Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Impact of Endoscopic Pancreatic Duct Stent Placement on Clinical Symptoms and Quality of Life in Patients with Acute Pancreatitis: A Cross-Sectional Survey Based on Patient-Reported Outcomes

YANRONG YAO
Ningxia Medical University General Hospital
WEIJIE YAO
Ningxia Medical University General Hospital
JIE WEI
General Hospital of Ningxia Medical University
BO YUAN
Ningxia Medical University
XIAOLI WANG
Ningxia Medical University General Hospital
ZHENGQUAN MA
Ningxia Hui Autonomous Region Peoples Hospital
ZUOZHENG WANG
wangzuozheng2008@sina.com
Ningxia Medical University General Hospital
BIN LI
Ningxia Medical University

Research Article

Keywords: Acute pancreatitis, Pancreatic duct stent placement, Patient-reported outcomes, Quality of life, Comfort, Symptoms

Posted Date: September 14th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10771308/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Objective: To investigate changes in clinical symptoms, quality of life, and comfort—and their associated characteristics—in patients with acute pancreatitis (AP) following endoscopic pancreatic duct stent placement, based on patient-reported outcomes (PROs). This study aims to supplement patient-level subjective evidence from the perspective of pancreatic duct stenting and to provide a reference for individualized, precision-based symptom management in AP patients.

Methods: Using convenience sampling, patients with AP who underwent endoscopic pancreatic duct stent placement at the General Hospital of Ningxia Medical University between October 2025 and April 2026 were enrolled. Longitudinal surveys were administered at three time points—on admission, before discharge, and 2 weeks post-discharge—using a general information questionnaire, an adaptively modified Pancreatitis Quality of Life Instrument (PANQOLI), and the General Comfort Questionnaire (GCQ). Inflammatory laboratory indicators (serum amylase, C-reactive protein, peripheral white blood cell count and so on) and clinical data on pain relief and recovery progress were collected on admission and before discharge.

Results: A total of 146 AP patients meeting the inclusion and exclusion criteria were enrolled, including 62 cases (42.47%) of biliary AP, 56 cases (38.36%) of hypertriglyceridemic AP, and 28 cases (19.18%) of AP due to other etiologies. Compared with admission values, PANQOLI total and dimension scores, as well as GCQ total scores, showed a sustained upward trend before discharge and at 2 weeks post-discharge, with statistically significant differences ($P<0.001$); improvement was most pronounced in the physical function dimension. Pearson correlation analysis revealed no significant correlations between the magnitude of decline in serum amylase, lipase, and white blood cell count during hospitalization and the magnitude of improvement in PANQOLI and GCQ scores or the alleviation of AP-related symptoms and negative emotions (all $P>0.05$). Only a small number of inflammatory markers showed weak correlations with relief of individual subjective symptoms, with low absolute correlation coefficients and limited clinical relevance.

Conclusion: Endoscopic pancreatic duct stent placement effectively improves clinical symptoms, quality of life, and comfort in patients with AP. However, improvement in objective inflammatory laboratory indicators does not parallel the enhancement of patients' subjective perceptions in a linear, synchronous manner. Clinical practice should therefore give greater weight to patient-reported outcomes, incorporating subjective measures such as quality of life and comfort into efficacy assessment frameworks, with symptom interventions individualized according to patients' etiological characteristics.

Introduction

Acute pancreatitis (AP) is a common acute abdominal condition of the digestive system, characterized by a complex pathogenesis and marked clinical heterogeneity; in severe cases, it may progress to multiple organ failure[1]. The global incidence of AP has risen steadily, imposing an increasingly heavy disease burden [2–3]. Current management remains predominantly conservative, relying on fluid resuscitation and organ support [4–5], while direct etiology-targeted interventions are still lacking. Accumulating evidence suggests that pancreatic duct hypertension and the ensuing systemic inflammatory cascade are central to disease progression, and that timely relief of ductal hypertension—thereby interrupting the vicious inflammatory cycle—may be critical to improving outcomes [6–7].

Building on this premise, our team previously proposed that pancreatic duct obstruction represents an important etiological factor in AP and pioneered endoscopic pancreatic duct stent placement via endoscopic retrograde cholangiopancreatography (ERCP) [8–9]. This procedure uses the physical scaffolding of the stent to restore pancreatic juice drainage and reduce intraductal pressure, thereby alleviating pancreatic edema and inflammation. To date, our team has performed pancreatic duct stent placement in over 1,500 AP cases. Retrospective studies [10], case analyses focusing on hypertriglyceridemic pancreatitis [11] and acute necrotizing pancreatitis [12], and randomized controlled trials [13] have consistently shown that this procedure is significantly superior to conventional conservative treatment in shortening disease course, reducing hospital stay, lowering inflammatory markers, preventing progression to severe disease, relieving pain, and enhancing postoperative comfort. These findings have since been corroborated by several independent groups [14–17].

To date, however, evidence for these therapeutic effects has come largely from objective indicators—serum amylase, lipase, C-reactive protein (CRP), and imaging findings reflecting lesion resolution. While such objective measures can delineate the biological trajectory of disease, they often fail to capture the patient's lived experience as the subject of treatment, and improvement in objective parameters does not always parallel improvement in subjective perception [18–19].

Patient-reported outcomes (PROs)—subjective outcome measures obtained through direct patient self-report of health status, functional status, and treatment experience—represent an essential complement to traditional objective outcomes [20–22] and have become an indispensable dimension of efficacy evaluation and treatment optimization [23–24]. Our previous qualitative work revealed that AP patients carry a substantial burden of negative psychological states and disease-related symptoms during their illness [25]. Yet whether patients derive concurrent benefit in pain control, gastrointestinal recovery, and negative emotions such as anxiety and depression following pancreatic duct stent placement remains largely unexplored from a PRO perspective. The existing evidence base relies almost exclusively on objective indicators and lacks efficacy data from the patient's own perspective.

We therefore conducted a cross-sectional survey to systematically evaluate changes in objective inflammatory indicators alongside PROs—encompassing quality of life, comfort, and symptom-related emotional status—in AP patients treated with pancreatic duct stent placement, and to further examine the relationship between improvement in objective indicators and subjective outcomes. This study aims to validate the efficacy and clinical applicability of pancreatic duct stent placement for AP from both objective and subjective dimensions, complete the clinical evidence chain for this procedure, and provide patient-derived evidence to support its incorporation into AP clinical practice guidelines.

Methods and materials

1. **Study Participants**

- This study used a convenience sampling method to enroll 146 patients with AP who underwent pancreatic duct stent placement at the Department of Hepatobiliary Surgery, General Hospital of Ningxia Medical University, between October 2025 and April 2026. **Inclusion criteria were as follows**: (1) fulfillment of the diagnostic criteria for acute pancreatitis [1], defined as the presence of at least two of the following three features: □ acute onset of persistent upper abdominal pain; □ serum amylase and/or lipase activity elevated to at least three times the upper limit of normal; and □ characteristic imaging findings of acute pancreatitis on contrast-enhanced CT, MRI, or abdominal ultrasound; (2) having undergone ERCP with pancreatic duct stent placement; and (3) provision of informed consent. **Exclusion criteria were**: (1) acute exacerbation of chronic pancreatitis; (2) pancreatitis secondary to pancreatic cancer or other malignancies; (3) severe cognitive impairment or psychiatric disorder precluding cooperation with follow-up; and (4) substantial missing data precluding meaningful analysis. **Questionnaires were excluded if they met any of the following criteria**: (1) a missing-item rate > 10%; (2) an evident response pattern (e.g., consecutive identical answers) or internal logical inconsistency; or (3) loss to follow-up for reasons unrelated to the study (e.g., accidental death, transfer to another medical facility).

2. Sample Size Calculation

- Sample size was estimated according to the convention for multiple linear regression analysis, whereby the required sample is 5–10 times the number of variables. In this study, the general information questionnaire comprised 13 items, the Chinese version of the Pancreatitis Quality of Life Instrument (PANQOLI) comprised 4 dimensions, and the General Comfort Questionnaire (GCQ) comprised 4 dimensions, yielding a total of 21 variables. To account for sampling error and potential loss to follow-up, the estimated sample size was inflated by 20%, giving a target range of 126–252 cases. A total of 146 patients were ultimately enrolled.

3. Survey Instruments

3.1 General Information Questionnaire for AP Patients

- A general information questionnaire for AP patients was developed based on a review of the literature. It included demographic data (name, age, medical record number, contact information, sex, education level, occupation, and employment status) and disease-related data (number of prior hospitalizations for pancreatitis, etiology, disease severity at admission, whether the stent placement was the patient's first, and whether concurrent biliary intervention was performed). Clinical data at each time point were extracted from the hospital's electronic medical record system: admission indicators were collected within the first 24 hours of hospitalization, and discharge indicators within 24 hours before discharge.

