

Advances in acute pancreatitis management: From guidelines to clinical practice

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ABSTRACT

Objectives: This study aimed to evaluate current management strategies and early outcomes in patients with acute pancreatitis (AP) to provide insights into effective practices and contribute to the discourse on optimizing AP care.

Methods: A retrospective observational study was conducted on 350 AP patients admitted to Kanuni Sultan Süleyman Training and Research Hospital between January 2015 and December 2022. Data were extracted from electronic medical records, including demographics, clinical presentation, laboratory findings, imaging results, treatment strategies, and outcomes. Patients were assessed for severity using the Revised Atlanta Classification and Bedside Index for Severity in Acute Pancreatitis (BISAP) scores, and management protocols included controlled fluid resuscitation, pain management, nutritional support, selective antibiotic use, and endoscopic interventions.

Results: Of 350 patients (male: 54%, mean age: 50 years), 79.7% had mild AP, 14.9% moderately severe AP, and 5.4% severe AP. Goal-directed fluid resuscitation and early nutritional support were implemented, with early oral feeding initiated in 81.4% of cases. Antibiotics were used in 20% of patients with confirmed or suspected infections, and Endoscopic retrograde cholangiopancreatography (ERCP) was performed in 24.6% of patients with biliary pancreatitis. The mean hospital stay was 7, 14, and 21 days for mild, moderately severe, and severe AP, respectively. Intensive care unit (ICU) admission was required for 8.6%, and in-hospital mortality was 2%. Recurrence within six months occurred in 9.1% of cases.

Conclusions: Individualized management strategies adhering to current guidelines led to favorable early outcomes, including reduced complications and a high six-month survival rate (98%). Future multicenter studies are recommended to confirm these findings and assess long-term outcomes.

Keywords: Acute pancreatitis, fluid resuscitation, nutritional support, severity assessment, endoscopic intervention, BISAP score, early outcomes

Acute pancreatitis (AP) is an abrupt inflammatory condition of the pancreas. The disease manifests when pancreatic enzymes become prematurely activated within the pancreas, leading to autodigestion and subsequent inflammation [1]. Glob-

ally, AP is a leading cause of gastrointestinal hospital admissions, with its incidence showing an upward trend in recent years [2].

The clinical presentation of AP varies widely. While approximately 80% of cases are mild and self-

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limiting, about 20% progress to moderately severe or severe forms [3]. Severe AP is characterized by persistent organ failure and local or systemic complications, which can result in a mortality rate as high as 20% [4]. Early recognition and management are crucial, as they significantly influence the disease trajectory and patient outcomes [5].

Initial management within the first 72 hours is critical and encompasses several key strategies: accurate assessment of disease severity, goal-directed fluid resuscitation, effective pain control, early initiation of nutritional support, selective use of antibiotics, and timely endoscopic interventions when indicated [6]. Recent shifts in clinical practice emphasize individualized care based on patient-specific factors and evidence-based protocols [7].

Advancements in understanding the pathophysiology of AP have led to changes in management approaches. For instance, moderate fluid resuscitation with isotonic crystalloids is now preferred over aggressive hydration to prevent complications associated with fluid overload [8]. Early enteral nutrition is encouraged to maintain gut integrity and reduce infection risks, moving away from the traditional "pancreatic rest" approach [9]. The use of prophylactic antibiotics is now limited to cases with confirmed or highly suspected infections to avoid antibiotic resistance and other adverse effects [10].

Despite these advancements, several areas remain contentious, such as the optimal timing and volume of fluid resuscitation, the role of various analgesics in pain management, and the indications for endoscopic interventions like endoscopic retrograde cholangiopancreatography (ERCP) [11]. Addressing these controversies is essential for improving patient care and outcomes.

This study aims to evaluate the current management strategies and early outcomes of patients with acute pancreatitis. By analyzing clinical characteristics, treatment modalities, and patient responses, we seek to provide insights into effective practices and contribute to the ongoing discourse on optimizing AP management.

