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Comparison of Predictive Validity of PULP and Boey's score in Predicting the Risk of Peptic Ulcer Perforations: A Prospective Observational Study

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KEYWORDS

Peptic ulcer perforation, PULP score, Boey score, Mortality, Risk stratification, Postoperative outcomes

ABSTRACT:

Background: Peptic ulcer perforation is a life-threatening surgical emergency with significant morbidity and mortality.

Objectives: To evaluate the effectiveness of the PULP and Boey scoring systems in assessing the severity of peptic ulcer perforation; and to analyze the correlation between these scoring systems and the duration of ICU and hospital stay, as well as to assess their role in predicting postoperative complications.

Methods: This was a hospital based prospective observational study conducted in the Department of General Surgery, JSS Medical College, Karnataka, India for a duration of 18 months among patients more than 18 years of age with hollow viscus perforation.

Results: This study included 42 participants with a mean age of 64.6 years (SD = 9.1). A majority (64.3%) were aged 60 years and above, and 73.8% were male. Mortality was significantly higher in older patients ($p = 0.032$), with non-survivors having a mean age of 71.8 years (SD = 7.5) compared to 62.1 years (SD = 8.3) in survivors ($p = 0.001$). Delayed presentation beyond 24 hours was significantly associated with mortality (81.8% vs. 18.2%, $p = 0.001$). Preoperative shock was a strong predictor of mortality, with all affected patients succumbing to the illness ($p < 0.001$). The mean duration of surgery was 3.0 hours (SD = 0.0), and the mean perforation size was 0.8 cm (SD = 0.2). ICU admission was significantly associated with mortality ($p < 0.001$), with 90.9% of non-survivors requiring intensive care. Non-survivors had significantly longer hospital (9.7 vs. 8.2 days, $p = 0.041$) and ICU stays (4.3 vs. 2.2 days, $p = 0.013$), suggesting increased postoperative complications. The ASA classification was the strongest predictor of mortality (AUC = 0.893, $p < 0.001$), with higher ASA grades (III-V) significantly associated with death. The PULP (AUC = 0.727, $p = 0.027$) and Boey (AUC = 0.711, $p = 0.039$) scores also predicted mortality, with higher scores correlating with prolonged hospital stays. The PULP score showed a strong positive correlation with

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ICU (r = 0.676, p = 0.004) and hospital stay (r = 0.490, p = 0.001), while the Boey score was more strongly associated with hospital stay (r = 0.523, p < 0.001).

Conclusion: The study demonstrates that the ASA classification, PULP, and Boey scores are valuable tools for predicting the severity and outcomes of peptic ulcer perforation. Delayed presentation, preoperative shock, and ICU admission were strongly associated with increased mortality.

Introduction

Peptic ulcer disease (PUD) is a prevalent clinical condition characterized by mucosal erosions in the stomach or duodenum due to an imbalance between protective factors and aggressive luminal factors such as gastric acid and pepsin.(1) Patients with PUD typically present with symptoms of dyspepsia, including epigastric pain, bloating, and nausea. However, these symptoms are often nonspecific, leading to potential delays in diagnosis, especially in outpatient settings.(2) Chronic PUD can result in serious complications, with bleeding being the most common, followed by perforation.(3, 4) Perforation of a peptic ulcer is a life-threatening complication that involves the leakage of gastrointestinal contents into the peritoneal cavity, leading to peritonitis.(5) This condition constitutes a surgical emergency and requires prompt intervention to improve patient outcomes.(6) Despite advancements in surgical and critical care management, perforated peptic ulcer (PPU) continues to be associated with significant morbidity and mortality.(7) Early identification of high-risk patients is critical to optimizing perioperative care and mitigating adverse outcomes.

