



Comparative Analysis of Scoring Systems in Acute Pancreatitis: Evaluating PASS and CSSS For Clinical Severity and Outcome Prediction

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Abstract

Objective: Acute pancreatitis (AP) presents with a wide clinical spectrum, ranging from mild self-limited disease to life-threatening organ failure. Accurate early risk stratification is essential for guiding intensive monitoring and resource utilisation. Existing prognostic tools differ in accuracy, complexity and bedside practicality. This study compared the Glasgow (Imrie) score, the Pancreatitis Activity Scoring System (PASS) and the Chinese Simple Scoring System (CSSS) for early severity stratification and prediction of in-hospital mortality.

Methods: A hospital-based retrospective observational study was conducted in the Department of General Surgery, Government Medical College, Jammu, over a twelve-month period from February 2025 to January 2026. Of 187 patients screened, 156 fulfilled the Revised Atlanta diagnostic criteria and 100 eligible patients formed the final cohort. Primary endpoints were development of severe acute pancreatitis (SAP), classified according to the Revised Atlanta Classification as persistent organ failure (>48 hours), and in-hospital mortality. Receiver operating characteristic (ROC) analysis was used to derive the area under the curve (AUC), optimal cut-off values, sensitivity, specificity, positive predictive value and negative predictive value for each score.

Results: Of the 100 patients included in the final analysis, 54 (54%) were classified as mild acute pancreatitis, 11 (11%) as moderately severe, and 35 (35%) as severe acute pancreatitis. Eight patients (8%) died during the index admission. The Glasgow score showed the strongest discrimination for early severity prediction (AUC 0.841), while PASS assessed on day 7 was superior for mortality prediction (AUC 0.832). CSSS occupied an intermediate position for severity (AUC 0.798) and was the most specific predictor of mortality (84.8%). All three systems achieved negative predictive values above 95% for in-hospital mortality.

Conclusion: The Glasgow score, calculated from routinely available admission parameters, provided the most accurate early identification of severe acute pancreatitis, and day-7 PASS assessment provided the most accurate prediction of in-hospital mortality. Both scores are readily applicable at the bedside and offer complementary prognostic information for risk assessment in a tertiary surgical setting.

Keywords: Acute Pancreatitis; Glasgow Score; Pancreatitis Activity Scoring System; Chinese Simple Scoring System; Severity Stratification; Mortality Prediction

Abbreviations

AP: Acute Pancreatitis; PASS: Pancreatitis Activity Scoring System; CSSS: Chinese Simple Scoring System; SAP: Severe Acute Pancreatitis; ROC: Receiver Operating Characteristic; AUC: Area Under the Curve; PPV: Positive Predictive Value; NPV: Negative Predictive Value.

Introduction

Acute pancreatitis is an inflammatory condition of the pancreas whose clinical course varies from a mild, self-resolving illness to a fulminant disease characterised by persistent organ failure and substantial mortality [1]. Global incidence estimates range between 3 and 80 cases per 100 000 population [2,3]. Reliable population-based data for India remain limited, although ongoing multicentre surveillance and regional studies from southern India indicate a substantial disease burden [2,3]. While the majority of patients recover with supportive care, approximately one-fifth progress to severe disease with local or systemic complications. Case fatality rises from roughly 3% in interstitial oedematous pancreatitis to nearly 20% once necrosis develops [2,4]. Early recognition of patients who might suffer an adverse course is therefore a prerequisite for appropriate monitoring intensity, timely supportive interventions and rational use of intensive-care resources [1,2].

Multiple prognostic tools have been proposed, among them the Ranson criteria, the Glasgow (Imrie) score, APACHE II, BISAP, the CT Severity Index, the Pancreatitis Activity Scoring System (PASS) and the Chinese Simple Scoring System (CSSS) [1,4-6]. Several of these scores are limited by delayed completion, requirement of numerous laboratory variables or restricted bedside applicability [1]. PASS and CSSS were introduced more recently in an attempt to address some of these shortcomings, PASS by incorporating dynamic markers of disease activity and CSSS by relying on readily obtainable parameters [4,5]. Comparative data on the relative performance of PASS, CSSS and the traditional Glasgow score remain limited in South Asian surgical populations. Because these scoring systems require complete imaging data for full implementation, their application is best characterised within tertiary-centre cohorts in which standardised imaging protocols are in place. The present study evaluates these three systems in such a setting.

