

Comparison of Various Scoring Systems in Predicting the Out Come In Patients of Perforation Peritonitis

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Abstract:

Background: Perforation peritonitis is a major surgical emergency associated with significant postoperative morbidity and mortality. Early identification of high-risk patients is essential for appropriate resuscitation, peri-operative monitoring, and postoperative care. Several prognostic scoring systems have been developed, but their predictive performance may vary across patient populations.

Aim: To compare the ability of the Boey score, Jabalpur Prognostic Score (JPS), Mannheim Peritonitis Index (MPI), and P-POSSUM to predict postoperative morbidity and mortality in patients with perforation peritonitis.

Materials and Methods: This prospective hospital-based study included 30 patients aged 18–70 years with peritonitis secondary to hollow viscus perforation who underwent surgical management at the Department of General Surgery, SV Medical College, Tirupati, over a six-month period. Demographic, clinical, biochemical, and intraoperative parameters were recorded. Each scoring system was evaluated for prediction of postoperative outcomes. ROC analysis was performed to determine discriminatory ability and optimal cut-off values. Data were analyzed using Epi Info 7.2.5.

Results: The study included 22 males (73.3%) and 8 females (26.7%), with a mean age of 50.7 ± 13.5 years. Postoperative morbidity occurred in 17 patients (56.7%), while overall mortality was 10% (3/30). Mortality increased with higher risk categories. Among patients with a Boey score of 3, mortality was 75%, compared with 0% in scores 0–2. Both patients with JPS ≥ 15 died, while no deaths occurred in the lower categories. JPS demonstrated an AUC of 0.977 (95% CI: 0.948–1.000; $p < 0.001$), with 93.75% sensitivity and 96.43% specificity at a cut-off > 9 . MPI demonstrated an AUC of 0.917 (95% CI: 0.859–0.975; $p < 0.001$), with 100% sensitivity and 70.24% specificity at a cut-off > 23 . P-POSSUM classified patients across increasing predicted-risk categories, with deaths occurring in the highest-risk group; complete ROC parameters were not available for quantitative comparison.

Conclusion: All four scoring systems demonstrated useful prognostic characteristics in perforation peritonitis. JPS showed excellent discriminatory performance and allowed early preoperative risk stratification, while MPI demonstrated strong mortality and morbidity prediction when operative findings were available. Boey provided a simple and rapid preoperative assessment, whereas P-POSSUM offered a more comprehensive perioperative evaluation. Larger multicentre studies are required for further validation.

Keywords: Perforation peritonitis; Jabalpur Prognostic Score; Mannheim Peritonitis Index; P-POSSUM.

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Introduction

Peritonitis is an inflammatory condition affecting the serous membrane that lines the abdominal cavity and covers the intra-abdominal organs. It is one of the most common surgical emergencies encountered in clinical practice and remains a significant cause of morbidity and mortality worldwide. [1]

Secondary peritonitis most commonly results from contamination of the normally sterile peritoneal cavity following perforation of a hollow viscus, such as a perforated duodenal or gastric ulcer. In addition to bacterial contamination, leakage of

chemically irritating substances, including gastric acid, bile, pancreatic enzymes, or intestinal contents, contributes to the inflammatory response and rapid progression of the disease.

Peptic ulcer perforation is among the leading causes of perforation peritonitis. Several risk factors have been implicated in the development of gastrointestinal perforation, with cigarette smoking and prolonged use of non-steroidal anti-inflammatory drugs (NSAIDs) is the most important modifiable factors. These factors increase the likelihood of

ulcer formation and subsequent perforation, particularly in elderly individuals and patients with multiple comorbidities. [2]

Perforation peritonitis constitutes a surgical emergency that requires prompt diagnosis, aggressive resuscitation, timely administration of broad-spectrum antibiotics, and definitive surgical intervention. Despite advances in perioperative care, anesthesia, antimicrobial therapy, and intensive care management, the condition continues to be associated with considerable postoperative complications, prolonged hospitalization, and significant mortality.

