a corresponding range in mortality that is up to 20% in severe cases.² Complications of the disease include high morbidity, surgical intervention, and hospital stay including intensive care unit stay.⁶ Surgical management may be required at times, typically for complications associated with pancreatitis. Recurrent pancreatitis occurs in approximately 17% of patients.⁷ Acute pancreatitis can also progress to chronic pancreatitis in 36% of cases.⁸ Cholecystectomy is the surgery indicated in acute pancreatitis cases of biliary etiology.⁹ Same-admission or early cholecystectomy is advised to prevent recurrence of acute biliary pancreatitis when the pancreatitis is mild.¹⁰

In some studies, socioeconomic factors have been associated with incidence and outcomes of pancreatitis. One study found that incidence was higher among lowest income and education patients.¹¹ Another study found that older age, male gender, Black race, and lower income were associated with mortality.¹² A further study demonstrated racial disparities in acute cholangitis management, with Black patients less likely to undergo endoscopic retrograde cholangiopancreatogram (ERCP).¹³ In patients with acute cholangitis, those with Medicaid were less likely to receive definitive surgical therapy.¹⁴

Although much is known about pancreatitis, much remains to be studied. Given the prevalence, morbidity, and mortality of this disease, improved understanding could lead to substantial improvements in patient care. The goal of this study is to analyze factors associated with outcomes in pancreatitis at a safety net hospital. In addition, although pancreatitis is a multidisciplinary disease, treated by internal medicine, surgery, gastroenterology (GI), and interventional radiology (IR), there have been little data on the optimal pathway for admission and consultations. Understanding the influence of medical and socioeconomic factors on pancreatitis is crucial for designing effective treatment strategies and improving access to health care services. Although large database studies contribute to the literature, without granularity on specifics of consultations such as to surgery, GI, or IR, an institutional study was determined to be most effective in examining specifics at a unique center and with a specific question.

Methods

The study was reviewed by the institutional review board and found to be exempt. Patients admitted with pancreatitis between January 2015 and December 2022 were abstracted from the electronic health record (EHR). Two reviewers evaluated each chart. Patients with acute pancreatitis were included, including those with acute on chronic pancreatitis, post-ERCP pancreatitis, and those with a pseudocyst if they had acute symptoms. Patients were excluded if they had a diagnosis in the chart of pancreatitis but were admitted for another reason, had malignancy or there was a high suspicion of malignancy as the cause of pancreatitis (e.g., pancreatic head mass), had their primary diagnosis of chronic rather than

acute pancreatitis, or had an extensive course at another hospital before transfer. Data were abstracted from the EHR via Research Electronic Data Capture, a Health Insurance Portability and Accountability Act-compliant, web-application for data capture and research studies.¹⁵ Variables collected were age, sex, primary language spoken, race, ethnicity, body mass index, smoking history, insurance type, admission service, admission time, vitals, symptoms, etiology of pancreatitis, comorbidities, laboratory findings, admission consults, alcohol use, tobacco use, antibiotics given during admission, procedures performed, follow up, complications, and mortality. We did not investigate Social Vulnerability Index as we anticipated that most of our patients were from the surrounding region with the same Social Vulnerability Index and would not be as useful in distinguishing disparities between our individuals. The primary outcomes were morbidity and mortality at 30 d. Secondary outcomes included consultation of surgery, GI, IR, and use of antibiotics.

Statistical analysis was performed using Statistical Package for the Social Sciences (IBM Corp released 2022 IBM SPSS Statistics, version 29.0. Armonk, NY). Results are presented as mean and standard deviation or percentages with number of patients. A chi-squared test or Fischer's exact test was used for categorical variables. A Mann-Whitney U test or Kruskal-Wallis test was used for nonparametric continuous variables. P values were considered significant if < 0.05 and two-tailed tests were used.