3.2 Assessment of Clinical Symptoms after Pancreatic Duct Stent Placement in AP Patients

- The Pancreatitis Quality of Life Instrument (PANQOLI), developed through a multicenter study in the United States, is a disease-specific instrument for assessing quality of life in patients with pancreatitis [26]. Wassef et al. [27] evaluated its reliability and validity in 159 patients with pancreatitis, reporting a Cronbach's α of 0.914, indicating good psychometric performance. Relative to generic instruments, the scale's most distinctive feature is a dedicated "self-worth" module, which confers greater specificity and sensitivity for evaluating quality of life in this population. Aivaliotis et al.[28] applied the PANQOLI to assess the effect of psychological intervention on quality of life in patients with pancreatitis and found that intervention effects captured by the PANQOLI corresponded closely with those captured by the mental component of the SF-36.
- Because the PANQOLI was originally developed and validated in populations with chronic pancreatitis, it is oriented toward quality-of-life impairment arising from long-term, recurrent disease and is not fully suited to the acute and short-term recovery phases of AP. No instrument currently exists specifically for assessing disease-related quality of life in AP patients. We therefore made adaptive modifications to the scale's recall period prior to the formal survey, aligning it with the disease course of AP and the three observation time points of this study (admission, before discharge, and 2 weeks post-discharge). The original recall period ("over the past several months") was replaced with time-window-specific anchors: at admission, relative to the pre-illness state; before discharge, relative to the pre-surgical state; and at 2 weeks post-discharge, relative to disease onset. The four core dimensions (physical function, role function, emotional function, and self-worth) and all 18 original items were retained, and the original scoring rules, reverse-scoring conventions, and total score range were unchanged. The revised instrument was subsequently reviewed by a chief physician and an associate chief physician specializing in pancreatic disease, together with a nursing research expert with expertise in pancreatitis, who jointly assessed its content validity, item readability, and suitability for the acute pancreatitis setting, and confirmed its appropriateness for evaluating short-term quality-of-life change in AP patients following disease onset.
- The Chinese version of the PANQOLI was developed by Wang Yuanchen in 2023 [29]. Its average content validity index was 0.91, and the Cronbach's α of the total scale was 0.868, with a positive correlation with the SF-36—indicating good reliability and validity for assessing quality of life in this population. The Chinese version comprises 4 dimensions and 18 items. Physical function (items 1–6) captures changes in pain, vomiting, nausea, diarrhea severity, weight loss, and sleep quality. Role function (items 7–10) captures the ability to participate in household or family activities, social activities, work or study, and travel or vacation. Emotional function (items 11–14) captures changes in frustration or depression, anxiety or worry, irritability or anger, and loneliness or isolation. Self-worth (items 15–18) captures satisfaction with self-image, perceived burden on family or others, confidence about the future, and perceived loss of control over one's life. Each item is scored from 0 to 5, with items 1–6 and 12–18 reverse-scored. Total scores range from 0 to 90, with higher scores indicating better quality of life.

3.3 Assessment of Comfort after Pancreatic Duct Stent Placement in AP Patients

- Comfort was assessed using the General Comfort Questionnaire (GCQ), developed by American nursing scholar Kolcaba [30] on the basis of her taxonomic model of comfort. The instrument was progressively refined under her "comfort theory," established in 1994, and has since become a key tool linking nursing theory to clinical practice.

- The GCQ was translated into Chinese and psychometrically validated by Zhu Lixia in 2004 [31], yielding a content validity index of 0.86 and a Cronbach's α of 0.92, indicating good reliability and validity for assessing patient comfort. The Chinese version comprises 4 dimensions and 30 items: physical (items 2, 9, 13, 16, 17), psychological (items 3, 4, 5, 12, 15, 18, 22, 24, 26, 28), social (items 1, 6, 8, 10, 23, 25, 29, 30), and environmental (items 7, 11, 14, 19, 20, 21, 27). Items are rated on a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree), with reverse-scored items (e.g., "I feel depressed") handled accordingly. Total scores range from 30 to 120, with higher scores indicating greater comfort.

4. Data Collection Procedures

Baseline data, including general and disease-related characteristics, were first extracted from the hospital's electronic medical record system and supplemented by the research team. The study's purpose, significance, and procedures were then explained to patients in person. After obtaining informed consent, patients were instructed on how to complete the questionnaires, which were distributed on-site and collected after verification. Questionnaires were completed by patients themselves or, where necessary, by their caregivers; for patients with limited literacy or impaired vision, the researcher recorded responses as dictated by the patient.

To ensure completion quality and response rate, paper-based questionnaires were used throughout the in-hospital phase. These were administered face-to-face by the researcher at the bedside within 24 hours of admission and within 24 hours before discharge, with the purpose and instructions for each survey explained beforehand. At 2 weeks post-discharge, an online questionnaire was administered by the researcher via WeChat or telephone follow-up.

All questionnaires were checked and collected on-site, with missing items completed immediately. Of 150 questionnaires distributed, 4 were excluded as invalid, leaving 146 valid questionnaires and an effective response rate of 97.33%.

5. Quality Control

Prior to data collection, the principal investigator underwent training by the study supervisor to ensure procedural consistency. Issues arising during the survey process were reviewed and resolved in a standardized manner. Data entry was performed by the investigator and independently verified by a second author to ensure accuracy and completeness before the SPSS database was finalized.

6. Statistical Analysis

All data entry and statistical analyses were performed using SPSS 29.0. Categorical variables were expressed as frequencies and percentages. Continuous variables were assessed for normality; normally distributed data are presented as mean±standard deviation (SD), and non-normally distributed data as median and interquartile range (IQR).

Repeated-measures analysis of variance (ANOVA) was used to compare PANQOLI scores, GCQ scores, and individual symptom and emotion indicators across the three time points (admission, before discharge, and 2 weeks post-discharge); the Friedman test was applied when the assumption of normality was violated. The magnitude of change in each inflammatory marker and in subjective symptom, quality-of-life, and comfort scores during hospitalization was quantified as a change score (discharge value minus admission value). Linear correlations between changes in objective inflammatory indicators and improvement in patient-reported outcomes were assessed using Pearson correlation analysis, with Spearman rank correlation applied when normality assumptions were not met. One-way ANOVA was used to compare short-term postoperative recovery indicators among AP patients with different etiologies. A two-sided $P < 0.05$ was considered statistically significant.

RESULTS

1. Comparative Analysis of Baseline Characteristics by Etiology in Patients Undergoing Endoscopic Pancreatic Duct Stent Placement

A total of 146 patients with AP were enrolled, including 62 (42.5%) with biliary AP, 56 (38.4%) with hypertriglyceridemic AP (HTG-AP), and 28 (19.2%) with AP of other etiologies. Statistically significant differences were observed among the three groups in age, sex, education level, receipt of biliary intervention, disease severity, and whether stent placement was the patient's first (all $P < 0.05$), shown at Table 1

Patients with biliary AP were older (median age, 62.00 [47.75, 73.25] years) than those with HTG-AP (37.00 [33.00, 46.00] years) or AP of other etiologies (46.00 [38.00, 57.75] years; $P < 0.001$). Sex distribution also differed significantly among groups, with females predominating in the biliary AP group and males predominating in the HTG-AP group ($P < 0.05$). Education level differed significantly as well ($P < 0.01$), with a relatively higher proportion of patients with lower educational attainment in the biliary AP group.

The proportion of patients who underwent biliary intervention was significantly higher in the biliary AP group than in the other two groups ($P < 0.001$), and disease severity differed significantly across groups ($P < 0.001$). The proportion of patients undergoing pancreatic duct stent placement for the first time was highest in the biliary AP group, intermediate in the HTG-AP group, and lowest in the other-etiology group ($P < 0.001$). Among all 146 patients, 118 (80.82%) rated their perceived disease recovery as "very good," and 6.85% reported good dietary recovery; neither outcome differed significantly among the three groups ($P > 0.05$).