To address the clinical challenges posed by PPU, several scoring systems have been developed to predict severity, postoperative complications, and patient outcomes.(8) These include the Boey score, Peptic Ulcer Perforation (PULP) score, Jabalpur score, APACHE score, Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity (POSSUM), and Postoperative Mortality Prediction (POMP) score. Among these, the Boey and PULP scores have been widely studied and are recognized for their predictive value.(9)

The Boey score, introduced in 1987, incorporates three clinical factors: preoperative shock, comorbid illnesses, and duration of perforation longer than 24 hours.(10) It is a simple tool that stratifies patients based on their risk of mortality and morbidity. In contrast, the PULP score is a more comprehensive system that includes variables such as age, comorbidities, and physiological parameters, offering a broader assessment of patient risk.(11) Both scoring systems have demonstrated utility in guiding clinical decision-making and resource allocation in the management of PPU.(8)

The accurate assessment of clinical severity in patients with PPU is crucial, as it enables healthcare providers to anticipate potential complications and implement appropriate interventions. While numerous studies have evaluated the efficacy of these scoring systems, there is no consensus on the most effective tool. Comparative analyses suggest that the Boey and PULP scores have strong predictive capabilities, making them valuable in risk stratification and outcome prediction.(12, 13) Against this background, the objectives of the present study were to evaluate the effectiveness of the PULP and Boey scoring systems in assessing the severity of peptic ulcer perforation; and to analyze the correlation between these scoring systems and the duration of ICU and hospital stay, as well as to assess their role in predicting postoperative complications.

Materials and Methods

This was a hospital-based prospective observational study conducted in the outpatient department and/or inpatient wards of the Department of General Surgery, Jagadguru Sri Shivarathreeshwara (JSS) Medical College, Mysuru, Karnataka, India for a duration of 18 months. The study received approval from the Institutional Human Ethics Committee (IHEC) with reference number JSS/MC/PG/2046/112/2023-24 dated 23/06/2023. Each participant was provided with a Participant Information Sheet (PIS) translated into their local language. The information was also explained verbally to ensure clear understanding and voluntary agreement. Written informed consent was obtained prior to enrolling participants in the study. Patients ≥18 years

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of age, of both gender, with hollow viscus perforation and a history of peptic ulcer disease were included. However, patients presenting with perforation after history of trauma; hollow viscus perforation; and history of typhoid disease, tuberculosis were excluded.

The sample size was calculated based on expected sensitivity values of 75% for Boey's score and 100% for the PULP score, with 90% power and 5% alpha error.(14) Using Kirkwood's formula,(15) the required sample size was estimated to be 38. After adjusting for a 10% attrition rate, the final sample size was set at 42 participants. We used nonprobability sampling technique – purposive sampling/complete enumeration to enrol patients. Data collection was carried out prospectively at the time of patient admission with a clinical diagnosis of perforated peptic ulcer. For each patient, relevant clinical and biochemical information was systematically recorded using a structured proforma to facilitate the calculation of both the Peptic Ulcer Perforation (PULP) score and the Boey score. The PULP score was determined based on parameters including age, comorbid illnesses, renal function (serum creatinine), time elapsed from symptom onset to hospital presentation, and the American Society of Anesthesiologists (ASA) score. Each parameter was assigned a specific point value, and the total PULP score ranged from 0 to 18, stratifying patients into low (0–7), moderate (8–12), and high (13–18) mortality risk categories. Simultaneously, the Boey score was assessed using three key clinical criteria: presence of shock at admission (systolic blood pressure <90 mmHg), duration of symptoms exceeding 24 hours, and the presence of significant comorbid conditions. Each criterion was allotted one point if present, resulting in a total score between 0 and 3. This score was used to categorize patients into corresponding mortality risk groups: low (0), moderate (1), high (2), and very high (3). Both scoring systems were applied to each study participant to assess the severity of their clinical condition and to predict the risk of postoperative mortality.

Statistical analysis: The data obtained was manually entered into Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) v23. All the categorical variables were summarised using frequencies and percentages. Continuous variables were summarized using mean (standard deviation) (based on the results of data normality, tested using Kolmogorov–Smirnov test and the Shapiro–Wilk test). Receiver operating characteristic (ROC) analysis was done to determine the area under the curve (AUC) of PULP scores and Boey scores in predicting mortality among patients with peptic ulcer perforation. The diagnostic accuracy of PULP scores and Boey scores were calculated in terms of sensitivity and specificity. Statistical significance was considered at p value less than 0.05.