Patients presenting with diffuse peritonitis frequently exhibit systemic inflammatory response syndrome (SIRS), septic shock, electrolyte abnormalities, dehydration, and varying degrees of organ dysfunction. The severity of clinical presentation depends on several factors, including the site of perforation, duration of contamination, bacterial load, patient age, nutritional status, and associated medical illnesses. [3,4]

Accurate assessment of disease severity remains challenging because of the heterogeneous nature of perforation peritonitis. Consequently, comparison of treatment outcomes and evaluation of different therapeutic strategies are often limited by the absence of a universally accepted prognostic classification system.

To overcome these limitations, several clinical scoring systems have been developed to objectively assess disease severity, estimate the risk of postoperative morbidity and mortality, and facilitate clinical decision-making. These scoring systems assist surgeons in identifying high-risk patients who may require intensive perioperative monitoring and aggressive management.

Among the commonly used prognostic models are the Peptic Ulcer Perforation (PULP) score, Acute Physiology and Chronic Health Evaluation (APACHE II), Boey score, Jabalpur Prognostic Score, Mannheim Peritonitis Index (MPI), and Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity (P-POSSUM). Each scoring system incorporates different combinations of physiological parameters, laboratory investigations, operative findings, and patient characteristics to estimate clinical outcomes. [5,6,7] The application of reliable prognostic scoring systems has several advantages. They enable early risk stratification, facilitate appropriate allocation of healthcare resources, guide postoperative intensive care requirements, improve communication among healthcare professionals, and provide an objective method for surgical audit and comparison of outcomes across institutions. Identification of patients at increased risk of adverse outcomes allows clinicians to implement timely inter-

ventions that may reduce postoperative complications and improve survival.

Need for the Study and Research Gap: An ideal prognostic scoring system should accurately assess disease severity and identify patients who require varying levels of perioperative care and intensive monitoring. Effective risk stratification facilitates appropriate allocation of healthcare resources, guides clinical decision-making, and enables timely interventions for patients at increased risk of adverse outcomes.

Although significant advances have been made in diagnostic techniques, antimicrobial therapy, anesthesia, surgical management, and critical care, perforation peritonitis continues to be associated with substantial postoperative morbidity and mortality. The clinical presentation of patients is often heterogeneous, making early prediction of outcomes challenging. Consequently, reliable prognostic assessment remains an essential component of patient management.

Several prognostic scoring systems, including the Boey score, Jabalpur Prognostic Score, Mannheim Peritonitis Index (MPI), and P-POSSUM, have been developed to estimate the risk of postoperative complications and mortality. However, the predictive accuracy of these scoring systems varies across different patient populations and healthcare settings. Moreover, limited comparative evidence is available regarding their performance in patients with perforation peritonitis secondary to hollow viscus perforation in the Indian population.

Therefore, the present study was undertaken to compare the predictive performance of four commonly used prognostic scoring systems—Boey score, Jabalpur Prognostic Score, Mannheim Peritonitis Index, and P-POSSUM—in assessing postoperative morbidity and mortality among patients undergoing surgery for perforation peritonitis. The findings of this study are expected to identify the most reliable and practical scoring system for early risk stratification, thereby facilitating improved clinical decision-making, optimized resource utilization, and better patient outcomes.

Aim: To compare various scoring systems in predicting the outcome in patients of perforation peritonitis.

Objectives: To determine the accuracy of Boey score, Jabalpur prognostic score, Mannheim Peritonitis Index (MPI) score and p-possum scoring. To compare each predicted scoring systems for prediction of morbidity and mortality of patients with perforation peritonitis.

Materials & Methods

The study was conducted in 30 cases admitted and treated over 6 months period in the Department of General Surgery, SV Medical College, and Tirupati. This was a prospective hospital-based study, data regarding demographics, biochemical investigations, intraoperative findings were noted and patient were observed in postoperative period and data noted.

Inclusion criteria: Patients between 18 -70 years diagnosed with peritonitis secondary to hollow viscus perforation and gave written and informed consent for surgical treatment was included.

Exclusion criteria: Peritonitis secondary to trauma, post-operative peritonitis and patients with laparotomy done elsewhere or transferred out to continue treatment elsewhere were excluded.

Data Collection: Consent was obtained from all the participants of the study. All the data regarding presenting complaints, duration, vitals at the time of presentation, associated comorbid conditions, biochemical values, and intra operative findings were noted. Each scoring system was evaluated with the available data.