Results

The initial search found 649 patients. After applying exclusion criteria, 404 patients were included in the study. The average age of patients was 48 y, 46% were female, and mean length of stay was 6.4 d. The majority of patients were English speaking, 74.8%, and a significant number were Spanish speaking, 21.3%. Most patients were Black or African American, 57.4%, or other race, 34.2%. Most patients were Not Spanish/Hispanic/Latino, 67.6%. The majority, 74.0%, had public insurance, and the next most common insurance status was self pay/charity care/uninsured at 13.4%; only 10.4% had private insurance. Most patients were admitted to medicine, 83.4%, and 85.1% presented with abdominal pain as their main symptom. The etiology of pancreatitis was similar between alcohol, 41.1%, and gallstones, 39.4%. Almost one third of patients had a procedure related to pancreatitis (Table 1). Four percent of patients died and 19.6% had a complication within 30 d (Table 2).

Male sex, any comorbidity, presence of diabetes, elevated white blood cell count, antibiotics administration, surgery consultation, and IR consultation during the hospital stay were associated with mortality at 30 d. Male patients had a mortality rate of 6.4% compared to 1.1% for female patients, $P = 0.008$. Only 0.8% of patients with no comorbidities died compared to 5.3% of patients with at least one comorbidity, $P = 0.035$. Mortality rate was 7.5% in patients with diabetes compared to 2.9% in patients without diabetes, $P = 0.044$. The average white blood cell count was 12.9 in patients who died compared to 10.1 in those who survived, $P = 0.011$. Antibiotics were given in 10.2% of patients who died compared to 1.4%

Table 1 – Demographics.

Variable	% or mean	N or SD
All patients N = 404		
Age (y)	48.25	14.6
LOS (d)	6.4	11.4
BMI (kg/m ²)	27.6	7.0
Temperature (°F)	98.3	0.8
Heart rate (beats per min)	91	20
Respiratory rate (respirations per min)	18	2
WBC (x10 ³ µL)	10.2	4.8
Creatinine (mg/dL)	1.1	1.6
AST (U/l)	147	219
LDH (N = 66, rest unavailable)	374	151
Bilirubin (mg/dL)	1.7	3.1
Lipase (U/l)	1026	1167
Female sex	46.0%	186
Admission hour daytime	50.0%	202
Language		
English	74.8%	302
Spanish	21.3%	86
American sign language	0.5%	2
Polish	0.2%	1
Yoruba	0.2%	1
Arabic	0.2%	1
Portuguese	1.5%	6
French Creole	2	0.5%
Other	0.2%	1
Hindi	0.2%	1
Persian	0.2%	1
Race		
White	7.4%	30
Black or African American	57.4%	232
Other race	34.2%	138
Unknown/unavailable	0.2%	1
Asian Indian	0.2%	1
Other Pacific Islander	0.2%	1
Black and American Indian or Alaskan Native	0.2%	1
Ethnicity		
Not Spanish/Hispanic/Latino	67.6%	273
Central or South American	8.4%	34
Mexican, Mexican American, Chicano	2.7%	11
Puerto Rican	5.7%	11
Other Spanish/Hispanic/Latino	15.1%	61
Declined to answer	0.2%	1
Unknown/unavailable	0.2%	1
Smoking		
Every day/heavy smoker	36.6%	148
Former	14.9%	60
Missing data	0.2%	1
Never	40.3%	163

(continued)

Table 1 – (continued)

Variable	% or mean	N or SD
Some days/light smoker	6.9%	28
Unknown	1.0%	4
Primary payor		
Private	10.4%	42
Public	74.0%	299
Self pay, charity care, or uninsured	13.4%	54
Unknown/missing	2.2%	9
Alcohol use		
Missing data	0.5%	2
None	33.7%	136
Previous, heavy	5.4%	22
Previous, light	0.7%	3
Previous, unspecified amount	2.2%	9
Current, heavy	38.9%	157
Current, light	15.1%	61
Current, unspecified amount	3.5%	14
Discharge disposition		
Home	79.5%	321
Home health service	3.5%	14
Died	3.5%	14
Skilled nursing facility	5.0%	20
Rehab center	0.5%	2
Acute care hospital	0.2%	1
Psychiatric hospital	0.2%	1
Hospice (home or hospital)	0.5%	2
Court/law enforcement	0.2%	1
Against medical advice	6.9%	28
Service		
Medicine	83.4%	337
Obstetrics/gynecology	0.2%	1
Surgery	16.3%	66
Main presenting symptom		
Abdominal pain	85.1%	244
Chest pain	4.7%	19
Nausea and/or vomiting	8.4%	34
Other	1.7%	7
Etiology alcohol	42.1%	170
Etiology gallstones	39.4%	159
Etiology hypertriglyceridemia	5.0%	20
Etiology medications	3.0%	12
Etiology other	9.4%	38
Etiology unknown	11.6%	47
Comorbidity		
DM	23.0%	93
HTN	52.0%	210
CAD/MI	2.5%	10
CHF	4.2%	17
CKD	4.2%	17
ESRD	2.0%	8