Objectives

Primary objectives

- To compare the discriminatory ability of the Glasgow score, PASS and CSSS for early identification of severe acute pancreatitis within 48 hours of admission.
- To compare the same three scoring systems for

prediction of in-hospital mortality.

Secondary objectives

- To determine optimal cut-off values and the corresponding sensitivity, specificity, positive and negative predictive values for each score.
- To examine associations of demographic, comorbid and laboratory variables with disease severity and outcome.
- To identify which scoring tool is most practical for bedside use in a resource-limited surgical setting and to explore the complementary prognostic information provided by the scores.

Material and Methods

Study Design and Setting

This hospital-based retrospective observational study was performed in the Department of General Surgery, Government Medical College, Jammu, over a twelve-month period from February 2025 to January 2026. The protocol received approval from the Institutional Ethics Committee; written informed consent was waived because of the retrospective design and use of anonymised data.

Study Population

During the 12-month study period (February 2025–January 2026), 187 patients were admitted with suspected acute pancreatitis. Of these, 156 fulfilled diagnostic criteria (≥ 2 of 3 Revised Atlanta criteria). A total of 56 patients were subsequently excluded: 12 for chronic pancreatitis or acute-on-chronic presentation, 8 for recurrent pancreatitis, 18 for incomplete clinical data within 48 hours, 14 for unavailable or suboptimal contrast-enhanced CT imaging, and 4 for acute pancreatitis secondary to immediately life-threatening comorbidity. The final cohort comprised 100 consecutive eligible patients treated at a tertiary surgical centre where contrast-enhanced CT imaging is available and performed routinely.

Inclusion Criteria

Age ≥ 18 years.

First episode of acute pancreatitis.

Availability of clinical, biochemical and radiological data sufficient to calculate all three scoring systems within 48 hours of admission, specifically including early contrast-enhanced computed tomography.

Exclusion Criteria

Age < 18 years.

Clinical or radiological evidence of chronic pancreatitis or an acute-on-chronic episode.

Pregnancy.

Incomplete records precluding calculation of any of the three scores.

Acute pancreatitis occurring secondary to another immediately life-threatening illness.

Data Collection

Demographic details, clinical features, comorbidities and aetiological risk factors were extracted from institutional records. Laboratory investigations and contrast-enhanced cross-sectional imaging performed within the first 48 hours were used to compute the three scores. The principal outcome was severe acute pancreatitis as defined by the Revised Atlanta Classification [1]. The secondary outcome was in-hospital mortality.

Scoring Systems

Glasgow (Imrie) score. This simplified adaptation of the Ranson criteria incorporates eight variables (age, white-cell count, serum glucose, urea, arterial PaO₂, calcium, lactate dehydrogenase and albumin). Each abnormal value contributes one point; a total of three or more is conventionally regarded as indicating severe disease [1].

Pancreatitis Activity Scoring System (PASS). PASS integrates five weighted components: organ failure, intolerance of solid oral intake, SIRS criteria, morphine-equivalent analgesic requirement and patient-reported pain intensity on a 0–10 scale. Organ failure was defined by a modified Marshall score ≥ 2 ; oral intolerance by recurrence of pain or vomiting on re-feeding; and SIRS by the presence of two or more conventional criteria. Because PASS

incorporates dynamic markers of organ dysfunction that overlap temporally with the definition of severe pancreatitis (persistent organ failure >48 hours), PASS was assessed on day 7 of admission for mortality prediction, creating temporal separation between measurement and outcome definition. Component weightings are summarised in Table 1.