Data analysis plan: Descriptive quantitative and qualitative data were expressed as Mean $\pm$ SD and proportions respectively. ROC analysis was done to predict the cut-off scores of various scoring system in assessing outcome of peritonitis due to perforation. The numerical aspects of the results was analysed with Epi Info 7.2.5(CDC, Atlanta)

Sample collected were Blood sample for CBC, S. Creatinine, Electrolytes, Blood urea. Parameters monitored were Duration of symptoms, Personal and drug history, Vitals at the time of admission, Glasgow coma scale, Radiological and blood investigations, Intraoperative findings, and Postoperative period monitoring. Study Deliverables Short term: Preferential care to high risk patients. And long term: Risk stratification and early identification of high risk patients.

Results

The present prospective hospital-based study included 30 patients with perforation peritonitis secondary to hollow viscus perforation who underwent surgical management.

Table 1: Demographic Characteristics of Study Participants (N=30)

Variable	Category	n	%
Age mean $\pm$ SD 50.7 $\pm$ 13.5	<40 years	8	26.7
	40 -59 years	13	43.3
	>60 years	9	30.0
Sex	Male	22	73.3
	Female	8	26.7

Table 2: Postoperative Outcome of Study Participants

Outcome	n	%
Postoperative morbidity present	17	56.7
No postoperative morbidity	13	43.3
Mortality	3	10.0
Survival	27	90.0

Table 3: Association between Boey Score and Mortality

Boey score	n	%	Survivors	Deaths n (%)	Mortality rate
0	7	23.3	7	0	0
1	9	30.0	9	0	0
2	10	33.3	10	0	0
3	4	13.3	1(25%)	3(75%)	75%

Table 4: Association between JPS Category and Mortality

JPS category	n	%	Survivors	Deaths n (%)	Mortality rate
<5	7	23.3	7	0	0
5-9	11	36.7	9	0	0
10-14	10	33.3	10	0	0
≥ 15	2	6.7	0	2 (100%)	100%

Table 5: Association between MPI Category and Mortality

MPI category	n	%	Survivors	Deaths n (%)	Mortality rate
<21	9	30.0	9	0	0
21-29	15	50.0	15	0	0
>29	6	20.0	3	3(50%)	50%

Table 6: Association between MPI Category and Postoperative Morbidity

MPI category	n	%	Morbidity n (%)	No morbidity n (%)
<21	9	30.0	0 (0.0)	9 (100.0)
21–29	15	50.0	11 (73.3)	4 (26.7)
>29	6	20.0	6 (100.0)	0 (0.0)

Table 7: Distribution According to P-Possum Predicted Mortality Risk

P-POSSUM	predicted mortality risk n %
<20%	10 (33.3%)
20–39%	10 (33.3%)
40–59%	7 (23.3%)
≥60%	3 (10%)

Table 8: Roc Characteristics of JPS and MPI For Prediction Of Mortality

Scoring system	AUC	95% CI	p-value	Cut-off	Sensitivity	Specificity
JPS	0.977	0.948–1.000	<0.001	>9	93.75%	96.43%
MPI	0.917	0.859–0.975	<0.001	>23	100.0%	70.24%

Table 9: Comparative Performance of the Four Scoring Systems

Parameter	Boey Score	JPS	MPI	P-POSSUM
Preoperative calculation	Yes	Yes	No	Partly
Operative variables required	No	No	Yes	Yes
Relative complexity	Very simple	Simple	Moderate	High
Highest-risk category mortality	75%	100%	50%	-

Demographic and Clinical Characteristics: The study population consisted of 22 males (73.3%) and 8 females (26.7%). The mean age of the study population was 50.7 ± 13.5 years. Patients aged 40–59 years constituted the largest age group (43.3%), followed by those aged ≥60 years (30.0%) and those aged <40 years (26.7%).

Postoperative morbidity was observed in 17 patients (56.7%), whereas 13 patients (43.3%) had an uncomplicated postoperative course. Overall mortality was 10%, with 3 of the 30 patients dying and 27 patients (90%) surviving.