Table 1
Baseline characteristics of participants with different etiologies of acute pancreatitis (N = 146)

Item	Classification	Biliary AP (n = 62)	Hypertriglyceridemic AP (n = 56)	Other-etiology AP (n = 28)	Statistical value	*P* value
Age (years)		62.00 [47.75,73.25]	37.00[33.00,46.00]	46.00 [38.00,57.75]	44.485	0.001**
Sex	Male	35(42.5)	42(38.4)	23(19.2)	7.682	0.021*
	Female	27(19.5)	14(17.6)	5(8.8)		
Educational level	Primary school and below	28(17.4)	9(15.7)	4(7.9)	22.263	0.004*
	Junior high school	14(16.4)	15(15.0)	10(7.5)		
	High school/Technical secondary school	12(12.7)	11(11.5)	7(5.8)		
	Junior college	4(4.2)	4(3.8)	2(1.9)		
	Bachelor's degree and above	4(11.0)	17(10)	5(5.0)		
Disease severity	Mild	1(3.0)	1(2.7)	5(1.3)	13.152	0.001**
	Moderate-severe	42(39.9)	36(36.1)	16(18.0)		
	Severe	19(19.9)	19(17.3)	7(8.6)		
First-time pancreatic stent placement		42(30.6)	24(27.6)	6(13.8)	18.068	0.001**
Biliary tract intervention performed		46(23.8)	9(21.5)	1(10.7)	59.768	0.001**
Self-perceived disease recovery	Very good	48(50.1)	46(45.3)	24(22.6)	0.959	0.619
	Good	14(11.9)	10(10.7)	4(5.4)		
Dietary recovery status	Very good	3(4.7)	5(4.2)	3(2.1)	1.908	0.753
	Good	45(45.4)	41(41.0)	21(20.5)		
	Fair	14(11.9)	10(10.7)	4(5.4)		
Discharge with drainage tube		5(3.8)	3(3.5)	1(1.7)	0.776	0.679

*: **P < 0.05**, **: **P < 0.001.**

2. Comparative Analysis of Inflammatory Indicators and Postoperative Recovery Parameters by Etiology at Different Time Points After Endoscopic Pancreatic Duct Stent Placement

Comparisons of inflammatory laboratory indicators between admission and discharge for all patients are presented in Table 2. Compared with admission values, serum amylase, serum lipase, white blood cell count, and C-reactive protein (CRP) were all significantly lower before discharge (all $P < 0.05$), whereas the change in serum procalcitonin did not reach statistical significance ($P = 0.057$).

Between-group comparisons of short-term postoperative outcomes among patients with biliary AP, HTG-AP, and AP of other etiologies are presented in Table 3. No significant differences were observed among the three groups in postoperative pain relief time, total or postoperative length of hospital stay, or time to first postoperative oral intake (all $P > 0.05$). These findings indicate that patients with AP of differing etiologies achieve comparable therapeutic benefit from endoscopic pancreatic duct stent placement, lending further support to the clinical value, feasibility, and generalizability of this procedure in the management of AP.

Table 2
Comparison of inflammatory biomarkers among participants at different time points (N = 146, $\bar{x}\pm s$)

Inflammatory biomarkers	At admission	Before discharge	Statistical value	*P* value
Serum amylase (U/L)	658.46 ± 808.77	83.74 ± 65.45	62.234	<0.001
Serum lipase (U/L)	5285.62 ± 6922.52	448.29 ± 601.87	62.773	<0.001
White blood cell count (×10^9/L)	10.96 ± 5.23	7.59 ± 3.04	66.796	<0.001
CRP(mg/L)	82.20 ± 118.65	41.94 ± 48.46	9.850	0.002
Serum procalcitonin (ng/mL)	2.70 ± 10.84	0.67 ± 2.70	3.717	0.057

Table 3
Comparison of post-operative efficacy indicators among participants with different etiologies of acute pancreatitis (N = 146, $\bar{x}\pm s$)

Indicators	Biliary AP (n = 62)	Hypertriglyceridemic AP (n = 56)	Other-etiology AP (n = 28)	Statistical value	*P* value
Post-operative pain relief time (h)	24.00 [12.00,24.00]	24.00[12.00,24.00]	12.00 [6.00,24.00]	2.715	0.257
Time to first postoperative dietary resumption (h)	40.65 ± 22.49	37.61 ± 24.63	35.32 ± 31.08	0.485	0.617
Post-operative hospital stay (d)	5.05 ± 3.07	4.71 ± 3.00	3.75 ± 3.90	1.577	0.210
Total hospital stay (d)	6.50 ± 3.25	6.32 ± 3.58	5.00 ± 3.79	1.906	0.152

Note: Median [interquartile range] was presented for non-normally distributed variables; normally-distributed data were expressed as mean ± standard deviation.

- **3 Changes in Quality of Life and Related Symptoms Following Endoscopic Pancreatic Duct Stent Placement at Different Time Points**

3.1 Changes in Total Quality of Life Scores

- The PANQOLI was used to evaluate quality of life at three time points—admission, before discharge, and 2 weeks post-discharge. Dimension and total scores at each time point are presented in Table 4. Total PANQOLI scores increased steadily over time, rising from 19.84 at admission to 82.23 at 2 weeks post-discharge ($P < 0.001$). Scores in all four dimensions—physical function, role function, emotional function, and self-worth—showed similarly significant upward trends across time points ($P < 0.001$) (Fig. 1), indicating that endoscopic pancreatic duct stent placement effectively improves quality of life in patients with AP.

Table 4
Comparison of PANQOLI sub-domain scores of participants at different time points(N = 146, $\bar{x}\pm s$)

Sub-domain	At admission	Before discharge	2-week post-discharge	Statistical value	P value
Physical function	6.79 ± 2.04	24.17 ± 1.48	28.83 ± 0.50	9856.084	<0.001
Role function	4.75 ± 1.43	13.06 ± 1.53	17.92 ± 1.62	3075.437	<0.001
Emotional function	3.72 ± 2.10	15.47 ± 0.77	17.66 ± 0.78	4480.219	<0.001
Self-worth	4.59 ± 1.61	15.34 ± 1.14	17.82 ± 0.78	5229.293	<0.001
Total score	19.84 ± 3.92	68.04 ± 2.93	82.23 ± 2.35	18756.104	<0.001

Data are presented as mean±standard deviation. Repeated-measures analysis of variance was applied for inter-time-point comparison. $P < 0.001$ indicates statistically significant difference.

3.2 Comparative Analysis of Changes in Acute Pancreatitis-Related Symptoms and Emotions at Different Time Points

Changes in pancreatitis-related symptoms and negative emotions were compared across the three time points—admission, before discharge, and 2 weeks post-discharge. Repeated-measures ANOVA revealed significant time effects for all symptom and emotion scores over the course of treatment ($P < 0.001$). Post-hoc comparisons showed that scores for pain, vomiting, nausea, and diarrhea, as well as for the negative-emotion subdomains of depression-frustration, anxiety-worry, and irritability-anger, were all significantly higher before discharge and at 2 weeks post-discharge than at admission—reflecting improvement, given the reverse-scored convention of these items. These findings indicate that endoscopic pancreatic duct stent placement effectively alleviates disease-related discomfort and improves associated negative emotions, as detailed in Table 5.

Table 5
Comparison of AP-related symptoms and emotional changes among participants at different time points (N = 146, $\bar{x} \pm s$)

Item	At admission	Before discharge	2-week post-discharge	Statistical value	*P* value
Symptom changes					
Pain severity	0.21 ± 0.41	4.92 ± 0.27	4.96 ± 0.20	12265.646	<0.001
Vomiting severity	0.96 ± 0.66	4.91 ± 0.29	4.97 ± 0.16	4331.723	<0.001
Nausea severity	0.91 ± 0.67	4.87 ± 0.41	4.97 ± 0.18	3579.748	<0.001
Diarrhea severity	1.97 ± 1.30	4.89 ± 0.31	4.97 ± 0.16	730.381	<0.001
Emotional changes					
Depression-frustration severity	1.07 ± 1.14	3.89 ± 0.31	4.07 ± 0.25	801.763	<0.001
Anxiety-worry severity	0.43 ± 0.50	3.84 ± 0.37	4.00 ± 0.33	3874.924	<0.001
Irritability-anger severity	0.94 ± 0.67	3.86 ± 0.35	4.84 ± 0.38	2676.975	<0.001

This 3-D waterfall plot visualizes score variations across four sub-domains (physical function, role function, emotional function, self-worth) and the total quality-of-life score. Time-point 1 denotes admission, time-point 2 indicates pre-discharge evaluation, and time-point 3 corresponds to the 2-week short-term follow-up after hospital discharge. Repeated-measures analysis of variance identified a significant main effect of time for all PANQOLI sub-domain and total scores ($P < 0.001$), showing progressive elevation in patient-reported quality-of-life scores across these three time-points.

- **4. Changes in GCQ Comfort Scale Scores at Different Time Points Following Endoscopic Pancreatic Duct Stent Placement**
- Repeated-measures ANOVA was used to compare GCQ scores at admission, before discharge, and 2 weeks post-discharge; results are presented in Table 6. Significant time effects were observed for the total GCQ score and for the physical, psychological, social, and environmental dimension scores ($P < 0.001$). The total GCQ score increased progressively, from 57.82 ± 3.35 at admission to 93.51 ± 3.31 before discharge, and further to 103.55 ± 2.42 at 2 weeks post-discharge. Scores in all four dimensions likewise showed a steady upward trend (Fig. 2), indicating that endoscopic pancreatic duct stent placement comprehensively improves comfort in patients with acute pancreatitis.

Table 6
Comparison of GCQ sub-domain scores of participants at different time points(N = 146, $\bar{x} \pm s$)

Sub-domain	At admission	Before discharge	2-week post-discharge	Statistical value	P value
Physiological domain	7.88 ± 1.27	16.10 ± 0.92	18.67 ± 0.86	4291.312	<0.001
Psychological domain	19.73 ± 1.38	30.95 ± 1.26	34.47 ± 1.22	5116.861	<0.001
Social domain	17.32 ± 1.74	24.36 ± 2.02	27.01 ± 1.32	1197.874	<0.001
Environmental domain	12.89 ± 1.39	22.10 ± 1.80	23.40 ± 1.30	2104.306	<0.001
Total score	57.82 ± 3.35	93.51 ± 3.31	103.55 ± 2.42	7985.350	<0.001

Data are expressed as mean ± standard deviation. Repeated-measures analysis of variance was used for comparisons across different time points. $P < 0.001$ was considered statistically significant.