Results

In this study comprising 42 patients with peptic ulcer perforation, the mean age was 64.6 ± 9.1 years, with 64.3% aged over 60 years. Males constituted the majority (73.8%). Most patients (59.5%) presented within 24 hours of symptom onset, while preoperative shock was observed in 14.3% of cases. The mean duration of surgery was 3.0 hours, and the mean perforation size was 0.8 ± 0.2 cm. According to the ASA classification, most patients were categorized as ASA I (73.8%). The mean PULP score was 8.0 ± 3.9, and the mean Boey score was 1.4 ± 0.9, with 40.5% scoring 1 and 31.0% scoring 2. ICU admission was required in 38.1% of cases, with a mean ICU stay of 2.7 ± 1.5 days. The mean total hospital stay was 8.6 ± 2.1 days. In-hospital mortality was reported in 26.2% of patients, while 73.8% survived the postoperative period.

The mean age of deceased patients was significantly higher (71.8 ± 7.5 years) compared to survivors (62.1 ± 8.3 years; p = 0.001). Mortality was significantly more common among patients aged >60 years (90.9%) compared to those <60 years (9.1%; p = 0.032). A significantly higher proportion of patients who died had symptom onset >24 hours before presentation (81.8%) compared to survivors (25.8%; p = 0.001). Preoperative shock was also significantly associated with mortality, present in 54.5% of those who died and none of the survivors (p < 0.001). Although gender distribution showed a trend toward higher mortality among females (45.5%), this was not statistically significant (p = 0.091). Duration of surgery and perforation size did not differ significantly between groups.

Patients who died had significantly higher ASA physical status classifications, with 72.7% classified as ASA III or above, compared to only 6.4% among survivors (p < 0.001). The mean PULP score was significantly higher in

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the mortality group (10.3 ± 3.8) than in survivors (7.3 ± 3.7; p = 0.025), and the mean Boey score was also elevated in non-survivors (1.9 ± 1.0 vs. 1.2 ± 0.7; p = 0.013). Notably, 36.4% of non-survivors had a Boey score of 3, while none in the survivor group did (p = 0.006). ICU admission was required in 90.9% of patients who died, compared to only 19.4% of survivors (p < 0.001), indicating a strong association between intensive care needs and mortality. Moreover, deceased patients had significantly longer ICU stays (9.7 ± 2.1 days vs. 8.2 ± 1.9 days; p = 0.041) and hospital stays (4.3 ± 1.5 days vs. 2.2 ± 1.2 days; p = 0.013), underscoring greater clinical burden.

ROC analysis demonstrated that ASA classification, PULP score, and Boey score were all statistically significant predictors of mortality in patients with peptic ulcer perforation. The ASA score showed the highest predictive accuracy, with an AUC of 0.893 (95% CI: 0.751–1.000), using a cut-off value ≥3.0, yielding a sensitivity of 72.7% and a specificity of 96.8% (p < 0.001). The PULP score also showed good predictive ability, with an AUC of 0.727 (95% CI: 0.546–0.908), cut-off ≥9.0, sensitivity of 72.7%, and specificity of 80.6% (p = 0.027). The Boey score had an AUC of 0.711 (95% CI: 0.512–0.910), with a cut-off ≥2.0, and demonstrated a sensitivity of 63.6% and specificity of 64.5% (p = 0.039).

Correlation analysis revealed that the severity of peptic ulcer perforation, as assessed by the PULP score, showed a strong positive correlation with the duration of ICU stay (r = 0.676, p = 0.004) and a moderate positive correlation with the duration of hospital stay (r = 0.490, p = 0.001), both statistically significant. In contrast, the Boey score demonstrated a significant moderate correlation with the duration of hospital stay (r = 0.523, p < 0.001), but no significant correlation with ICU stay duration (r = 0.220, p = 0.412).