Parameter	Weighting factor
Organ system failure (per affected system)	$\times 100$
Each SIRS criterion satisfied	$\times 25$
Pain rating (0–10 numerical scale)	$\times 5$
Morphine-equivalent analgesic dose (mg)	$\times 5$
Intolerance of solid oral feeding (present = 1)	$\times 40$

Table 1: Component weightings of the Pancreatitis Activity Scoring System.

SIRS, systemic inflammatory response syndrome. Adapted from Buxbaum, et al. [5]. **Chinese Simple Scoring System (CSSS).** CSSS comprises six routinely available variables: serum creatinine, blood glucose, lactate dehydrogenase, heart rate, C-reactive protein and extent of pancreatic necrosis on contrast-enhanced CT, yielding a maximum score of 9 points. Cut-off values for the present cohort were derived from ROC analysis using the Youden index. Component thresholds appear in Table 2.

Parameter	Score 0	Score 1	Score 2	Score 3	Score 4
Serum creatinine ($\mu\text{mol/L}$)	< 100	≥ 100	—	—	—
Serum glucose (mmol/L)	< 12	≥ 12	—	—	—
Lactate dehydrogenase (U/L)	< 380	≥ 380	—	—	—
C-reactive protein (mg/L)	< 65	≥ 65	—	—	—
Heart rate (beats/min)	< 100	≥ 100	—	—	—
Pancreatic necrosis (% of gland)	0	< 30	30–50	50–70	> 70

Table 2: Component thresholds of the Chinese Simple Scoring System.

Adapted from Wang, et al. [6].

Statistical Analysis

Analyses were performed with IBM SPSS Statistics version 25.0. Categorical variables are presented as frequencies and percentages; continuous variables as mean $\pm$ standard deviation. Group comparisons used the chi-square or Fisher exact test for categorical data and the independent-samples t-test for normally distributed continuous data. A two-sided p-value < 0.05 was considered statistically significant. ROC curve analysis provided the area under the curve (AUC) with 95% confidence intervals for each scoring

system and for individual continuous predictors; optimal cut-offs were identified by the Youden index, from which sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were derived.

Results

Baseline Characteristics

According to the Revised Atlanta Classification, patients were categorised as mild (no organ failure and no local or systemic complications), moderately severe (transient organ

failure resolving within 48 hours and/or local or systemic complications without persistent organ failure), or severe acute pancreatitis (persistent organ failure lasting >48 hours). The final cohort comprised 100 patients: 54 (54%) mild, 11 (11%) moderately severe, and 35 (35%) severe acute pancreatitis. For analytical purposes, patients with

mild and moderately severe disease were combined into a non-severe group (n = 65) and compared with the severe group (n = 35). Increasing age, higher body mass index, alcohol use and prolonged hospital stay were significantly associated with severe disease (Table 3).

Variable	Non-severe (n = 65)	Severe (n = 35)	p value	AUC
Age, years (mean $\pm$ SD)	45.8 $\pm$ 14.9	53.1 $\pm$ 17.2	0.002*	0.626
Male sex, n (%)	50 (76.9)	28 (80.0)	0.712	—
Body mass index, kg/m ² (mean $\pm$ SD)	23.2 $\pm$ 4.1	25.1 $\pm$ 4.7	0.003*	0.62
Hyperlipidaemia, n (%)	8 (12.3)	7 (20.0)	0.312	—
Type 2 diabetes mellitus, n (%)	6 (9.2)	4 (11.4)	0.734	—
Gallstone disease, n (%)	27 (41.5)	14 (40.0)	0.881	—
Current alcohol use disorder, n (%)	7 (10.8)	16 (45.7)	< 0.001*	—
History of significant alcohol intake, n (%)	19 (29.2)	25 (71.4)	< 0.001*	—
Length of hospital stay, days (mean $\pm$ SD)	11.9 $\pm$ 7.6	17.8 $\pm$ 12.4	0.002*	0.658
In-hospital mortality, n (%)	1 (1.5)	7 (20.0)	0.002*	—

Table 3: Demographic and clinical profile stratified by disease severity

AUC, area under the receiver operating characteristic curve; SD, standard deviation. *p < 0.05. AUC is reported for continuous variables only.

