

# Evaluation of Relevance of Scoring Systems and Individual Laboratory Parameters in Acute Pancreatitis

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**Abstract:** *Acute pancreatitis, a disease with a long history of recognition, continues to challenge the medical community due to its complex pathogenesis and varying clinical presentation. This article explores the significance of assessing the severity of acute pancreatitis and evaluates various scoring systems in a prospective study conducted in two Armed Forces tertiary care centers. The study, involving 50 cases, employs scoring systems like Ransons, Glasgows, APACHE II, and Balthazar - Ransons CT grading, aiming to determine the most reliable prognostic factors. The analysis reveals that Balthazar - Ransons CT grading emerges as the most dependable predictor of severity, followed by APACHE II at 48 hours. This study underscores the importance of utilizing CT grading in routine clinical practice for acute pancreatitis prognosis, shedding light on the evolving landscape of severity assessment in this challenging condition.*

**Keywords:** Acute pancreatitis, severity assessment, scoring systems, Balthazar - Ranson CT grading, prognosis, clinical relevance

## 1. Introduction

Acute pancreatitis has been recognized since antiquity and its clinical significance well described since 1856. The pathogenesis is still not well understood. A plethora of clinical and experimental studies have been performed, and much is known about predisposing risk factors, pathology, and some biochemical events. However, the earliest changes in the gland i. e., the initiator and the triggering factors, await discovery.<sup>(1)</sup>

The clinical disease, although varying in severity, was found to be similar regardless of the cause, supporting the concept that a final common pathway may be present.<sup>(1)</sup>

Acute pancreatitis remains a common disease of varying severity with an overall mortality of 5 - 10%. Most of the cases and self - limiting and have a good outcome. In 10 - 20% of patients with severe disease characterized by pancreatic necrosis or distant organ failure, one can anticipate the need for intensive care and possible operative intervention with a mortality of 40%.<sup>(2)</sup>

It cannot be strongly emphasized that the primary treatment of acute pancreatitis is conservative only. Supportive therapy which includes vigorous intravenous hydration, nasogastric aspiration for symptomatic relief, ample analgesics, and correction of dyselectrolytemia, along with cardiovascular, respiratory, and renal support as needed, remains the mainstay of therapy.<sup>(2)</sup>

Direct surgical intervention in the immediate period following the onset of Acute Pancreatitis is rarely indicated. In the absence of a specific treatment for Acute Pancreatitis, prediction of outcome has little to add to the management of these patients; however, in patients with severe pancreatitis, the consensus now exists on the benefit of aggressive early resuscitation and careful monitoring, preferably within a high dependency or intensive care environment<sup>(3)</sup>

Several approaches and scoring systems have been described, but none holds the stage of universal acceptance.

Acute pancreatitis exhibits a broad spectrum of behavior ranging from a self - limiting illness to a fulminant and rapidly fatal condition associated with multiple organ system failure. The clinical signs of hypotension, abdominal distension, body wall staining (Cullen's sign or Grey Turners), obvious pleural effusions occurring in some cases, and duration of paralytic ileus can be and have been used as markers of severity of disease, but objective assessment has been difficult<sup>(4)</sup>

One of the most important developments in this field was derived from studies of Ranson in New York in the mid - 70s. Ranson's study correlated eleven factors with the severity of the disease (based on age, leucocytosis, hypoglycemia, hepatocellular injury, renal and respiratory insufficiency, HYPOCALCEMIA, falling hematocrit, metabolic acidosis, and fluid sequestration). However, his study population was dominated by alcohol abusers wherein the prognostication was less reliable when applied to gallstone pancreatitis and Other types of pancreatitis.<sup>(4)</sup>

Imrie et al (1978) assessing serum albumin instead of hematocrit fall and base deficit, devised the scoring system based on a population dominated by Gallstone pancreatitis<sup>(4)</sup> Glasgow differed by removing hematocrit, base deficit, and fluid sequestrations and adding serum albumin concentration to the prognostic criteria<sup>(6)</sup>. The clinical criteria as a guide to grade the prognosis were used by Banks et al in 1983. He gave particular emphasis to cardiac, respiratory, and renal abnormalities<sup>(7)</sup> of the recent developments are the APACHE II and III systems, which can be performed within a few hours after admission till there is a requirement for acute care<sup>(8)</sup> Balthazar - Ranson's CT - based grading system evolved, with the basis of imaging the appearance of a bulky pancreas to a necrotic one<sup>(9)</sup> Despite the availability of so many scoring systems, in routine clinical practice, none takes precedence independently.

This leaves us at a threshold wherein there is a requirement to understand the actual relevance of assessing the severity

of acute pancreatitis and if so what would be the most reliable ones.