The Boey score distribution showed that 7 patients (23.3%) had a score of 0, 9 patients (30.0%) had a score of 1, 10 patients (33.3%) had a score of 2, and 4 patients (13.4%) had a score of 3. Thus, the majority of patients had intermediate Boey scores of 1 or 2.

Mortality increased markedly with increasing Boey score. No deaths occurred among patients with Boey scores of 0, 1, or 2. In contrast, 3 of the 4 patients with a Boey score of 3 died, corresponding to a mortality rate of 75% in the highest-risk group. The lowest-risk group had 0% mortality. Thus, although the number of patients in the highest Boey category was small, the score demonstrated a clear concentration of mortality among patients with the maximum score. The overall pattern supports the ability of the Boey score to identify a subgroup with substantially increased mortality risk. With regard to morbidity, the available cross-tabulation demonstrated an increasing burden of postoperative complications with higher Boey scores, although the morbidity table in the source dataset does not

provide a sufficiently complete statistical analysis to calculate a reliable independent p-value. Therefore, the association between Boey score and morbidity should be interpreted descriptively in this study.

The Jabalpur Prognostic Score demonstrated a progressive distribution from low to high-risk categories. Seven patients (23.3%) had a score <5, 11 patients (36.7%) had a score of 5–9, 10 patients (33.3%) had a score of 10–14, and 2 patients (6.7%) had a score ≥15. A strong relationship was observed between increasing JPS category and mortality. None of the patients with a JPS score <5, 5–9, or 10–14 died. Both patients with a JPS score ≥15 died, giving a mortality of 100% in the highest-risk category.

The mortality gradient was therefore particularly striking for JPS, with 0% mortality in the lower three categories and 100% mortality in the highest category. ROC analysis in the study demonstrated excellent discriminatory ability of JPS for mortality. The area under the ROC curve was 0.977 (95% CI: 0.948–1.000; $p < 0.001$). At a cut off value >9, JPS demonstrated a sensitivity of 93.75% and specificity of 96.43%. These findings indicate that JPS had very high discriminatory ability for identifying patients at increased risk of mortality.

Mannheim Peritonitis Index: The MPI distribution showed that 9 patients (30.0%) had an MPI score <21, 15 patients (50.0%) had a score between 21 and 29, and 6 patients (20.0%) had a score >29. Therefore, half of the study population belonged to the intermediate-risk MPI category. Mortality showed a clear relationship with

increasing MPI category. No deaths occurred among patients with MPI <21 or between 21–29. However, 3 of the 6 patients with MPI >29 died, corresponding to a mortality rate of 50% in the highest-risk category.

The association between increasing MPI score and mortality was statistically significant in the source analysis ($p < 0.001$). The findings therefore demonstrate that higher MPI scores were associated with substantially increased mortality risk.

Postoperative morbidity also increased with increasing MPI category. None of the patients with MPI <21 developed morbidity, whereas 11 of 15 patients in the 21–29 category and all 6 patients with MPI >29 developed postoperative morbidity. This represents a morbidity rate of 73.3% in the intermediate category and 100% in the highest-risk category.

ROC analysis demonstrated an AUC of 0.917 (95% CI: 0.859–0.975; $p < 0.001$), indicating excellent discriminatory ability for mortality. At a cutoff value >23, MPI showed 100% sensitivity and 70.24% specificity.

The P-POSSUM predicted-risk distribution showed that 10 patients (33.3%) were in the low-risk category (<20%), 10 patients (33.3%) were in the moderate-risk category (20–39%), 7 patients (23.3%) were in the high-risk category (40–59%), and 3 patients (10.0%) were in the very-high-risk category ($\geq 60\%$).

The available data indicate that deaths occurred in the highest predicted-risk group. Thus, P-POSSUM was able to place the observed deaths toward the higher end of its predicted-risk distribution. The dataset specifically describes this finding as deaths occurring in the highest predicted-risk group.

However, unlike JPS and MPI, the uploaded dataset does not provide a complete ROC analysis for P-POSSUM in this 30-patient cohort. Therefore, an AUC, sensitivity, specificity, positive predictive value, or negative predictive value for P-POSSUM cannot be validly reported from the available data without performing a fresh patient-level analysis.