Laboratory Findings on Admission

Compared with patients who remained non-severe, those who progressed to severe disease displayed significantly higher leukocyte counts, blood urea, creatinine, alanine aminotransferase, fasting glucose, lactate dehydrogenase, triglycerides and C-reactive protein, together with lower

serum albumin and calcium concentrations. C-reactive protein and lactate dehydrogenase showed the strongest individual discrimination for severe disease (AUC 0.801 and 0.792 respectively). These laboratory differences are consistent with a more intense systemic inflammatory response and early multi-organ involvement (Table 4).

Laboratory parameter	Non-severe (n = 65)	Severe (n = 35)	p value	AUC
Leukocyte count ($\times 10^9$ /L)	10.2 $\pm$ 4.7	15.3 $\pm$ 6.8	< 0.001*	0.731
Haemoglobin (g/L)	129.4 $\pm$ 20.8	126.7 $\pm$ 29.1	0.591	0.53
Blood urea (mmol/L)	4.5 $\pm$ 1.6	7.4 $\pm$ 4.9	< 0.001*	0.713
Serum creatinine (μ mol/L)	75.2 $\pm$ 32.4	118.6 $\pm$ 105.3	< 0.001*	0.653
Serum albumin (g/L)	38.1 $\pm$ 6.9	33.4 $\pm$ 7.6	< 0.001*	0.676
Alanine aminotransferase (U/L)	64.3 $\pm$ 98.7	112.5 $\pm$ 278.4	0.008*	0.565
Serum calcium (mmol/L)	2.22 $\pm$ 0.22	1.97 $\pm$ 0.35	< 0.001*	0.727
Fasting glucose (mmol/L)	7.2 $\pm$ 3.5	10.8 $\pm$ 5.6	< 0.001*	0.707
Lactate dehydrogenase (U/L)	228.4 $\pm$ 97.6	445.2 $\pm$ 248.1	< 0.001*	0.792
Serum triglycerides (mmol/L)	2.7 $\pm$ 1.3	4.8 $\pm$ 5.9	< 0.001*	0.636
C-reactive protein (mg/L)	74.6 $\pm$ 55.1	145.9 $\pm$ 63.7	< 0.001*	0.801

Table 4: Admission laboratory parameters stratified by disease severity.

AUC, area under the receiver operating characteristic curve. *p < 0.05.

Factors Associated with Mortality

Eight patients (8%) died during the index admission. Non-survivors were older and showed more pronounced renal impairment, hypo-albuminaemia, hypocalcaemia and

elevations of glucose, lactate dehydrogenase and C-reactive protein than survivors. Blood urea and serum albumin demonstrated the strongest individual discrimination for in-hospital death (AUC 0.986 and 0.821 respectively; Table 5).

Variable	Survivors (n = 92)	Non-survivors (n = 8)	p value	AUC
Age, years (mean $\pm$ SD)	47.6 $\pm$ 15.8	54.8 $\pm$ 19.1	0.041*	0.614
Male sex, n (%)	71 (77.2)	7 (87.5)	0.682	—
Length of hospital stay, days	14.3 $\pm$ 9.5	9.1 $\pm$ 13.7	0.038*	0.622
Leukocyte count ($\times 10^9$ /L)	11.7 $\pm$ 5.5	15.1 $\pm$ 8.9	0.018*	0.627
Blood urea (mmol/L)	5.2 $\pm$ 3.3	13.1 $\pm$ 1.4	< 0.001*	0.986
Serum creatinine (μ mol/L)	83.4 $\pm$ 58.2	205.7 $\pm$ 168.3	< 0.001*	0.754
Serum albumin (g/L)	36.9 $\pm$ 7.1	27.8 $\pm$ 6.9	< 0.001*	0.821
Serum calcium (mmol/L)	2.15 $\pm$ 0.26	1.81 $\pm$ 0.58	0.001*	0.704
Fasting glucose (mmol/L)	8.1 $\pm$ 4.2	14.2 $\pm$ 8.1	0.002*	0.748
Lactate dehydrogenase (U/L)	298.5 $\pm$ 179.4	512.3 $\pm$ 341.7	0.002*	0.71

Table 5: Demographic and laboratory variables stratified by survival status.