This 3-D waterfall plot visualizes the longitudinal score variations for four sub-domains (physiological, psychological, social, environmental) and the total comfort score. Time-point 1 indicates admission, time-point 2 represents pre-discharge evaluation, and time-point 3 corresponds to two-week follow-up after hospital discharge. Repeated-measures analysis of variance revealed a significant main effect of time for all GCQ sub-domain and total scores ($P < 0.001$), with comfort scores gradually elevated over the clinical course.

5. Correlation Analysis Between the Magnitude of Decrease in Inflammatory Markers and Improvement in Subjective Perceptions

To examine the relationship between improvement in objective inflammatory indicators and change in patient-reported outcomes, Pearson correlation analysis was used to assess associations between the magnitude of decrease in serum amylase, lipase, C-reactive protein (CRP), procalcitonin (PCT), and white blood cell (WBC) count, and the magnitude of improvement in PANQOLI scores, GCQ scores, and relief of individual subjective symptoms. Results are presented in Table 7 and Fig. 3.

The magnitude of decrease in amylase and lipase showed no significant correlation with improvement in PANQOLI or GCQ scores, or with relief of any subjective symptom (all $P > 0.05$). The decrease in CRP was weakly and negatively correlated with improvement in GCQ scores ($r = -0.24$, $P < 0.05$) but was not significantly associated with improvement in PANQOLI scores ($P > 0.05$). The decrease in PCT showed a weak negative correlation with relief of vomiting ($r = -0.20$, $P < 0.05$) and a weak positive correlation with relief of diarrhea ($r = 0.23$, $P < 0.05$). The decrease in WBC count showed only a weak positive correlation with relief of irritability/anger ($r = 0.23$, $P < 0.05$). All statistically significant correlation coefficients were low in absolute value, indicating weak associations.

Taken together, although patients showed marked improvement in inflammatory laboratory indicators, subjective symptoms, quality of life, and comfort following endoscopic pancreatic duct stent placement, no significant overall linear association was observed between the magnitude of decrease in inflammatory markers and the overall improvement in quality of life or comfort; only a few inflammatory markers showed weak correlations with a limited number of individual symptoms.

These findings suggest that recovery of objective laboratory parameters and improvement in patients' subjective perceptions represent relatively independent dimensions of treatment efficacy—the benefits of endoscopic pancreatic duct stent placement are not fully explained by reductions in inflammatory markers alone, and appear to independently enhance patients' self-perceived health status.

Table 7
Pearson correlation matrix for the reduction range of objective inflammatory indicators and improvement range of subjective outcomes in participants (N = 146, r)

Variable	GCQ Scale improvement	PANQOLI Scale improvement	Pain relief range	Vomiting relief range	Nausea relief range	Diarrhea relief range	Depression relief range	Anxiety relief range	Irritability relief range
Amylase reduction	-0.02	0.01	-0.09	-0.02	0.06	-0.11	0.18	-0.13	0.09
Lipase reduction	0.04	-0.02	-0.15	0.01	-0.04	-0.02	0.17	-0.10	0.15
CRP reduction	-0.24*	-0.11	0.16	-0.09	0.09	-0.03	-0.01	-0.01	0.00
PCT reduction	0.05	0.11	-0.07	-0.02*	-0.08	0.23*	-0.04	0.00	0.11
WBC reduction	0.16	0.07	-0.08	0.08	0.06	0.14	0.07	-0.07	0.23*

Note. Pearson's correlation coefficients (r) are presented in cells. N = 146. *$P < 0.05$, two-tailed. All pairwise correlations were tested via two-tailed Pearson correlation analysis.

Pearson's correlation coefficients (r) are displayed within each cell. N = 146. * $P < 0.05$, two-tailed test. The color gradient represents the magnitude of correlation coefficients; red indicates positive correlation, and blue indicates negative correlation.

DISCUSSION

In this study, we systematically evaluated dynamic changes in inflammatory markers, symptom burden, quality of life, and comfort from admission through discharge and 2 weeks post-discharge in patients with acute pancreatitis (AP) following endoscopic pancreatic duct stent placement, drawing on patient-reported outcomes (PROs)—including self-reported quality of life, clinical symptoms, and comfort—alongside objective clinical indicators (serum amylase, CRP, and white blood cell count). Pancreatic duct stent placement not only significantly improved objective inflammatory indicators but also concurrently enhanced patients' quality of life and comfort. Notably, this benefit was consistent across patients with biliary, hypertriglyceridemic, and other AP etiologies, suggesting favorable efficacy and broad clinical applicability of this procedure across etiological subtypes.

1. Etiological Composition and Clinical Characteristics of the Study Population

The etiological composition of AP exhibits marked population-level heterogeneity. Among the 146 patients enrolled in this study, biliary AP was the most common etiology (42.47%), followed by hypertriglyceridemic AP (38.36%)—a distribution broadly consistent with the etiological spectrum described in domestic AP clinical practice guidelines [1, 32].

Baseline characteristics also differed markedly by etiology: patients with biliary AP were generally older, more often female, and had lower educational attainment on average, whereas patients with hypertriglyceridemic AP were predominantly young to middle-aged males. This pattern aligns with findings from several regional population-based studies in China and elsewhere [4, 33]. In a study of 500 AP patients, biliary etiology was significantly more common among females than males ($P < 0.05$), while hypertriglyceridemic etiology remained relatively prevalent across both sexes [34]. A retrospective cohort of 702 AP patients likewise reported significant differences in sex, age, and body mass index across etiological subgroups [35]. Mechanistically, biliary pancreatitis is predominantly driven by gallstones or biliary obstruction and occurs more often in middle-aged and elderly women, whereas hypertriglyceridemia-associated pancreatitis is more common among young and middle-aged men and is closely linked to metabolic dysfunction and unhealthy lifestyle factors [36–38]. These demographic differences point to the need for etiology-tailored health education and disease management strategies in clinical practice.

Notably, self-perceived disease recovery and dietary recovery status at discharge did not differ significantly among the three etiological subgroups. This finding suggests that, despite substantial differences in demographic background and objective

clinical presentation during hospitalization, patients with different AP etiologies tend to converge on a comparable subjective recovery experience by the time of discharge following standardized inpatient treatment such as endoscopic pancreatic duct stent placement. This convergence offers a practical rationale for using patient-reported outcome measures to evaluate this procedure's efficacy, and underscores that clinical efficacy assessment should give equal weight to patient-reported outcomes—subjective symptoms, quality of life, and comfort—alongside traditional objective indicators such as laboratory and imaging findings.

2. Improvement in Quality of Life, Symptom Burden, Emotional Well-Being, and Comfort

Quality of life and treatment comfort are core patient-reported outcomes and important dimensions for evaluating the efficacy of pancreatic duct stent placement. As the traditional biomedical model—focused narrowly on biological indicators—gives way to a biopsychosocial model encompassing psychological and social functioning, PROs have emerged as a key tool embodying patient-centered care [39–40]. Because PROs capture health status and treatment experience directly from the patient, without interpretation by clinicians or third parties, they can reflect functional status and subjective experience that traditional objective measures often fail to quantify [41–42]—providing the theoretical rationale for using the PANQOLI and GCQ instruments in this study.

Across the three time points assessed (admission, before discharge, and 2 weeks post-discharge), PANQOLI total scores and all four dimension scores—physical function, role function, emotional function, and self-worth—increased continuously following stent placement. Physical symptoms including pain, nausea, vomiting, and diarrhea were significantly relieved, and negative emotions such as depression, anxiety/worry, and irritability/anger improved markedly. GCQ total comfort scores and scores across the physical, psychological, social, and environmental dimensions showed a corresponding progressive upward trend that persisted through 2 weeks post-discharge. These findings indicate that the therapeutic benefit of pancreatic duct stent placement extends beyond improvement in inflammatory laboratory markers to encompass synchronous, multi-domain gains in physical symptoms, psychological and emotional well-being, and social and environmental adaptation.

During an acute AP episode, severe abdominal pain and gastrointestinal symptoms impose substantial physiological stress; combined with uncertainty about disease prognosis, these factors readily provoke anxiety and depressed mood, directly impairing daily functioning and disrupting normal family and social roles. This is likely an important driver of the low quality-of-life and comfort scores observed early after admission in this cohort [40, 43–44]. In clinical practice, clinicians tend to rely on objective indicators such as serum amylase and CRP to judge treatment efficacy, potentially overlooking patients' subjective experience. It is not uncommon for patients with normalized inflammatory markers to nonetheless report residual abdominal discomfort and significant psychological distress—their subjective recovery lagging behind their laboratory recovery. Our findings suggest that pancreatic duct stent placement may address AP-related physical symptoms at their pathological source, by reducing intraductal pressure and mitigating pancreatic autodigestive injury. As physical distress resolves, psychological stress diminishes accordingly, in turn facilitating the restoration of social interaction and environmental adaptation—culminating in comprehensive improvement across quality of life and overall comfort.