(continued)

Table 1 – (continued)

Variable	% or mean	N or SD
COPD/asthma/OSA	17.8%	72
CVA	2.2%	9
Cirrhosis	6.9%	28
Other	18.8%	76
None	30.0%	121
Ultrasound done	70.3%	284
CT done	62.9%	254
Surgery consultation during stay		
N/A – admitted to surgery	16.3%	66
Yes	56.7%	229
No	27.0%	109
GI consultation during stay	45.8%	185
IR consultation during stay	6.9%	28
Type of pancreatitis		
Acute fluid collection	8.2%	33
Necrotizing	7.2%	29
Necrotizing infected	0.5%	2
No fluid collection/edematous	48.0%	194
Unknown	36.1%	146
Procedure related to pancreatitis	27.2%	110

AST = aspartate aminotransferase; BMI = body mass index; CAD/MI = coronary artery disease/myocardial infarction; CHF = congestive heart failure; CKD = chronic kidney disease; COPD = chronic obstructive pulmonary disease; CT = Computed Tomography CVA = cerebrovascular accident; DM = diabetes mellitus; ESRD = end stage renal disease; HTN = hypertension; LDH = lactate dehydrogenase; LOS = length of stay; SD = standard deviation; WBC = white blood cell.

who did not, $P < 0.001$. Surgery consultation or admission to surgery occurred in 14.0% of patients who died compared to 1.7% of patients who did not, $P = 0.031$. IR consultation was obtained in 25.0% of patients who died compared to 2.5% of patients who did not, $P < 0.001$. Type of pancreatitis was also associated with mortality; there was greater mortality seen in patients with an acute fluid collection or necrotizing pancreatitis, 25.9% compared to 1.0%, $P < 0.001$. We did not find an association between race or ethnicity with mortality.

Payor type was associated with complications at 30 d; more patients with public insurance (20.4%) or self-pay (29.6%) had complications compared to those with private insurance (4.8%), $P = 0.009$. Presence of comorbidities and IR consultation were also associated with complications at 30 d. 22.6% of

patients with comorbidities had complications compared to 12.4% of patients without comorbidities, $P = 0.018$. Complications occurred in 42.9% of patients who received IR consultation compared to 17.8% of those who did not, $P = 0.001$.

We further analyzed which patients received a surgical consultation. Those who were smokers or former smokers, had end stage renal disease, or who were admitted to the medical intensive care unit were more likely to have a surgery consultation. Furthermore, more patients with gallstone pancreatitis had a surgery consultation, 52.8% compared to 22.8% ($P < 0.001$). Patients who had pancreatitis due to alcohol were less likely to have a surgical consultation (22.4% compared to 41.2%, $P < 0.001$). Those who had pancreatitis from hypertriglyceridemia, medications, or other were equally likely to have or not have a surgical consultation. More patients where the etiology was unknown did not have a surgery consultation (15.2% versus 34.9%, $P = 0.008$). More patients who had an ultrasound (39.3% compared to 18.4%, $P < 0.001$) or a computed tomography (40.1% compared to 18.2%) received a surgery consultation. In addition, more of those who had a GI consultation (48.3% compared to 20.2%, $P < 0.001$), an IR consultation (64.0% compared to 29.7%, $P < 0.001$), or a procedure during their stay (61.0% compared to 23.8%, $P < 0.001$) had a surgery consultation. Of patients with necrotizing or infected pancreatitis, 32.3% had an IR consultation and 74.2% had a surgery consultation or were admitted to surgery. In contrast, for those without necrotizing or infected pancreatitis, only 8.9% had IR consultation and 3.4% had a surgery consultation or were admitted to surgery. Notably, some patients could not be categorized because they did not have axial imaging and these patients were excluded from this calculation. Of patients with gallstone pancreatitis, 39.9% (61 of 153) had a cholecystectomy that same admission. Within 90 d of arrival, that increased only slightly to 42.7%, or just three additional patients.