### Objective:

The study is designed -

- To study the clinical relevance of the various scoring systems applied to the patients with acute pancreatitis admitted to the Armed Forces Hospital.
- To evaluate the outcome and conclude to find out the most relevant factors and also the very need for prognostication of acute pancreatitis in the clinical setting of Armed Forces Hospital.

## 2. Methods

A prospective study of the Evaluation of the relevance of scoring systems in acute pancreatitis was done and their outcome was followed up in 50 cases, in two Tertiary care centers in Armed Forces. Acute pancreatitis was initially defined as the presence of a consistent clinical history and examination supported by the biochemical parameters (threefold rise in the amylase, lipase) and confirmed on imaging (USG & CT).

**Inclusion criteria:** All patients diagnosed with a case of acute pancreatitis were admitted primarily to the hospital (not the transferred patients reporting after initial treatment).

**Exclusion criteria:** All those who were admitted before the onset of the study. All those in whom the CT imaging was not done or done after a gap of more than 5 days. The cases of chronic pancreatitis were also excluded.

The severity was determined based on the clinically based classification proposed in the Atlanta symposium (16), that is outcome was defined as severe if it was associated with local complications or systemic/organ failure. Local complications included the development of pancreatic necrosis, abscess, pseudocyst, or pancreatic ascites. Systemic complications included DIC, metabolic disturbances, and any sign of organ failure defined as Pulmonary insufficiency if PaO<sub>2</sub><60mmHg; Renal failure if creatinine >2mg/dl; GI bleed >500ml per episode; Shock if systolic BP<80mmHg (not on inotropes)

The severity was simultaneously scored using the scoring systems viz., Ranson's, Glasgow's, Revised Glasgow's, APACHE II, Bank's, and Balthazar - Ransons CT grading for the above - selected patients of acute pancreatitis admitted to the armed forces hospitals of CH (SC) Pune and BHDC Delhi (Tertiary care hospitals).

The recordings were made on proforma, for each patient, of a total of 50 cases of acute pancreatitis.

A detailed history was taken, a clinical examination was done, and comorbidities were checked. All the relevant hematological, biochemical, and radiological parameters required for the scoring systems were done and the individual prognostic scoring was noted in the proforma.

All the patients were managed with close watch and attention to the course of the disease, all in intensive unit

care facilities. All were put on standard therapy, NG aspiration, proton pump inhibitors, analgesics and antibiotics, and supportive measures including TPN as and when required, and octreotide for all severe cases. Surgical procedures were done as and when indicated ranging from peritoneal lavage to necrosectomies in the immediate follow - up and cystoenterostomies in the later follow - up. These outcomes were noted in the scoring proforma in the end. The clinical outcome as defined by the Atlanta criteria is noted.

This outcome is compared with the predicted outcome based on the individual scoring system noted for each in the proforma. The individual parameters included in all the scoring systems (viz., TLC, AST, ALT, PaO<sub>2</sub>, Ser Ca, K, Na etc, etc.) were also separately assessed for each patient and subjected to statistical analysis.

All the data was put on the Microsoft Excel sheets and then data analysis was performed employing the logistic regression analysis; the t - test, and the p - value were derived for comparison of the scoring system Vs. outcome and the ROC (Receiver operating characteristic) curve were used for the comparison between the various scoring systems. The individual parameters of all the scoring systems were also tabulated and the P - value was derived. The aetiological factors were not given any statistical significance.

## 3. Results

### AGE Incidence

Age in years	Number of cases	Percentage
0 - 10	0	0
11 - 20	1	2
21 - 30	4	8
31 - 40	20	40
41 - 50	12	24
51 - 60	10	20
61 - 70	3	6
71 - 80	0	0
81 - 90	0	0
91 - 100	0	0

- 1) In this study the incidence of the male: female was 3.5: 1, i. e.78% male and 22% female. In a total of 50, there were 39 males and 11 females.
- 2) The fatal cases were having the ages of 43, 58 and 64. All are above 40 and all male.
- 3) There were 37 mild cases and 13 severe cases (who developed complications). i. e.74% mild and 26 % severe.
- 4) For Ransons scoring:
  - The mean for the mild cases was 0.56 with a standard deviation of 1.16
  - The mean for the severe cases was 2.38 with a standard deviation of 1.98.
- 5) For Glasgow scoring
  - The mean for the mild cases was 0.40 with a standard deviation of 0.98
  - The mean for the severe cases was 2.15 with a standard deviation of 1.95.
- 6) For Rev - Glasgow's scoring:

- The mean for the mild cases was 0.35 with a standard deviation of 0.82
  - The mean for the severe cases was 1.53 with a standard deviation of 1.32.
- 7) For APACHE II at admission:
- The mean for the mild cases was 2.97 with a standard deviation of 0.45
  - The mean for the severe cases was 6.30 with a standard deviation of 5.00.
- 8) For APACHE II at 24h:
- The mean for the mild cases was 4.29 with a standard deviation of 3.44
  - The mean for the severe cases was 8.76 with a standard deviation of 2.91.
- 9) For APACHE II at 48h:
- The mean for the mild cases was 3.86 with a standard deviation of 3.31
  - The mean for the severe cases was 10.30 with a standard deviation of 4.34.
- 10) For Banks criteria:
- The mean for the mild cases was 0.054 with a standard deviation of 0.32
  - The mean for the severe cases was 0.84 with a standard deviation of 1.14.
- 11) For Balthazar - Ranson C T grading:
- The mean for the mild cases was 1.68 with a standard deviation of 0.96
  - The mean for the severe cases was 5.84 with a standard deviation of 2.54.