Temporally, PANQOLI and GCQ scores across all dimensions continued to improve from discharge through 2 weeks post-discharge, indicating that physical and psychological recovery does not end at hospital discharge and that the post-discharge period remains a critical window for subjective recovery. Restoration of physical function enables resumption of daily activities; improved role function reflects a gradual return to family and social roles; rising psychological scores signal effective relief of negative emotion; and gains in the social and environmental dimensions represent patients' re-adaptation to their family and living environment.

This study's follow-up, however, extended only to 2 weeks post-discharge—a short-term observation window that constitutes a limitation of this analysis. Prior studies have shown that patients with moderately severe or severe AP may develop long-term complications such as diabetes mellitus and pancreatic exocrine insufficiency, leading to a sustained decline in quality of life[45–46], and such complications may similarly affect comfort over an extended period[47]. Clinical management should therefore not end with symptom control during hospitalization; continued attention to patients' physical symptoms, psychological status, and comfort after discharge—supported by appropriate follow-up care—remains essential. Taken together, patient-reported outcomes

can compensate for the limitations of traditional objective indicators and more comprehensively capture the true clinical benefit of pancreatic duct stent placement. We recommend that patient-reported outcome measures be formally incorporated into the AP efficacy assessment framework[48].

3. Relationship Between Objective Inflammatory Markers and Patient-Reported Outcomes

The findings above confirm that endoscopic pancreatic duct stent placement effectively reduces systemic inflammation while significantly improving quality of life, physical symptoms, negative emotions, and comfort. Whether these objective biological changes bear a direct linear relationship to improvement in subjective outcomes, however, warranted further investigation. Pearson correlation analysis revealed no significant correlation between the magnitude of decrease in serum amylase or white blood cell count and the magnitude of improvement in PANQOLI or GCQ scores, or with most symptom-relief indicators. Only a handful of weak associations emerged: the decrease in CRP was weakly and negatively correlated with GCQ improvement; the decrease in PCT showed weak correlations with relief of vomiting and diarrhea; and the decrease in WBC count was weakly correlated with relief of irritability/anger—though all statistically significant coefficients were low in absolute value. Overall, no stable linear relationship was observed between the magnitude of decrease in inflammatory markers and improvement in total quality-of-life or comfort scores. This finding suggests that normalization of inflammatory markers does not equate to proportional, synchronous improvement in patients' subjective experience, and that recovery of objective laboratory parameters and improvement in patient-reported outcomes constitute two relatively independent dimensions of treatment efficacy.

In clinical practice, decline in inflammatory markers is often treated as the principal basis for judging treatment efficacy, with the implicit assumption that greater biochemical improvement corresponds to better subjective recovery. Our findings do not support this assumption. The decrease in inflammatory markers primarily reflects the biological process of controlling pathological injury, whereas patients' subjective experience is shaped not only by the underlying pancreatic pathology but also by non-biological factors—individual pain tolerance, psychological coping style, illness perception, and family and social support[49–52]. Similar dissociations have been reported elsewhere[40, 53]: some patients with excellent biochemical recovery continue to experience persistent dull abdominal pain and anxiety with little improvement in quality of life, while others with only modest biochemical improvement report marked gains in physical comfort and psychological well-being.

This dissociation indicates that inflammatory laboratory markers alone cannot fully capture the therapeutic benefit of endoscopic pancreatic duct stent placement. The procedure exerts its effect by relieving pancreatic duct obstruction and reducing intraductal pressure through two partially distinct pathways: suppression of the pancreatic inflammatory cascade, reflected in improved laboratory markers [14], and direct relief of obstruction-related physical symptoms such as pain, which confers subjective benefit independently. Because these two pathways of benefit do not fully overlap, improvement in inflammatory markers need not track linearly with improvement in subjective outcomes.

CONCLUSION

This study demonstrates that endoscopic pancreatic duct stent placement is a safe and effective treatment for acute pancreatitis, significantly improving objective inflammatory markers, enhancing post-discharge quality of life and comfort, and alleviating clinical symptoms and negative emotions. This therapeutic benefit was consistent and generalizable across AP patients of differing etiologies. Further analysis revealed no significant correlation between improvement in objective inflammatory markers and improvement in subjective perceptions—a finding that does not indicate contradictory efficacy, but rather that objective indicators and patient-reported outcomes represent two relatively independent, parallel dimensions of treatment benefit, reflecting pathological resolution and patients' lived treatment experience, respectively. Efficacy evaluation and clinical management of AP should therefore fully recognize the value of patient-reported outcomes, integrating subjective measures—quality of life, symptom burden, emotional well-being, and comfort—with objective indicators within a dual-dimensional "objective indicators + patient-reported outcomes" evaluation framework. Individualized, etiology-directed treatment and strengthened post-discharge follow-up care should be pursued concurrently to further improve overall prognosis. This study provides patient-centered evidence

supporting the clinical standardization and rehabilitation management of endoscopic pancreatic duct stent placement for AP, and offers a valuable evidentiary supplement toward its future inclusion in AP clinical practice guidelines.

Limitations

This study has several limitations. First, it is a single-center cross-sectional survey with all cases drawn from one institution; the limited sample source warrants caution in generalizing findings to hospitals of different levels or settings. Second, follow-up extended only to 2 weeks post-discharge—a relatively short window that precludes assessment of the procedure's effects on long-term quality of life, pancreatitis recurrence, stent-related complications, and pancreatic functional impairment. Third, the original PANQOLI was developed for a chronic pancreatitis population; although the recall periods and certain item wordings were adapted and subsequently reviewed by experts, formal large-sample reliability and validity testing specific to the AP population has not yet been conducted. Fourth, this study lacked a control group without pancreatic duct stent placement and relied solely on within-patient pre- and post-treatment comparisons; the potential influence of concomitant comprehensive treatment and the natural disease course on outcome measures cannot therefore be fully excluded. Future multicenter, prospective, controlled studies with longer follow-up are warranted to further validate the true effect of endoscopic pancreatic duct stent placement on patient-reported outcomes and its long-term benefit in patients with AP.

Ethics Statement

This study was approved by the Ethics Committee of the General Hospital of Ningxia Medical University (Approval No. KYLL-2023-0509) and was conducted in accordance with the Declaration of Helsinki. The purpose and significance of the study were explained in detail to all patients, who were informed that questionnaires would not contain identifying names, and voluntary participation was confirmed through full informed consent. Survey data were coded using Arabic numerals only, and all collected data were used exclusively for statistical analysis. Patients' personal information was kept strictly confidential to protect their privacy.

Declarations

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding

Author Contribution

Y.Y. and W.Y. contributed equally to this work and share first authorship. Z.W. and B.L. contributed equally to this work and share corresponding authorship.Y.Y. and Z.W. were responsible for the conception and design of the study and secured funding for the project. B.L., J.W., and B.Y. were responsible for the design and analysis of the study instruments. X.W. and Z.M. were responsible for participant recruitment and for data collection and entry at each time point. Y.Y., W.Y., B.L., and Z.W. were responsible for data quality control and for the evaluation and revision of the adaptively modified PANQOLI instrument. Y.Y. drafted the initial manuscript. W.Y., Z.W., and B.L. critically revised the manuscript for important intellectual content. Z.W. and B.L. supervised the study and provided overall project administration. All authors read, critically reviewed, and approved the final manuscript.All authors have read and agreed to the published version of the manuscript.

Acknowledgement

The authors gratefully acknowledge all patients who participated in this study and the nursing and medical staff of the Department of Hepatobiliary Surgery, General Hospital of Ningxia Medical University, for their invaluable assistance in patient enrollment and

data collection.

Availability of data and materials

The datasets generated during and/or analysed during the current study are available from the first author and corresponding author on reasonable request.