Of the 102 patients started on antibiotics, the most common reason was another infection or concern unrelated to pancreatitis, such as colitis, pneumonia, urinary tract infection, or spontaneous bacterial peritonitis prophylaxis (40.2%). In 34.3% of cases, patients had no clear indication for antibiotics or appeared to have been started on them due to fever or leukocytosis; a further 9.8% were started on antibiotics for the indication of “pancreatitis.” Thus, as many as 44.1% of the patients started on antibiotics had no documented infection or indication (Table 3).

There were 110 patients who underwent a procedure related to pancreatitis. The majority, 89.1%, underwent endoscopic ultrasound, esophagogastroduodenoscopy, ERCP, and/or cholecystectomy (minimally invasive or open). The remainder underwent debridement, decompressive laparotomy or exploratory laparotomy, or a drainage procedure (Table 4).

Table 2 – Outcomes N = 404.

Variable	%	N
Mortality at 30 d	4.0%	16
Mortality at 90 d	4.5%	18
Complications at 30 d	19.6%	79
Follow up to clinic within 30 d after discharge	31.7%	128

Discussion

This study of 404 patients who presented with acute pancreatitis to a safety net hospital adds to the literature on pancreatitis given the unique patient population and few prior studies on socioeconomic factors and consultation pattern. Most

Table 3 – Reason for antibiotics N = 102.

Variable	% (N)
Pancreatitis	5.9% (6)
Infected pancreatitis	9.8% (10)
Cholangitis or cholecystitis as possible concurrent diagnosis	9.8% (10)
No clear indication/fever/leukocytosis	34.3% (35)
Infection unrelated to pancreatitis (e.g. colitis, pneumonia, urinary tract infection, spontaneous bacterial peritonitis prophylaxis)	40.2% (41)

patients were English speaking, Black or African American, and had public insurance. The majority were admitted to the medicine service. There was an even split between alcohol and gallstone as a cause, relatively in line with prior literature.^{3,4,16}

In this study, patients who were male, had any morbidity, had diabetes, presented with leukocytosis, were administered antibiotics, had a surgery and/or IR consultation, or had pancreatitis with a fluid collection or necrotizing pancreatitis were more likely to have a mortality. Payor type, presence of comorbidities, and IR consultation were associated with 30-d complications. Payor type association with complications may reflect underlying socioeconomic factors that delay access to comprehensive health care leading to more complications and poorer outcomes. Some of these findings, such as lower socioeconomic status associated with poor outcomes in pancreatitis, are in line with prior studies.^{11,12,14} However, unlike other studies, we did not find an association of race with outcomes.^{12,13,17} Though reassuring, it is unclear why we did not find an association between race and outcome. We did have a high percentage of patients in just two race categories and so there is a possibility of type II error.

IR consultation is likely a marker of a procedure required. Similarly, a surgery consultation may be obtained with more critically ill patients to assist with resuscitation or when intervention is being considered. Supporting this, IR consultation was obtained in approximately one-third of patients with necrotizing or infected pancreatitis and surgery consultations in almost three quarters of patients with necrotizing or infected pancreatitis, both greater than those without. These are risk factors for higher morbidity and/or mortality. GI consultation likely had no association with poorer outcomes

Table 4 – Procedure related to pancreatitis N = 110.