Comparative Performance of the Four Scoring Systems: The four scoring systems differed in their complexity and timing of calculation. Boey score was the simplest system and could be calculated preoperatively using clinical parameters. JPS was also simple and preoperative. MPI incorporated clinical and intraoperative variables and therefore was generally calculated after operative assessment. P-POSSUM incorporated physiological and operative variables and was comparatively more complex, requiring perioperative information.

In terms of mortality discrimination, JPS showed the highest reported AUC of 0.977, followed by MPI with an AUC of 0.917. JPS also demonstrated excellent sensitivity and specificity at a cutoff >9, whereas MPI demonstrated excellent sensitivity but lower specificity at a cutoff >23.

The highest-risk category mortality was 75% for Boey, 100% for JPS and 50% for MPI. The P-POSSUM data showed that deaths occurred in the highest predicted-risk group, but a numerical highest-risk mortality percentage was not available in the source dataset.

Discussion

Perforation peritonitis remains a major surgical emergency in which rapid deterioration can occur because of bacterial contamination, systemic inflammatory response, and sepsis and organ dysfunction. The heterogeneous clinical presentation makes early identification of high-risk patients important. Prognostic scoring systems can provide objective risk stratification and help determine the intensity of perioperative monitoring and postoperative care.

The present study compared four prognostic systems—Boey score, Jabalpur Prognostic Score, Mannheim Peritonitis Index and P-POSSUM—with respect to postoperative morbidity and mortality. The study population consisted of 30 surgically treated patients with perforation peritonitis. The predominance of males (73.3%) and the concentration of patients in the 40–59-year age group are consistent with the demographic pattern described in several studies of perforation peritonitis.

Overall postoperative morbidity was observed in 56.7% of patients, while mortality was 10%. The relatively high morbidity compared with mortality indicates that although most patients survived, a substantial proportion experienced postoperative complications. This emphasizes the importance of prognostic systems not only for mortality prediction but also for identifying patients likely to require prolonged monitoring and intensive postoperative management.

Boey Score: The Boey score demonstrated a clinically meaningful association with mortality. No deaths occurred among patients with scores of 0, 1 or 2, whereas 75% of patients with the maximum score of 3 died. This concentration of mortality in the highest-risk group suggests that the Boey score can identify patients with severe disease who are particularly vulnerable to adverse outcomes.

An important advantage of the Boey score is its simplicity. It uses a small number of clinically important risk factors and can be calculated before surgery. This makes it attractive for emergency

settings where rapid decision-making is required. However, the present study had only four patients in the highest Boey category. Therefore, although the observed mortality of 75% is striking, it should not be interpreted as a precise estimate of mortality for all patients with a Boey score of 3. The small sample size substantially widens the uncertainty around this estimate.

The available morbidity data also suggest that higher Boey scores were associated with postoperative complications, but the dataset does not provide sufficiently complete statistical information to establish the strength of this association. Thus, the Boey score appears useful primarily as a simple preoperative mortality-risk stratification tool in the present cohort.

Jabalpur Prognostic Score: JPS was one of the strongest-performing systems in the present study. Mortality increased dramatically in the highest JPS category, with both patients scoring ≥ 15 dying. No deaths were observed in the lower three categories. This produced a clear risk gradient and supports the usefulness of JPS for identifying high-risk patients.

The ROC analysis further strengthened this observation. JPS achieved an AUC of 0.977, indicating excellent discrimination between survivors and non-survivors. At a cutoff >9 , sensitivity was 93.75% and specificity was 96.43%. The excellent performance of JPS may be particularly important in resource-limited hospitals. The scoring system uses routinely available clinical variables and does not depend on intraoperative findings. Consequently, risk stratification can be performed at the time of admission, potentially allowing early identification of patients who require aggressive resuscitation, close monitoring or intensive care.

The findings are consistent with the previous work cited in the uploaded material. Mishra et al., who developed the Jabalpur scoring system, reported that patients with scores of 0–4 had no mortality, whereas mortality was very high among patients with scores >15 . The present study showed a similar pattern, with 0% mortality in the lowest category and 100% mortality in the highest category.

Singh et al. also reported an association between JPS and morbidity, with higher scores being associated with greater postoperative morbidity. The simplicity of JPS is an additional advantage because it can be calculated without intraoperative information.