On observation, all the scoring systems have statistically been shown to predict the severity of acute pancreatitis satisfactorily when compared to the actual outcome, as proposed by the particular scoring system (e. g. <3 mild &>3 severe for ransons). The individual standings under the ROC curve for comparison between the scoring systems in descending order are as follows:

**Scoring system Area under ROC curve**

Balthazar –Ranson CT grading	0.9154
APACHE II AT 48H	0.89
Ranson	0.8399
Glasgows	0.8347
APACHE II AT 24h	0.8337
Rev - Glasgow	0.8202
Banks criteria	0.7162
APACHE II AT admission	0.6954

The following parameters had significant p - values (<0.05): LDH, Urea, Creatinine, Ser. Ca, Ser. K, Temp, Heart Rate, Respiratory Rate, pH, and Base excess.

The following had insignificant p - values: TLC >12000, Bl. Glucose, AST, ALT, PCV, PaO2, Ser. Bicarbonate, MABP, Ser. Na, Albumin, and Alv PaO2 were not assessed due to a lack of numbers.

**4. Discussion**

50 cases of acute pancreatitis, admitted to the service hospitals between Dec’02 and Feb ’05, were studied to evaluate the relevance of the scoring systems in clinical,

with the background fact of the proposition of several scoring systems while none hold universal acceptance in totality.

All the patients were managed conservatively initially and with Surgery contemplated as and when indicated, and all were treated in intensive unit care facilities.

This prospective study proceeded with the present understanding of no additional aggressive modalities available in the management of acute pancreatitis even in case predicted severe, but a consensus agrees on assessing the severity in the course of the management.

The present study has concluded, after statistical analysis that Balthazar –Ransons CT severity grading is the most reliable scoring system for the prediction of severity followed by APACHE II after 48h. This confirms the recent studies and meta - analyses, agreeing on the same fact.

The scorings which follow in the decreasing order of reliability are Ransons, Glasgows, APACHE II after 24h, Rev - Glasgow, Banks, and APACHE II at admission. APACHE II scoring system was the most laborious, time - consuming, and cumbersome to maintain. Ransons and Glasgows have the disadvantage of predicting 48 hours late other than not being as efficient in predicting the severity.

With correlation, it was found that what fetched the maximum score among the individual parameters of APACHE II were TLC, Temp., HR, and RR –which incidentally form a part of the SIRS (Systemic Inflammatory Response Syndrome). To further corroborate the assessment of the individual parameters, each of the scoring systems put together, has shown that the following parameters were statistically significant (p<0.05); LDH, Urea, Creat, Ser Ca, Ser k, Temperature, Heart rate, respiratory rate, pH, Base excess, TLC>15000. Bank’s criteria is a good prognostic indicator of mortality but a bad prognostic indicator of severity. Age was found to increase the risk significantly.

**5. Summary and Conclusion**

Thus we conclude that Computerised Tomography is one of the best modalities of diagnosis in a case of acute pancreatitis, and it has the added advantage of giving us the severity score with Balthazar–Ranson scoring. This study confirms the superiority of the CT scoring over the other scoring systems statistically. But there have been cases where the Balthazar –Ranson scoring has shown severe but the outcome was not turbulent. Most of the severe cases in CT scoring did show severe outcomes with APACHE II. Thus Ransons, Glasgow’s, Rev - Glasgow’s, Bank’s, and APACHE II are no longer relevant to routine scoring in acute pancreatitis unless a criterion is prescribed to be followed, provided we follow the CT grading as a convention.

**Proposed Score:**

With the conclusion that CT grading is the more reliable one, and with the individual analysis of all the parameters in all the scoring systems and the realization of the importance

of SIRS and age, we propose the following score based on all the findings obtained.

#### Proposed score

Balthazar - Ranson CT scoring	
1 - 2	1
3 - 6	2
7 - 10	5
SIRS	2
Age	
45 - 55	2
56 - 65	3
>65	4
LDH, SerCa, Ser. Electrolytes, Urea/Creat. (01 for each)	04 (max)
Total	1 (minimum) 12 (maximum).

<5- mild

>5- severe (with increasing risk with rise in score)

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