Variable	% (N)
Debridement with or without cholecystectomy	2.7% (3)
Decompressive laparotomy or exploratory laparotomy for ischemic bowel	2.7% (3)
Drainage procedure (e.g., cystgastrostomy, drainage of pseudocyst)	5.5% (6)
EGD and/or ERCP with cholecystectomy	20.0% (22)
EUS, EGD and/or ERCP	33.6% (37)
Cholecystectomy only	35.5% (39)

EGD, esophagogastroduodenoscopy; EUS, endoscopic ultrasound.

given that many patients with pancreatitis get GI consultation and many get an ERCP. Literature on the optimal pathway for admission and consultations are limited and our study presents information that adds to prior studies. Interestingly but not surprisingly, GI, IR, and surgery consultations appeared to occur in parallel, likely speaking to the multidisciplinary nature of the disease and treatment of pancreatitis. More data have shown the importance of a multidisciplinary approach^{16,18,19} and so this is a positive finding. To our knowledge, the optimal timing and number of consultations has not been well studied. The fact that certain findings such as acute fluid collections or necrotizing pancreatitis or more comorbidities led to more surgical consultations indicates that more severe pancreatitis or a higher risk patient triggers a provider to call a surgeon. This may be a point of improvement; as pancreatitis is a multidisciplinary disease, education of referring providers in the emergency room and on the medical service that a surgery consultation may be beneficial even in milder pancreatitis or healthier patients may be warranted. Exactly when consulting a surgeon or other team members such as IR or GI is useful is an area where further research would be beneficial.

Reassuringly, patients with gallstone pancreatitis were more likely to have a surgery consultation, but only approximately 40% of patients with gallstone pancreatitis had a cholecystectomy within 90 d. This is lower than some other studies¹⁰ but similar to others.²⁰ Patients with mild acute pancreatitis admitted to surgery may have a shorter length of stay and time to surgery so this may be an area for improvement.²¹ However, patients with moderate to severe biliary pancreatitis benefit from delayed, rather than immediate, cholecystectomy.¹⁶ Further institutional research would be necessary to determine which patients are appropriately receiving delayed cholecystectomy and if there are others who would benefit from earlier cholecystectomy. We hypothesize that some patients at a safety net hospital may have difficulty in outpatient follow up and may not come to clinic for further evaluation and potential scheduling of elective cholecystectomy. Data in the literature are limited about whether admission to surgery or medicine for pancreatitis generally, not just for gallstone pancreatitis, may be optimal.

There were also a high number of patients on antibiotics. Notably, 34% had no clear indication for antibiotics and a further 9.8% had an indication as “pancreatitis” without clear documentation of infected pancreatitis. This is lower than another published study showing 60% of patients receiving early antibiotic treatment.²² However, it still represents an area for progress and research, as antibiotics are not indicated unless there is an infected fluid collection associated with the pancreas or other reason for antibiotics, such as colitis or urinary tract infection, for instance.¹⁶ Furthermore, patients started on antibiotics had a higher complication rate.

This study adds to the literature in a number of ways. We assessed our unique patient population at a safety net hospital with acute pancreatitis and demonstrated variables associated with morbidity and mortality. We confirmed prior studies showing a relationship between payor status and outcomes and found, in contrast with other studies, that race was not associated with outcomes. Our patient population is unique with the vast majority of patients of Black or other race. This may limit

our ability to compare this study to others or to generalize this to other tertiary care hospitals beyond our site. We also delineated our consultation and admission practice, which has been less studied in the literature. However, a main limitation of our study includes its retrospective nature at a single site. This prevented us also from being able to compare a safety net and nonsafety net hospital, which could be done as a future collaborative study. Interesting questions for the future are which patients would benefit most from consultations and how to use resources well and determine if factors associated with morbidity and mortality can be optimized and improved on. Those patients recognized at higher risk for morbidity or mortality could also be placed in a higher level of care (e.g., monitored setting or intensive care unit) or have alerts in the EHR to signify to providers to take additional care with these patients.

Conclusions

This study assessed a unique patient population with acute pancreatitis at a safety net hospital. In contrast with other studies, we found that race was not associated with outcomes. We delineated a consultation and admission practice of medicine, surgery, GI, and IR, which has not been well examined. In the future, patients recognized at higher risk of morbidity and mortality could have targeted interventions for additional monitoring or optimization. This may include clinical pathways or electronic alerts flagging patients for higher level of care or consultations.

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CRedit authorship contribution statement

Andrew Zhang: Writing – review & editing, Writing – original draft, Methodology, Investigation. **Sindhura Kollli:** Writing – review & editing, Writing – original draft, Methodology, Investigation. **Disha Panchal:** Writing – review & editing, Writing – original draft, Methodology, Investigation. **Nisha Narula:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

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