Mannheim Peritonitis Index: MPI also showed strong prognostic performance. Mortality was absent in patients with scores below 29 and increased to 50% among patients with MPI >29 . Similarly, postoperative morbidity increased

substantially with increasing MPI category, reaching 100% in patients with MPI >29 . The ROC AUC of 0.917 indicates excellent discrimination. At a cutoff >23 , MPI had 100% sensitivity and 70.24% specificity. Thus, MPI was particularly effective for identifying patients who were likely to die, although its specificity was lower than that of JPS.

This difference between sensitivity and specificity is clinically relevant. A highly sensitive cutoff can be useful when the primary objective is to avoid missing a high-risk patient. However, lower specificity means that some survivors may also be classified as high risk. Such patients may nevertheless benefit from closer monitoring.

MPI has the additional advantage of incorporating operative findings, thereby allowing assessment of the extent and nature of peritoneal contamination. However, this is also a limitation when early preoperative risk stratification is required because some of the variables become available only during surgery.

The findings are broadly consistent with previous studies cited in the source material. Earlier work has demonstrated that MPI can predict mortality and morbidity in secondary peritonitis, although reported sensitivity and specificity vary according to study population, cutoff values and sample size. The uploaded literature also notes that MPI can be useful in hospitals with limited resources because it does not require some of the more sophisticated investigations required by physiological scoring systems.

P-POSSUM: P-POSSUM differs from Boey, JPS and MPI because it incorporates both physiological and operative variables and therefore provides a more comprehensive assessment of the patient's systemic condition and surgical severity.

In the present cohort, one-third of patients were classified as low risk, one-third as moderate risk, 23.3% as high risk and 10% as very high risk. Importantly, the available dataset indicates that deaths occurred in the highest predicted-risk group.

This finding suggests appropriate qualitative risk stratification by P-POSSUM. However, the absence of patient-level P-POSSUM mortality probabilities and ROC data in the uploaded dataset prevents direct calculation of AUC, sensitivity and specificity. These measures should therefore not be assigned without re-analysis of the original patient-level P-POSSUM data.

P-POSSUM is more comprehensive than the simpler clinical scores because it incorporates multiple physiological and operative variables.

This may allow it to capture aspects of disease severity that are not represented in a simple

preoperative score. On the other hand, its complexity makes it less convenient for rapid bedside calculation. The dataset itself classifies P-POSSUM as complex and perioperative, compared with the very easy preoperative Boey score and easy preoperative JPS.

Comparison of the Scoring Systems: The major finding of the present study is that all four scoring systems demonstrated useful prognostic characteristics, but they differ in their strengths.

JPS showed the highest available ROC AUC (0.977), followed by MPI (0.917). JPS also had very high sensitivity (93.75%) and specificity (96.43%) at a cutoff >9 . MPI had perfect sensitivity (100%) at a cutoff >23 , although specificity was lower at 70.24%. The difference between JPS and MPI is clinically important. JPS can be calculated at admission and does not require intraoperative findings, making it more suitable for early triage. MPI, in contrast, incorporates intraoperative information and may provide a more detailed assessment of the extent of peritoneal disease after surgical exploration.

The study also notes that JPS had a slightly higher AUC than MPI and emphasizes its ease of application because its parameters are readily obtainable at admission. Boey has the advantage of being the simplest system. In this study, it successfully concentrated mortality in the highest-risk category, where mortality was 75%, while the lower categories had no deaths. However, because the number of patients in the highest category was small, conclusions regarding its comparative accuracy should be made cautiously.

P-POSSUM offers a more comprehensive physiological and operative assessment. Its main advantage is the broader range of variables incorporated into risk estimation, while its main disadvantage is greater complexity. In the present dataset, deaths occurred in the highest predicted-risk group, suggesting useful risk stratification, but complete discriminatory statistics were not available.

Therefore, no single score can be considered universally superior for every clinical purpose. JPS appears particularly attractive for early admission-based risk stratification, MPI provides strong mortality discrimination with the advantage of incorporating operative findings, Boey is extremely simple and rapid, while P-POSSUM provides a more comprehensive perioperative assessment.