METHODS

This retrospective observational study was conducted

at Kanuni Sultan Süleyman Training and Research Hospital, focusing on patients who were diagnosed with acute pancreatitis (AP) between January 2015 and December 2022.

Approval for the study was obtained from the Institutional Ethics Committee affiliated with the Istanbul Provincial Health Directorate (Approval Number: KAEK/2024.10.225). Given the retrospective nature of the research, the ethics committee waived the requirement for informed consent. To ensure patient confidentiality, all data were anonymized before analysis.

Patients were included in the study based on the following criteria:

a. *Age*: Patients aged 18 years or older.

b. *Diagnosis of Acute Pancreatitis*: Confirmed by at least two of the following three criteria: (1) Abdominal pain characteristic of AP; (2) Serum amylase and/or lipase levels elevated to at least three times the upper limit of normal; (3) Imaging findings consistent with AP observed on abdominal ultrasound, computed tomography (CT), or magnetic resonance imaging (MRI).

c. *Demographics*: Age, sex.

d. *Clinical Presentation*: Symptoms at admission, vital signs.

e. *Laboratory Results*: Serum amylase, lipase, hematocrit, blood urea nitrogen (BUN), C-reactive protein (CRP), procalcitonin levels when available.

f. *Imaging Findings*: Results from abdominal ultrasound, CT, or MRI.

Patients were excluded if they had incomplete medical records or if they were transferred from another healthcare facility more than 48 hours after their initial presentation.

Data were extracted from electronic medical records and included variables such as patient demographics, clinical presentation, laboratory results, imaging findings, treatment modalities, and early outcomes.

Severity Assessment

Classified according to the Revised Atlanta Classification into mild, moderately severe, and severe AP [3]. Severity scores were calculated using the Systemic Inflammatory Response Syndrome (SIRS) criteria and the Bedside Index for Severity in Acute Pancreatitis (BISAP) score upon admission and daily for the first 72 hours [14].

Management Strategies

a. *Fluid Resuscitation*: Type of fluids administered (isotonic crystalloids, primarily lactated Ringer's solution), initial bolus volumes, and maintenance rates adjusted based on hemodynamic parameters [15].

b. *Pain Control*: Use of acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), and opioids when necessary [16].

c. *Nutritional Support*: Timing of initiation, route of feeding (oral, enteral via feeding tubes, or parenteral nutrition), criteria for nutritional support decisions [17].

d. *Antibiotic Use*: Indications for antibiotic therapy, types of antibiotics used, duration of treatment, use of procalcitonin-guided algorithms [18].

e. *Endoscopic Interventions*: Indications for endoscopic retrograde cholangiopancreatography (ERCP), timing (urgent within 24 hours, elective within 72 hours), and criteria for patient selection [19].

Outcome Measures

1. Length of hospital stay.
2. Development of local complications (e.g., pseudocysts, walled-off necrosis).
3. Development of systemic complications (e.g., organ failure).
4. Need for intensive care unit (ICU) admission.
5. In-hospital mortality.
6. Recurrence rates within six months of discharge.

Management Protocols

a) *Severity Assessment*: All patients underwent severity assessment upon admission using SIRS criteria and BISAP scores. Assessments were repeated daily for the first 72 hours to monitor disease progression [14].

b) *Fluid Resuscitation*: Patients received isotonic crystalloids. An initial bolus of 15-20 mL/kg was administered over the first hour for patients with hypovolemia. Maintenance fluids were given at 1.5 mL/kg/h, adjusted based on heart rate, mean arterial pressure, urine output, hematocrit levels, and BUN [15].

c) *Pain Management*: Analgesia was initiated with acetaminophen and NSAIDs. Opioids were administered to patients whose pain was not adequately controlled with non-opioid analgesics [16].

d) *Nutritional Support*: Early oral feeding was en-

couraged and initiated within 48 hours when tolerated. Patients unable to tolerate oral intake received enteral nutrition via nasogastric or nasojejunal tubes. Parenteral nutrition was reserved for patients with contraindications to enteral feeding [17].