AUC, area under the receiver operating characteristic curve. *p < 0.05. AUC is reported for continuous variables only.

Performance for Severity Prediction

For early severity prediction within 48 hours of admission, the Glasgow score yielded the highest discrimination (AUC 0.841). At a cut-off of ≥ 2 it achieved a sensitivity of 68.6% and a specificity of 84.6%. CSSS occupied an intermediate

position (AUC 0.798) with good specificity (82.3%). PASS was the most sensitive of the three systems (85.7%) at a cut-off of ≥ 100 , with an AUC of 0.762 (Table 6, Figure 1). These results support the Glasgow score as the preferred early predictor of severe disease in this cohort.

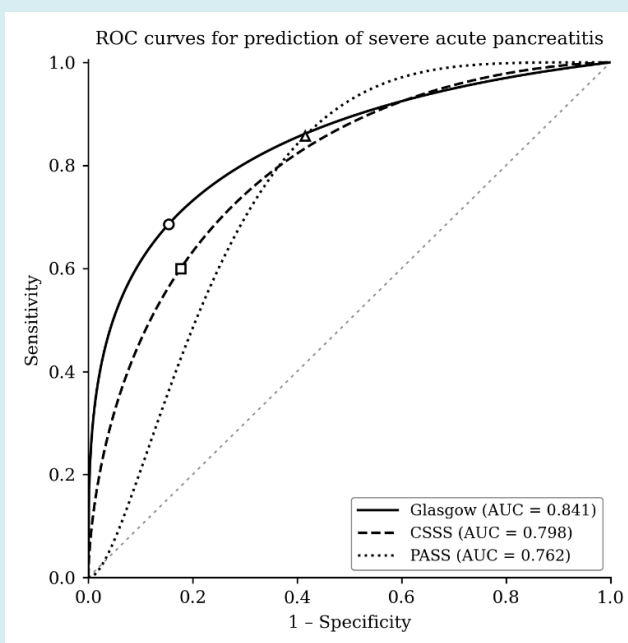


Figure 1: Receiver operating characteristic curves of the Glasgow score, CSSS and PASS for prediction of severe acute pancreatitis. Markers indicate the optimal cut-off identified by the Youden index for each score. The diagonal reference line represents no discrimination (AUC 0.500).

Scoring System	Cut-off	AUC (95% CI)	Sensitivity	Specificity	PPV	NPV
Glasgow	≥ 2	0.841 (0.812–0.870)	0.686	0.846	0.706	0.833
PASS	≥ 100	0.762 (0.731–0.793)	0.857	0.585	0.526	0.884
CSSS	≥ 2	0.798 (0.768–0.828)	0.6	0.823	0.647	0.792

Table 6: Diagnostic accuracy of the three scoring systems for severity prediction.

AUC, area under the ROC curve; CI, confidence interval; PPV, positive predictive value; NPV, negative predictive value.

Performance for Mortality Prediction

For in-hospital mortality prediction, PASS was assessed on day 7 of admission, beyond the acute phase in which severe disease classification occurs. PASS provided the strongest discrimination (AUC 0.832). At a threshold of ≥ 180 the score achieved a sensitivity of 75.0% and a specificity of 78.3%.

The Glasgow score showed moderate sensitivity (62.5%, AUC 0.715), whereas CSSS was the most specific (84.8%, AUC 0.741). All three systems demonstrated negative predictive values above 95%, indicating that a score below the chosen cut-off reliably excluded high risk of in-hospital death (Table 7, Figure 2).