Clinical Implications: The results have practical implications for emergency surgical practice. Patients with high JPS, MPI or Boey scores can be considered for more intensive perioperative surveillance, early optimization, aggressive

resuscitation and postoperative critical care when clinically indicated.

JPS may be particularly useful at the time of admission because it does not depend on intraoperative findings. MPI can complement this assessment after laparotomy when operative information regarding contamination and disease severity becomes available. P-POSSUM may be useful for comprehensive perioperative risk assessment, particularly where the required physiological and operative data are routinely available. However, its complexity may limit its use for immediate bedside triage.

Thus, a combined approach may be more practical than relying exclusively on one scoring system: a simple preoperative score such as JPS or Boey can facilitate early risk stratification, while MPI or P-POSSUM can provide additional perioperative prognostic information.

Limitations: The most important limitation of the present study is the small sample size of 30 patients. Only three deaths occurred, and therefore mortality estimates within individual score categories are based on very small numbers. The very high mortality percentages in the highest-risk categories, particularly for JPS and Boey, should therefore be interpreted cautiously.

The study was conducted at a single institution over a six-month period, which may limit generalizability to other hospitals and patient populations. Differences in case mix, delay before surgery, severity of peritonitis, surgical technique, antibiotic therapy and postoperative intensive care can influence outcomes.

Another limitation is that complete ROC analysis was not available for all four scoring systems in the supplied dataset. In particular, patient-level P-POSSUM values sufficient to independently calculate AUC, sensitivity and specificity were not provided. Consequently, comparative claims based on ROC analysis are strongest for JPS and MPI and should not be extended quantitatively to P-POSSUM without additional analysis.

Conclusion:

The present study demonstrates that prognostic scoring systems are useful tools for risk stratification in patients with perforation peritonitis. Increasing scores were associated with progressively poorer clinical outcomes, particularly mortality and postoperative morbidity.

Among the systems evaluated, Jabalpur Prognostic Score demonstrated the strongest discriminatory performance in the available analysis, with an AUC of 0.977 (95% CI: 0.948–1.000), sensitivity of 93.75% and specificity of 96.43% at a cutoff >9 . The clear separation between low- and high-risk

categories and its ability to be calculated using preoperative clinical information make JPS particularly useful for early identification of high-risk patients.

MPI also demonstrated excellent prognostic performance, with an AUC of 0.917 (95% CI: 0.859–0.975). At a cutoff >23, MPI showed 100% sensitivity and 70.24% specificity. Increasing MPI category was associated with both increasing mortality and postoperative morbidity. Boey score demonstrated useful clinical discrimination, particularly by concentrating mortality in the highest-risk category. Mortality was 0% in patients with scores of 0–2 and 75% in those with a score of 3. Its major advantage is simplicity and rapid preoperative applicability. P-POSSUM provided a broader perioperative assessment based on physiological and operative variables. In the present dataset, deaths occurred in the highest predicted-risk group, supporting its ability to identify patients with increased risk. However, because complete patient-level ROC data were not available in the supplied dataset, definitive quantitative comparison of P-POSSUM with JPS and MPI cannot be made from the present information alone.

Overall, JPS appears to be the most practical scoring system for early preoperative risk stratification in this study, owing to its excellent discrimination, high sensitivity and specificity, simplicity and ability to be calculated at admission. MPI is also highly effective, particularly when intraoperative findings are available. Boey remains valuable as a rapid and simple bedside score, while P-POSSUM offers a more comprehensive but more complex perioperative assessment.

The findings support the use of prognostic scoring systems as adjuncts to clinical judgment rather than replacements for it. High-risk patients identified by these scores should receive timely resuscitation; close monitoring and appropriate escalation of perioperative care. Larger prospective multicentre studies with adequate numbers of mortality events and complete patient-level ROC data are required to establish the definitive comparative superiority

of these four scoring systems. In conclusion, JPS showed the best overall prognostic performance among the scores for which complete ROC analysis was available, followed by MPI. Boey provided simple and rapid risk stratification, while P-POSSUM offered comprehensive perioperative risk assessment. A practical strategy would be to use JPS or Boey for early preoperative assessment and MPI/P-POSSUM as complementary perioperative prognostic tools.

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