e) *Antibiotic Therapy*: Antibiotics were reserved for patients with suspected or confirmed infections. Procalcitonin levels were used to guide antibiotic therapy when available. No prophylactic antibiotics were administered to patients without signs of infection [18].

f) *Endoscopic Interventions*: ERCP was performed in patients with gallstone pancreatitis accompanied by cholangitis or persistent biliary obstruction. Urgent ERCP was conducted within 24 hours for cholangitis cases, and elective ERCP within 72 hours for biliary obstruction [19].

Statistical Analysis

Data were analyzed using SPSS software version 29.0. Patient demographics, clinical features, management strategies, and outcomes were summarized using descriptive statistics. Depending on the distribution, continuous data were presented as means with standard deviations or as medians accompanied by interquartile ranges. Categorical variables were expressed as frequencies and percentages. Survival analysis with Kaplan-Meier curves was compared using the log-rank test. A p-value less than 0.05 was considered to indicate statistical significance. All patient data were de-identified before analysis to ensure confidentiality. Data were stored securely in password-protected systems accessible only to authorized personnel involved in the study.

RESULTS

A total of 350 patients diagnosed with acute pancreatitis (AP) were included in the study. There were 189 male patients (54%) and 161 female patients (46%), with a mean age of 50 years (range 18-85 years). The etiologies of AP among these patients were as follows: gallstones in 162 patients (46.3%), alcohol use in 105 patients (30%), hypertriglyceridemia in 33 patients (9.4%), post-endoscopic retrograde cholangiopancreatography (ERCP) in 18 patients (5.1%), and idiopathic or other causes in 32 patients (9.1%) (Table 1).

Table 1. Patient demographics and clinical characteristics

Characteristic	Data
Total number of patients	350
Gender (Male/Female)	189 161
Mean age (range) (years)	50 (18-85)
Etiology, n (%)	
Gallstones	162 (46.3%)
Alcohol	105 (30%)
Hypertriglyceridemia	33 (9.4%)
Post-ERCP	18 (5.1%)
Idiopathic/Other	32 (9.1%)

Severity Assessment

According to the Revised Atlanta Classification, 279 patients (79.7%) had mild AP, 52 patients (14.9%) had moderately severe AP, and 19 patients (5.4%) had severe AP. Systemic Inflammatory Response Syndrome (SIRS) criteria were positive in 117 patients (33.4%), and a Bedside Index for Severity in Acute Pancreatitis (BISAP) score of ≥ 3 was noted in 28 patients (8%) (Table 2).

Fluid Resuscitation

All patients received isotonic crystalloid solutions for fluid resuscitation. Patients presenting with hypovolemia were administered an initial bolus of 15-20 mL/kg over the first hour.

Maintenance fluids were given at a rate of 1.5 mL/kg/h and adjusted based on hemodynamic parameters such as heart rate, mean arterial pressure, urine output, hematocrit levels, and blood urea nitrogen (BUN).

Pain Control

Adequate pain management was achieved with acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs) in 245 patients (70%). Opioids were required in 105 patients (30%) due to severe pain unresponsive to non-opioid analgesics. No significant adverse events related to analgesic use were reported.

Nutritional Support

Early oral feeding was initiated within 48 hours of admission in 285 patients (81.4%). Enteral nutrition

via feeding tubes was necessary for 43 patients (12.3%) who could not tolerate oral intake. Parenteral nutrition was administered to 22 patients (6.3%) who had contraindications to enteral feeding, such as intestinal obstruction or severe ileus.

Antibiotic Use

Antibiotics were administered to 70 patients (20%) who had suspected or confirmed infections. Procalcitonin-guided algorithms were utilized when available to guide antibiotic therapy. No prophylactic antibiotics were given to patients without signs of infection, adhering to the principle of minimizing unnecessary antibiotic use.