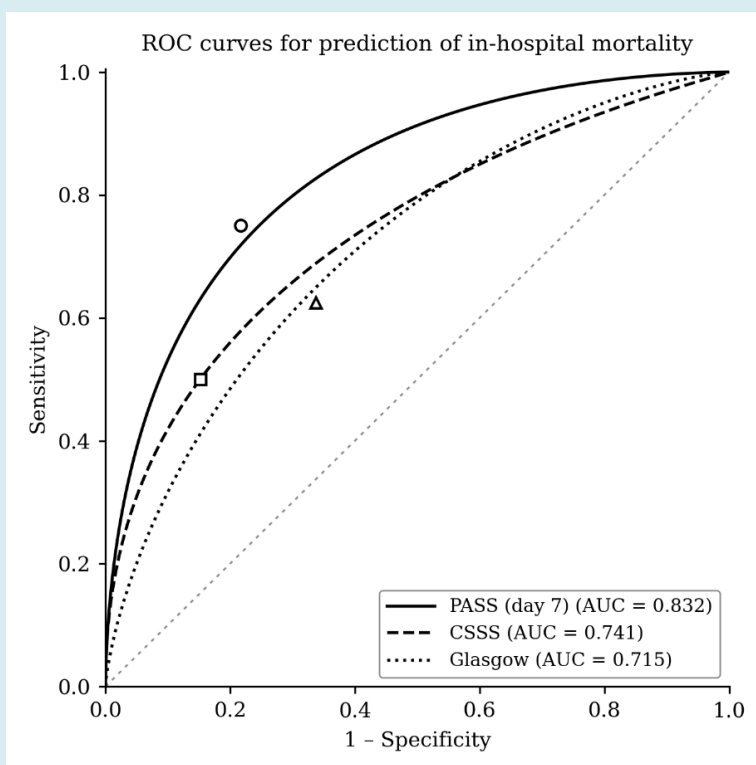


Figure 2: Receiver operating characteristic curves of PASS assessed on day 7, CSSS and the Glasgow score for prediction of in-hospital mortality. Markers indicate the optimal cut-off identified by the Youden index for each score. The diagonal reference line represents no discrimination (AUC 0.500).

Scoring System	Cut-off	AUC (95% CI)	Sensitivity	Specificity	PPV	NPV
Glasgow	≥ 2	0.715 (0.682–0.748)	0.625	0.663	0.125	0.968
PASS	≥ 180	0.832 (0.801–0.863)	0.75	0.783	0.231	0.973
CSSS	≥ 3	0.741 (0.709–0.773)	0.5	0.848	0.222	0.951

Table 7: Diagnostic accuracy of the three scoring systems for in-hospital mortality prediction.

AUC, area under the ROC curve; CI, confidence interval; PPV, positive predictive value; NPV, negative predictive value. PASS was assessed on day 7 of admission.

Discussion

Timely and accurate risk stratification continues to pose a practical challenge in the day-to-day management of acute pancreatitis. This analysis was conducted in a tertiary surgical centre where contrast-enhanced CT and intensive monitoring are standard components of care, and the cohort composition reflects that setting, with 35% of patients meeting criteria for severe disease. The predominance of alcohol as an aetiological factor among patients who developed severe disease mirrors patterns previously described in Indian and other Asian cohorts and highlights the importance of alcohol as a modifiable driver of severe pancreatitis [3,7].

With respect to severity prediction, the Glasgow score offered the most balanced combination of sensitivity and specificity and produced the highest AUC (0.841). PASS, by capturing ongoing disease activity rather than a single admission snapshot, was the most sensitive of the three systems, which is consistent with its original conception as a dynamic activity index rather than a static severity classifier [5,7]. CSSS performed intermediately, providing useful specificity when imaging data were available. Among individual laboratory predictors, C-reactive protein (AUC 0.801) and lactate dehydrogenase (AUC 0.792) discriminated severe disease almost as effectively as the composite CSSS, supporting their continued use as simple early markers of disease trajectory.

PASS incorporates organ failure and other markers that evolve during acute illness. To avoid incorporation bias, in which predictor variables measured during the outcome definition period artificially inflate apparent predictive power, PASS was assessed on day 7 for the mortality prediction analysis. This deferred assessment creates temporal separation between PASS measurement and disease classification, allowing valid prognostic evaluation. Mortality prediction followed a different pattern. Here PASS outperformed both the Glasgow score and CSSS, achieving an AUC of 0.832 with sensitivity and specificity both exceeding 75%. CSSS behaved as a highly specific mortality predictor, reflecting its reliance on established markers of renal dysfunction and inflammation [6]. Blood urea and serum albumin were the individual variables most strongly associated with in-hospital death, consistent with the central role of renal impairment and capillary leak in fatal disease.