References

1. Pancreatic Surgery Group, Chinese Society of Surgery, Chinese Medical Association. Chinese guidelines for the diagnosis and management of acute pancreatitis (2021). Chin J Surg. 2021;59(7):578–87. https://doi.org/10.3760/cma.j. cn112139-20210416-00172.
2. Iannuzzi JP, King JA, Leong JH, et al. Global Incidence of Acute Pancreatitis Is Increasing Over Time: A Systematic Review and Meta-Analysis. Gastroenterology. 2022;162(1):122–34. https://doi.org/10.1053/j.gastro.2021.09.043.
3. Peery AF, Murphy CC, Sandler RS, et al. Burden and Cost of Gastrointestinal, Liver, and Pancreatic Diseases in the United States: Update 2024. Gastroenterology. 2025;168(5):1000–24. https://doi.org/10.1053/j.gastro.2024.12.029. . Epub February 4, 2025. PMID: 39920892; PMCID: PMC12018144.
4. DING H, SUN B. Current status and future directions of diagnosis and treatment for acute pancreatitis in China. Chin J Pract Surg. 2022;42(1):1–7. https://doi.org/10.19538/j.cjps.issn1005-2208.2022.01.01.
5. Zerem E. Treatment of severe acute pancreatitis and its complications. World J Gastroenterol. 2014;20(38):13879–90. https://doi.org/10.3748/wjg.v20.i38.13879.
6. FENG J, ZHANG P. Pathogenesis of hypertriglyceridemic acute pancreatitis induced by pancreatic hypertension. J Clin Hepatol. 2024;40(1):186–90. https://doi.org/10.12449/JCH240134.
7. Emergency Medicine Branch of China International Exchange and Promotive Association for Medical and Health Care, Sepsis Prevention and Blockade Alliance. Emergency expert consensus on prevention and intervention of severe acute pancreatitis. Chin J Emerg Med. 2022;42(5):369–79. https://doi.org/10.3969/j.issn. 1002-1949.2022.05.001.
8. WANG Z. Pancreatic duct stent implantation for acute pancreatitis. Internal research report. Volume 24. General Hospital of Ningxia Medical University, Ningxia, China; 2019.
9. WANG Z. Early endoscopic transpapillary pancreatic duct drainage for acute biliary pancreatitis and clinical application of endoscopic pancreatic manometry. Internal research report. General Hospital of Ningxia Medical University, Ningxia, China; May 15, 2023.
10. Wang Z, Yao W, Yao J, et al. Treatment of acute pancreatitis with pancreatic duct decompression via ERCP is effective: a retrospective study. Ann Transl Med. 2020;8(12):756. https://doi.org/10.21037/atm-20-4198.
11. ZHAO C, WANG YAOW. Efficacy of pancreatic duct stenting in hypertriglyceridemic pancreatitis: a report of 33 cases. Chin J Gen Surg. 2021;30(9):1023–30. https://doi.org/10.7659/j.issn.1005-6947.2021.09.005.
12. CHEN L, ZHAO C. Efficacy of early pancreatic duct stent placement in acute necrotizing pancreatitis: a report of 57 cases. Chin J Gen Surg. 2023;32(9):1379–86. https://doi.org/10.7659/j.issn.1005-6947.2023.09.011.
13. Yao W, Wang Z, Yang Y, et al. Treatment of acute pancreatitis with early pancreatic stenting: a case series of 336 patients. Gland Surg. 2021;10(9):2780–9. https://doi.org/10.21037/gs-21-574. . PMID: 34733727; PMCID: PMC8514316.
14. YANG Y, XIN G, LIU M, et al. Clinical value of pancreatic duct stent drainage in the management of acute biliary pancreatitis. Chin J Gen Surg. 2022;31(3):369–75. https://doi.org/10.7659/j.issn.1005-6947.2022.03.010.
15. WANG M, YANG Y, ZHANG H, et al. Influence of pancreatic duct stents on post-ERCP pancreatitis in patients with difficult biliary cannulation. J Clin Hepatol. 2025;41(9):1877–80. https://doi.org/10.12449/JCH250924.
16. Conrad CC, Ellrichmann M. Stent placement in pancreatic disease, when, which and why?–a current perspective. Front Gastroenterol. 2023;3:1039649. https://doi.org/10.3389/fgstr.2022.1039649. . PMID: 41822084; PMCID: PMC12952463.
17. Knoph CS, Pandanaboyana S. Optimising Pain Relief in Acute Pancreatitis: An Evidence-Based Approach. J Clin Med. 2025;15(1):113. https://doi.org/10.3390/jcm15010113. . PMID: 41517363; PMCID: PMC12786627.

18. Pezzilli R, Morselli-Labate AM, Casadei R et al. Evaluation of patient-reported outcome in subjects treated medically for acute pancreatitis: a follow-up study. Pancreatology. 2009;9(4):375–382. https://doi.org/10.1159/000181171. Epub May 19, 2009. PMID: 19451747.
19. Jenkinson C, Gray A, Doll H et al. The PAN-PROsMISE study: design and validation of a patient-reported outcome measure scale in acute pancreatitis. Gut. 2021;70(1):139–146. https://doi.org/10.1136/gutjnl-2020-320729. Epub April 3, 2020. PMID: 32245906.
20. ZHANG X, LI R, LIN J, et al. Concept analysis and research progress of patient-reported outcomes. Chin Health Econ. 2025;44(4):1–7. 10.27030/j.cnki.23-1042/f.2025.04.001.
21. Calvert M, Blazeby J, Group CONSORTPRO et al. Reporting of patient-reported outcomes in randomized trials: the CONSORT PRO extension. JAMA. 2013;309(8):814–822. https://doi.org/10.1001/jama.2013.879. PMID: 23443445.
22. Patrick DL, Burke LB, Kennedy DL et al. Patient-reported outcomes to support medical product labeling claims: FDA perspective. Value Health. 2007;10(Suppl 2):S125-S137. https://doi.org/10.1111/j.1524-4733.2007.00275.x. PMID: 17995471.
23. US Department of Health and Human Services, Center for Drug Evaluation and Research. Guidance for industry: patient-reported outcome measures: use in medical product development to support labeling claims: draft guidance. Health Qual Life Outcomes. 2006;4:79. https://doi.org/10.1186/1477-7525-4-79. . PMID: 17034633; PMCID: PMC1629006.
24. Calvert M, Kyte D, Mercieca-Bebber R et al. Guidelines for Inclusion of Patient-Reported Outcomes in Clinical Trial Protocols: The SPIRIT-PRO Extension. JAMA. 2018;319(5):483–494. https://doi.org/10.1001/jama.2017.21903. PMID: 29411037.
25. Liu J, Ye X, Yao Y, et al. Tube-bearing experience of patients with biliary and pancreatic diseases outside the hospital: based on qualitative study. BMC Gastroenterol. 2025;25(1):733. https://doi.org/10.1186/s12876-025-04317-9. . PMID: 41087915; PMCID: PMC12522702.
26. CHEN J, PENG Y, XI H, et al. Application status of quality of life scales for chronic pancreatitis patients. Chin J Pancreatol. 2021;21(5):379–83. https://doi.org/10.3760/cma.j.cn115667-20210415-00080.
27. Wassef W, DeWitt J, McGreevy K et al. Pancreatitis Quality of Life Instrument: A Psychometric Evaluation. Am J Gastroenterol. 2016;111(8):1177–1186. https://doi.org/10.1038/ajg.2016.225. Epub June 14, 2016. PMID: 27296943.
28. Aivaliotis VI, Lee Y, Zia J, Wassef W et al. Telephone-Based Mindfulness Therapy Intervention for Patients with Chronic Pancreatitis. Dig Dis Sci. 2017;62(2):502–509. https://doi.org/10.1007/s10620-016-4389-6. Epub December 8, 2016. PMID: 27933469.
29. WANG Y, TAO H, ZHAO Q, et al. Psychometric evaluation of the Chinese version of Pancreatitis Quality of Life Instrument in patients with chronic pancreatitis. Chin J Pancreatol. 2023;23(6):444–8. https://doi.org/10.3760/cma.j. cn115667-20230803-00006.
30. Kolcaba KY. Holistic comfort: operationalizing the construct as a nurse-sensitive outcome. ANS Adv Nurs Sci. 1992;15(1):1–10. https://doi.org/10.1097/00012272-199209000-00003. PMID: 1519906.
31. ZHU L, GAO F, LUO H, et al. Reliability and validity test of General Comfort Questionnaire. Chin J Pract Nurs. 2006;1357–9. https://doi.org/10.3760/cma.j.issn. 1672-7088.2006.13.034.
32. Emergency Medicine Branch of Chinese Medical Association, Emergency Specialized Branch of Shanghai Medical Association. Expert consensus on emergency diagnosis and management of acute pancreatitis. Chin J Emerg Med. 2024;33(4):470–9. https://doi.org/10.3760/cma.j.issn.1671-0282.2024.04.004.
33. International Association of Pancreatology. Revised Guidelines on Acute Pancreatitis. 2025: Supported and Endorsed by the American Pancreatic Association, European Pancreatic Club, Indian Pancreas Club, and Japan Pancreas Society. Pancreatology. 2025;25(6):770–814. https://doi.org/10.1016/j.pan.2025.04.020. Epub July 10, 2025. PMID: 40651900.
34. ZHENG B, PENG J. Analysis of etiological and severity risk factors among 500 patients with acute pancreatitis in Xinjiang region. J Clin Med Pract. 2017;21(5):75–7889. https://doi.org/10.7619/jcmp.201705021.
35. QU Y, CAO F, DING Y, et al. Clinical characteristics and prognosis of acute pancreatitis with different etiologies. Chin J Dig Surg. 2025;24(5):623–9. https://doi.org/10.3760/cma.j.cn115610-20250305-00086.
36. Lu J, Wang Z, Mei W, et al. A systematic review of the epidemiology and risk factors for severity and recurrence of hypertriglyceridemia-induced acute pancreatitis. BMC Gastroenterol. 2025;25(1):374. https://doi.org/10.1186/s12876-025-03954-4.