Endoscopic Interventions

Endoscopic retrograde cholangiopancreatography (ERCP) was performed in 86 patients (24.6%) diagnosed with gallstone pancreatitis. Among these, urgent ERCP within 24 hours was conducted in 24 patients

Table 2. AP severity assessment and clinical outcomes

Characteristic	Data
Severity of AP, n (%)	
Mild	279 (79.7%)
Moderately severe	52 (14.9%)
Severe	19 (5.4%)
Positive SIRS criteria, n (%)	117 (33.4%)
BISAP score ≥ 3, n (%)	28 (8%)
Mean hospital stay (days)	
Mild AP	7
Moderately severe AP	14
Severe AP	21
Complications	
Local complications (pseudocysts, walled-off necrosis)	42 (12%)
Systemic complications (organ failure)	12 (3.4%)
ICU admissions, n (%)	30 (8.6%)
Mortality, n (%)	7 (2%)
Recurrence within six months, n (%)	3 (9.1%)

AP=acute pancreatitis, SIRS=Systemic inflammatory response syndrome, BISAP=Bedside Index for Severity in Acute Pancreatitis, ICU=Intensive care unit

(27.9%) who presented with cholangitis. Elective ERCP within 72 hours was performed in 62 patients (72.1%) with persistent biliary obstruction but without cholangitis.

Early Clinical Outcomes

The mean length of hospital stay varied according to the severity of AP: 7 days for patients with mild AP, 14 days for those with moderately severe AP, and 21 days for patients with severe AP (as shown in Table 2). Local complications, such as pseudocysts and walled-off necrosis, developed in 42 patients (12%). Systemic complications, primarily organ failure, occurred in 12 patients (3.4%).

Among the 19 patients with severe AP, the majority developed systemic complications, including respiratory failure (7 patients, 36.8%), renal failure (5 patients, 26.3%), and cardiovascular failure (3 patients, 15.8%). Eight patients required mechanical ventilation, and five underwent renal replacement therapy. The overall ICU mortality rate for severe AP patients was 21.1% (4 patients).

Intensive Care Unit (ICU) admission was required for 30 patients (8.6%), predominantly those with severe AP. The overall in-hospital mortality rate was 2% (7 patients), all of whom had severe AP complicated by multiple organ failure.

Within six months of discharge, 32 patients (9.1%) experienced a recurrence of AP. The recurrences were

mainly attributed to gallstones and alcohol use, emphasizing the need for addressing etiological factors during the convalescent period.

The overall survival rate at six months was 98% (Fig. 1). The Kaplan-Meier curve indicates that all deaths occurred during hospitalization, with no mortality observed after discharge. Recurrence-free survival at six months was 90%, with most recurrences occurring within the first 60 days (Fig. 2).

DISCUSSION

In this study, we evaluated the management strategies and early outcomes of 350 patients diagnosed with acute pancreatitis (AP) between 2015 and 2022. Examining the demographic characteristics, we found a relatively balanced distribution between males and females (189 males, 161 females), with an average age of 50 years (range 18-85). The most common etiological factors were gallstones (46.3%) and alcohol use (30%), while hypertriglyceridemia, post-ERCP, and idiopathic causes were less frequently observed. This distribution aligns with the literature, where gallstones and alcohol are reported as the most prevalent causes of AP [13].

In terms of severity assessment, according to the Revised Atlanta Classification, the majority of patients experienced mild AP (79.7%), with moderately severe