A consistently high negative predictive value (>95%) for mortality across all three systems supports their use as rule-out tools that can help triage patients who are unlikely to require intensive resources. This is of particular value in busy surgical units where intensive-care capacity is limited and early, confident identification of low-risk patients

allows resources to be directed where they are most needed. Complete accounting of all screened, excluded and included patients is provided, and the analytical strategy was designed to minimise temporal and incorporation bias by deferring PASS assessment to day 7 for mortality prediction rather than relying on early 48-hour measurements. The reporting of AUC values for individual clinical and laboratory variables alongside the composite scores allows readers to judge how much additional discrimination each scoring system provides over single routinely measured parameters.

Conclusion

In this tertiary-centre cohort, the Glasgow score provided the most accurate early prediction of severe acute pancreatitis (AUC 0.841), while day-7 PASS assessment most accurately predicted in-hospital mortality (AUC 0.832). CSSS offered high specificity for both endpoints, and all three systems achieved negative predictive values above 95% for mortality, supporting their value as rule-out instruments. The Glasgow score is calculated entirely from parameters obtained routinely at admission and remains the most practical early severity predictor for bedside use in a general surgical unit, while PASS provides useful additional prognostic information later in the admission. Together these findings offer a simple, resource-efficient approach to risk stratification in acute pancreatitis that can be applied without specialised equipment or software.

Declaration of Generative Artificial Intelligence Use

During the preparation of this manuscript, the author used a generative artificial intelligence tool (Claude, Anthropic) to assist with language editing, structural organisation and formatting of the text and tables. The tool was not used to generate, collect, analyse or interpret the study data, and it was not used to produce any scientific content, results or conclusions. After using this tool, the author reviewed and edited the content as required and takes full responsibility for the content of the publication.

References

1. Boxhoorn L, Voermans RP, Bouwense SA, Bruno MJ, Verdonk RC, et al. (2020) Acute pancreatitis. *Lancet* 396(10252): 726-734.
2. Mederos MA, Reber HA, Girgis MD (2021) Acute pancreatitis: a review. *JAMA* 325(4): 382-390.
3. Krishnan A, Pillai D, Amarchand R, Agarwal A, Ahuja V, et al. (2024) Epidemiology of chronic and acute pancreatitis in India (EPISCAP-India): protocol for a multicentre study. *BMJ Open Gastroenterol* 11(1): e001562.

4. Paragomi P, Hinton A, Pothoulakis I, Talukdar R, Kochhar R, et al. (2022) The modified Pancreatitis Activity Scoring System shows distinct trajectories in acute pancreatitis: an international study. *Clin Gastroenterol Hepatol* 20(6): 1334-1342.e4.
5. Buxbaum JL, Quezada M, Chong B, Gupta N, Yu CY, et al. (2018) The Pancreatitis Activity Scoring System predicts clinical outcomes in acute pancreatitis: findings from a prospective cohort study. *Am J Gastroenterol* 113(5): 755-764.
6. Wang L, Zeng YB, Chen JY, Luo Q, Wang R, et al. (2020) A simple new scoring system for predicting the mortality of severe acute pancreatitis: a retrospective clinical study. *Medicine (Baltimore)* 99(23): e20646.
7. Negi N, Mokta J, Sharma B, Sharma R, Jhobta A, et al. (2018) Clinical profile and outcome of acute pancreatitis: a hospital-based prospective observational study in Subhimalayan State. *J Assoc Physicians India* 66(3): 22-24.

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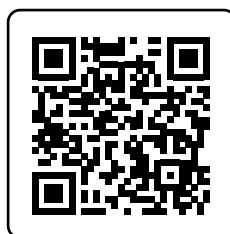
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