37. Li S, Zhou J, Luo GX, et al. Comparison of clinical characteristics between first-episode and recurrent acute hypertriglyceridemic pancreatitis: A national multicenter clinical research. Chin J Dig Surg. 2024;23(5):703–11. https://doi.org/10.3760/cma.j.cn115610-20240308-00146.
38. Expert Consensus Group for Diagnosis and Treatment of Hypertriglyceridemic Acute Pancreatitis. Emergency expert consensus on diagnosis and management of hypertriglyceridemic acute pancreatitis. Chin J Emerg Med. 2021;30(8):937–47.
39. GAO Y, LIANG S, YU C, et al. Interpretation of COSMIN Reporting Guideline Version 2.0 for measurement property studies of patient-reported outcome measures. Chin J Evid Based Med. 2026;26(3):359–65. https://doi.org/10.7507/1672-2531.
40. Gagnier JJ, de Arruda GT, Terwee CB, Mokkink LB, COSMIN Consensus Group. COSMIN reporting guideline for studies on measurement properties of patient-reported outcome measures: version 2.0. Qual Life Res. 2025;34(7):1901–1911. https://doi.org/10.1007/s11136-025-03950-x. Epub March 28, 2025. PMID: 40153128.
41. GU J. Current status, challenges and prospects of patient-reported outcomes in surgical clinical practice. Chin J Gastrointest Surg. 2026;29(5):648–52. https://doi.org/10.3760/cma.j.cn441530-20260421-000172.
42. Di Maio M, Basch E, ESMO Guidelines Committee. The role of patient-reported outcome measures in the continuum of cancer clinical care: ESMO Clinical Practice Guideline. Ann Oncol. 2022;33(9):878–892. https://doi.org/10.1016/j.annonc.2022.04.007. Epub April 21, 2022. PMID: 35462007.
43. Mishel MH. Uncertainty in illness. Image J Nurs Sch. 1988;20(4):225–232. https://doi.org/10.1111/j.1547-5069.1988.tb00082.x. PMID: 3203947.
44. Olesen SS, Phillips AE, Drewes AM, Pancreatic Quantitative Sensory Testing Consortium. Overlap and cumulative effects of pancreatic duct obstruction, abnormal pain processing and psychological distress on patient-reported outcomes in chronic pancreatitis. Gut. 2022;71(12):2518–2525. https://doi.org/10.1136/gutjnl-2021-325855. Epub October 21, 2021. PMID: 34675068.
45. Gál E, Dolenšek J, Venglovecz V, et al. Mechanisms of Post-Pancreatitis Diabetes Mellitus and Cystic Fibrosis-Related Diabetes: A Review of Preclinical Studies. Front Endocrinol (Lausanne). 2021;12:715043. https://doi.org/10.3389/fendo.2021.715043. . PMID: 34566890; PMCID: PMC8461102.
46. Rickels MR, Norris AW, Hull RL. A tale of two pancreases: exocrine pathology and endocrine dysfunction. Diabetologia. 2020;63(10):2030–9. https://doi.org/10.1007/s00125-020-05210-8. . Epub September 7, 2020. PMID: 32894313; PMCID: PMC7646259.
47. STARSurg C. Quality of life instruments in acute and chronic pancreatitis: a COSMIN-based consensus approach for health measurement instrument selection. HPB (Oxford). 2024;26(7):859–872. https://doi.org/10.1016/j.hpb.2024.04.004. Epub April 26, 2024. PMID: 38735815.
48. Abou-Ayash S, Fonseca M, Reissmann DR et al. Treatment effect of implant-supported fixed complete dentures and implant overdentures on patient-reported outcomes: A systematic review and meta-analysis. Clin Oral Implants Res. 2023;34(Suppl 26):177–195. https://doi.org/10.1111/clr.14065. PMID: 37750530.
49. Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. JAMA. 1995;273(1):59–65. PMID: 7996652.
50. Turk DC, Okifuji A. Psychological factors in chronic pain: evolution and revolution. J Consult Clin Psychol. 2002;70(3):678–690. https://doi.org/10.1037//0022-006x.70.3.678. PMID: 12090376.
51. Petrie KJ, Weinman J. Why illness perceptions matter. Clin Med (Lond). 2006;6(6):536–9. https://doi.org/10.7861/clinmedicine.6-6-536. . PMID: 17228551; PMCID: PMC4952762.
52. Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. Psychol Bull. 1985;98(2):310–57. PMID: 3901065.
53. Tenner S, Vege SS, Sheth SG, Sauer B, Yang A, Conwell DL, Yadlapati RH, Gardner TB. American College of Gastroenterology Guidelines: Management of Acute Pancreatitis. Am J Gastroenterol. 2024;119(3):419–37. https://doi.org/10.14309/ajg.0000000000002645. . Epub November 7, 2023. PMID: 38857482; PMCID: PMC13221274.

Figures

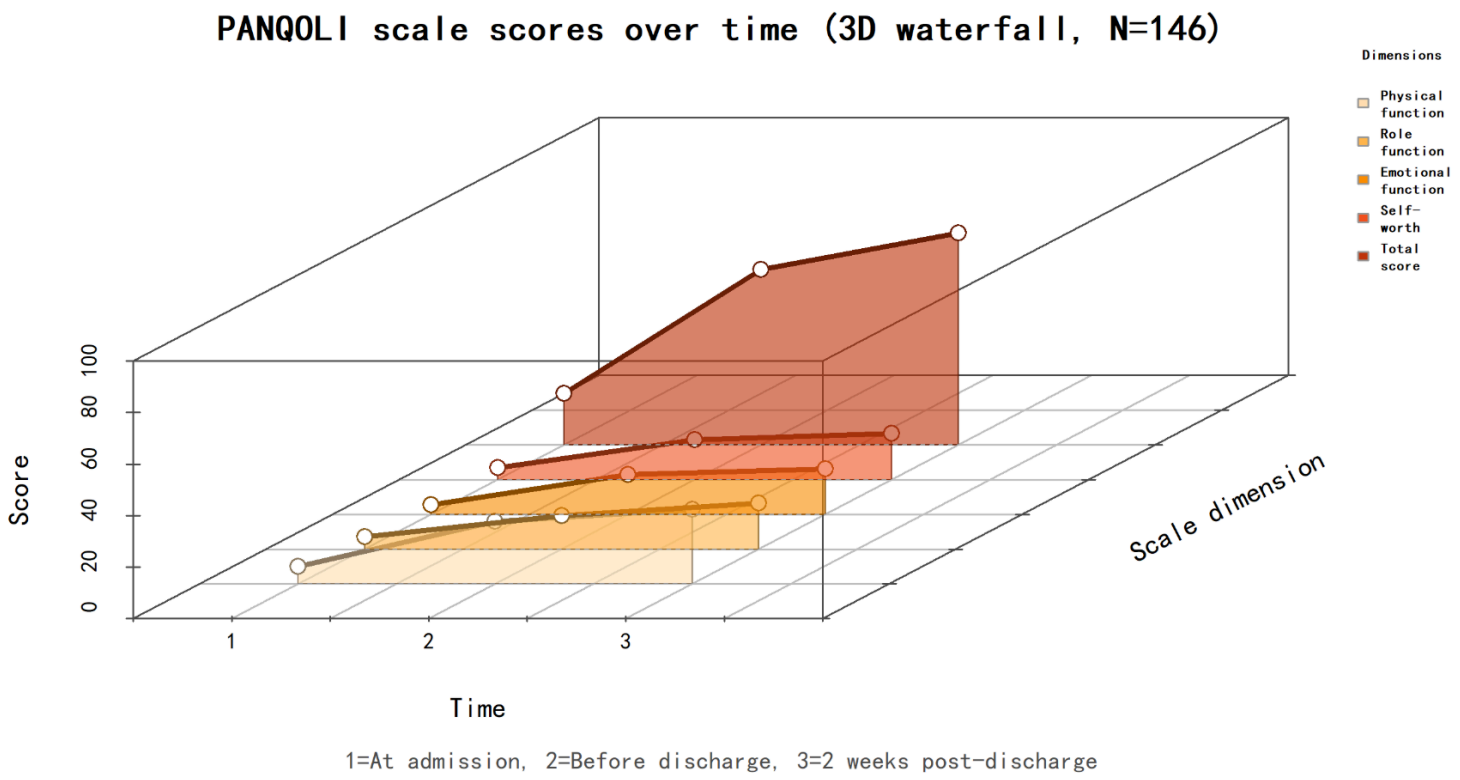


Figure 1

Changes in PANQOLI scale scores at different assessment time-points among patients receiving endoscopic pancreatic stent placement (N = 146).