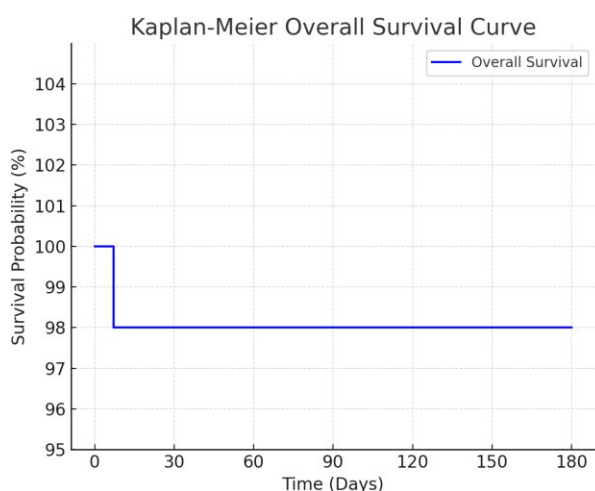


Fig. 1. Kaplan-Meier curve illustrating the overall survival rate of patients with acute pancreatitis over a six-month follow-up period.

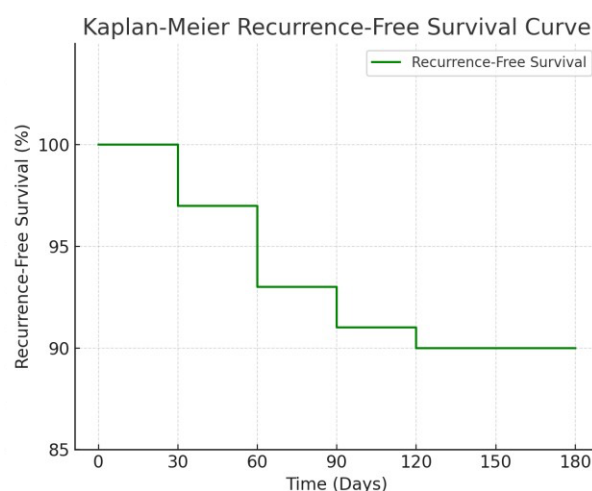


Fig. 2. Kaplan-Meier curve showing recurrence-free survival among patients with acute pancreatitis over a six-month follow-up period.

AP in 14.9% and severe AP in 5.4% of cases. The presence of SIRS criteria in 33.4% of patients and a BISAP score of ≥ 3 in 8% indicates that these scoring systems can be beneficial in the early detection of severe AP cases [14]. These findings emphasize the significant impact of early severity assessment on patient management and prognosis.

Patients with severe AP in our cohort demonstrated notably worse outcomes compared to those with mild or moderately severe AP. The ICU admission rate in this group was 100%, with a substantial proportion requiring advanced organ support, including mechanical ventilation and renal replacement therapy. The mortality rate of 21.1% in severe AP patients underscores the critical nature of this condition and highlights the importance of early aggressive management. These findings align with existing literature, which reports a higher morbidity and mortality rate among patients with severe AP due to systemic inflammatory response and organ failure [15].

Fluid resuscitation was administered with isotonic crystalloids in all patients and adjusted based on hemodynamic parameters. Patients with hypovolemia received an initial bolus of 15-20 mL/kg in the first hour, followed by maintenance infusion at a rate of 1.5 mL/kg/h. This approach is consistent with goal-directed therapy recommended in the literature and contributes to preventing complications such as fluid overload or insufficient fluid administration [15]. No serious complications related to fluid resuscitation were reported, highlighting the importance of controlled and individualized fluid therapy.

For pain management, acetaminophen and NSAIDs were sufficient in 70% of patients, while opioid use was required in 30%. No significant side effects related to opioid use were observed. These results are consistent with studies indicating that opioids can be safely used in AP and provide an effective approach to pain management [16].

Regarding nutritional support, early oral feeding was initiated within the first 48 hours in 81.4% of patients. Enteral feeding via tubes was necessary in 12.3%, and parenteral nutrition was applied in 6.3% who had contraindications to enteral feeding. Early nutritional support is known to be effective in preserving intestinal integrity, reducing bacterial translocation, and decreasing the risk of infection [17]. In our study, early feeding likely contributed to shortening

hospital stays and reducing complications.

In the severe AP group, nutritional management was more challenging, with 10 patients (52.6%) requiring enteral feeding through nasogastric or nasojejunal tubes and 6 patients (31.6%) necessitating parenteral nutrition. This highlights the need for tailored nutritional strategies in severe cases to minimize metabolic stress and support recovery.

Antibiotic use was applied only in patients with suspected or confirmed infections (20%). When possible, antibiotic therapy was guided by procalcitonin levels. Prophylactic antibiotic use has been reported in the literature not to reduce mortality or infection rates in AP, and in our study, antibiotics were not given to patients without signs of infection [11]. This approach helps prevent the development of antibiotic resistance by reducing unnecessary antibiotic use.

Endoscopic interventions were performed in 86 patients (24.6%) with gallstone pancreatitis. Urgent ERCP was conducted within the first 24 hours in 24 patients with cholangitis, while elective ERCP was performed within 72 hours in 62 patients with persistent biliary obstruction. This timing aligns with current guidelines on the indications and optimal timing of ERCP in acute biliary pancreatitis [18]. Literature indicates that urgent ERCP does not provide benefits in patients without cholangitis, and in our study, ERCP indications were carefully evaluated.

Assessing early outcomes, it was observed that the length of hospital stay increased significantly with the severity of AP (mild AP: 7 days, moderately severe AP: 14 days, severe AP: 21 days). Complications included local complications (12%) and systemic complications (3.4%). Local complications consisted of pseudocysts and walled-off necrosis, while systemic complications manifested as organ failure. Intensive care unit admission was required in 30 patients (8.6%), predominantly in severe AP cases. The mortality rate was 2%, with all deaths occurring in patients with severe AP and multiple organ failure. These findings support the relationship between the severity of AP and increased mortality and morbidity [19].

Recurrence was observed in 32 patients (9.1%) within six months, mainly associated with gallstones and alcohol use. This underscores the importance of managing etiological factors during the convalescent period. Timely cholecystectomy in patients with gallstone pancreatitis and providing alcohol intervention

and counseling in alcoholic AP cases are critical for preventing recurrences [20].

In assessing early outcomes, the Kaplan-Meier survival analysis demonstrated a high overall survival rate of 98% at six months. Since all deaths occurred during the initial hospitalization period, the survival curve plateaued after day 7, indicating no additional mortality during follow-up. The recurrence-free survival rate at six months was 90%, with most recurrences occurring within the first 60 days post-discharge. Although patients with gallstone-induced and alcohol-induced AP showed higher recurrence rates, the difference was not statistically significant, possibly due to the sample size.

The results of our study demonstrate that individualized treatment strategies applied following current guidelines in AP management lead to favorable early outcomes. Specifically, early severity assessment, controlled fluid resuscitation, effective pain management, early nutritional support, selective antibiotic use, and appropriate endoscopic interventions positively affected patient outcomes.

Limitations

There are some limitations to this study. Its retrospective design may increase the risk of bias in data collection and analysis. Additionally, being a single-center study limits the generalizability of the results. The lack of long-term follow-up data hinders the evaluation of the long-term effects and complications of AP. Future research should support these findings with larger patient populations and multicenter studies, and evaluate long-term outcomes.

CONCLUSION

The management of acute pancreatitis has evolved to prioritize individualized treatment strategies based on current evidence. Our study demonstrates that adhering to guidelines emphasizing early assessment, moderate fluid resuscitation, effective pain control, early nutritional support, selective antibiotic use, and timely endoscopic interventions results in favorable early outcomes. Future research should aim to refine these strategies further and explore new therapeutic options to enhance patient care.

Ethical statement

Ethics committee approval (number: KAEK/2024.10.225) was obtained from the from the Clinical Research Ethics Committee of Kanuni Sultan Süleyman Training and Research Hospital.

Authors' Contribution

Study Conception: AH; Study Design: AH; Supervision: AH; Funding: N/A; Materials: N/A; Data Collection and/or Processing: AH, AÇ; Statistical Analysis and/or Data Interpretation: AH, AÇ; Literature Review: AH, AÇ; Manuscript Preparation: AH and Critical Review: AH.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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