This 3-D waterfall plot visualizes score variations across four sub-domains (physical function, role function, emotional function, self-worth) and the total quality-of-life score. Time-point 1 denotes admission, time-point 2 indicates pre-discharge evaluation, and time-point 3 corresponds to the 2-week short-term follow-up after hospital discharge. Repeated-measures analysis of variance identified a significant main effect of time for all PANQOLI sub-domain and total scores ($P < 0.001$), showing progressive elevation in patient-reported quality-of-life scores across these three time-points.

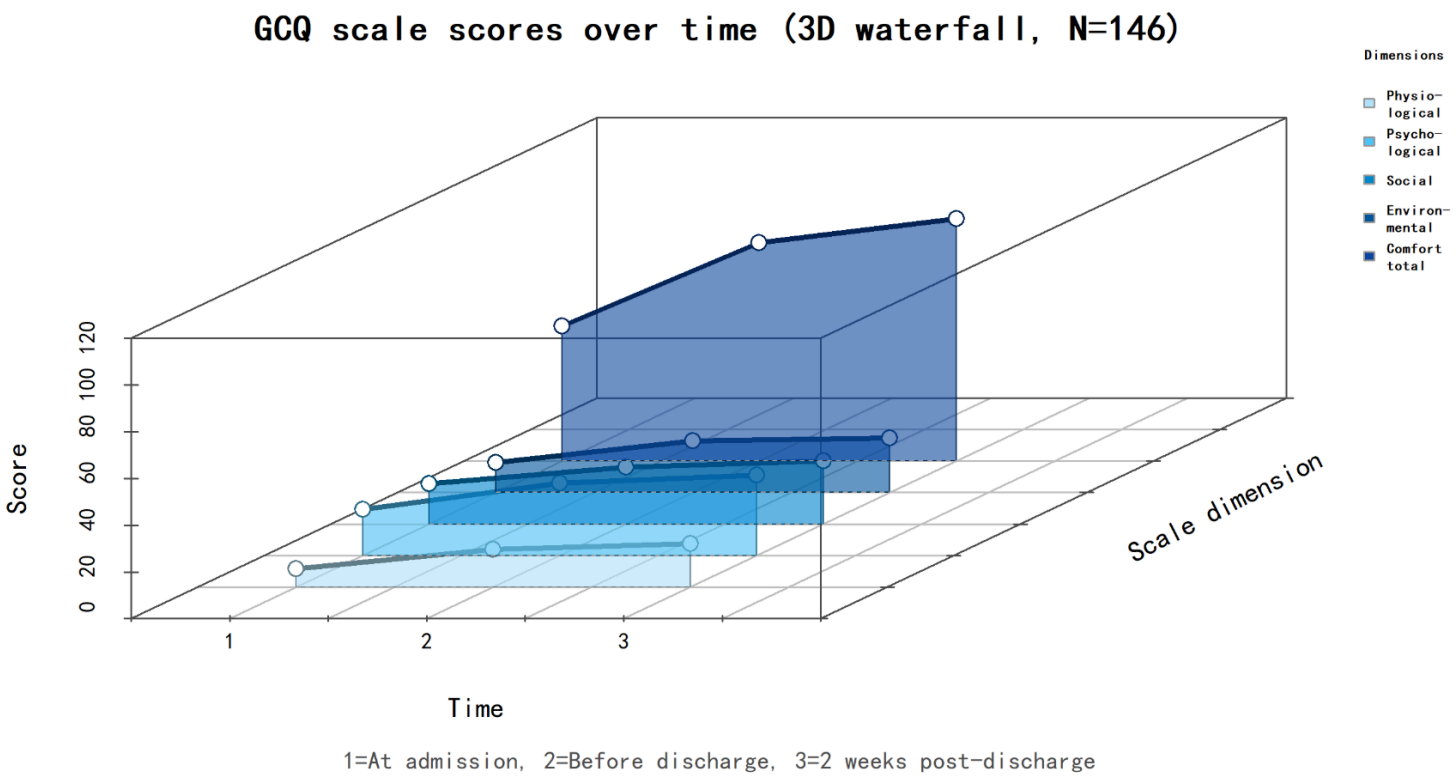


Figure 2

Changes in General Comfort Questionnaire (GCQ) scores across three assessment time-points among participants who underwent endoscopic pancreatic stent placement (N = 146).

This 3-D waterfall plot visualizes the longitudinal score variations for four sub-domains (physiological, psychological, social, environmental) and the total comfort score. Time-point 1 indicates admission, time-point 2 represents pre-discharge evaluation, and time-point 3 corresponds to two-week follow-up after hospital discharge. Repeated-measures analysis of variance revealed a significant main effect of time for all GCQ sub-domain and total scores (P<0.001), with comfort scores gradually elevated over the clinical course.

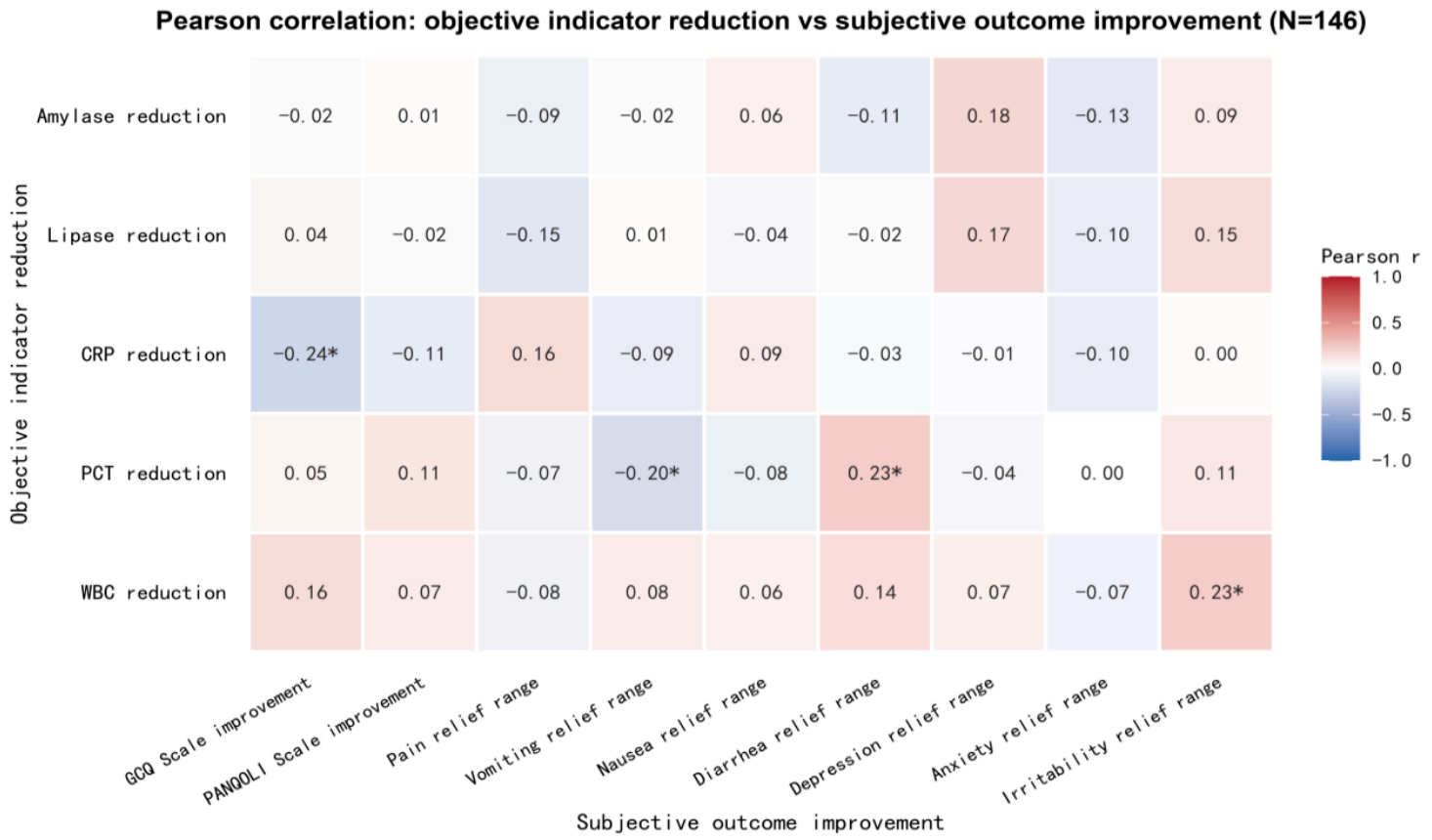


Figure 3

Heatmap of Pearson correlation coefficients between the reduction range of objective inflammatory indicators and the improvement range of patient-reported subjective outcomes.

Pearson's correlation coefficients (r) are displayed within each cell. N=146. * *P*<0.05, two-tailed test. The color gradient represents the magnitude of correlation coefficients; red indicates positive correlation, and blue indicates negative correlation.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Tables.docx