Discussion

The present study aimed to evaluate the utility of the PULP and Boey scoring systems in assessing the severity of peptic ulcer perforation and predicting postoperative outcomes. Age was found to be a significant predictor of mortality in our study. The mean age of non-survivors was significantly higher (71.8 years) than that of survivors (62.1 years), with a statistically significant difference (p = 0.001). Additionally, a greater proportion of patients aged 60 years and above experienced mortality (90.9%) compared to those below 60 years (9.1%) (p = 0.032). These findings are consistent with previous research that identifies advanced age as a major risk factor for adverse postoperative outcomes in peptic ulcer perforation cases.(16) Older patients often have multiple comorbidities, decreased physiological reserves, and impaired immune responses, all of which contribute to poor surgical outcomes.(11) Advanced age elevates vulnerability to surgical stress and impairs wound healing, while its association with increased comorbidities further predisposes patients to adverse postoperative outcomes in peptic ulcer perforation cases. In a retrospective cohort study by Lohsiriwat et al.(17) (2009), elderly patients undergoing emergency surgery for perforated peptic ulcers had a significantly higher mortality rate compared to younger patients, emphasizing the role of age-related physiological changes in postoperative recovery.

Although a higher proportion of males (80.6%) survived compared to females (54.5%), and more females (45.5%) succumbed to the illness compared to males (19.4%), this difference was not statistically significant (p = 0.091). The predominance of males (73.8%) in our study aligns with global epidemiological trends that report a higher incidence of peptic ulcer perforation among men, likely due to higher rates of smoking, alcohol consumption, and NSAID use.(18, 19) However, while gender differences in peptic ulcer perforation incidence are well documented, their direct impact on mortality remains inconclusive. Some studies have suggested that female patients may have poorer outcomes due to delayed diagnosis or more severe disease at presentation,(20) but further large-scale studies are needed to confirm this association.

A crucial finding from our study was that delayed presentation (onset of symptoms >24 hours) was strongly associated with increased mortality (81.8%) compared to early presentation (<24 hours), where mortality was significantly lower (18.2%) (p = 0.001). These results corroborate findings from previous studies that highlight delayed hospital presentation as a major risk factor for poor outcomes in peptic ulcer perforation.(21) Prolonged perforation leads to widespread peritonitis, sepsis, and systemic inflammatory response syndrome (SIRS), all of

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which increase the likelihood of multiorgan failure and mortality.(6) Svanes (2000) emphasized that patients with a delayed presentation often require more extensive surgical intervention, prolonged ICU admission, and intensive postoperative care.(21) As such, early diagnosis and timely surgical intervention are critical in reducing mortality rates.

Preoperative shock was the strongest predictor of mortality in our study, with all six patients who presented in shock (100%) succumbing to the illness ($p < 0.001$). This finding is consistent with previous studies that have identified hemodynamic instability at presentation as a critical determinant of poor outcomes in gastrointestinal perforation cases.(22) A study by Møller et al.(23) (2009) demonstrated that patients in preoperative shock had an over threefold increased risk of mortality compared to hemodynamically stable patients. Shock indicates severe systemic compromise due to peritonitis-induced sepsis and profound fluid loss, leading to multiorgan dysfunction.(24) Effective early resuscitation with aggressive fluid therapy, vasopressor support, and timely surgical intervention is essential for improving survival in these high-risk patients.

Our study found that the mean duration of surgery was 3.0 hours, with no significant variation between survivors (2.9 hours, SD = 0.9) and non-survivors (3.1 hours, SD = 1.0) ($p = 0.482$). Similarly, the mean perforation size was 0.8 cm (SD = 0.2), and no statistically significant difference was observed between survivors (0.7 cm, SD = 0.4) and non-survivors (0.8 cm, SD = 0.2) ($p = 0.614$). These findings suggest that neither the complexity of the surgical procedure (as indicated by operative time) nor the size of the perforation had a direct impact on in-hospital mortality. Previous studies have also indicated that perforation size alone is not an independent predictor of mortality.(25) A study by Møller et al.(23) (2009) found that while larger perforations can lead to greater peritoneal contamination, the host response, time to surgery, and comorbid conditions play a more significant role in determining outcomes. Similarly, Lohsiriwat et al.(17) (2009) reported that prolonged operative time is more often a consequence of intraoperative complications rather than an independent predictor of mortality.

One of the most significant findings of our study was the strong association between ICU admission and mortality. Among non-survivors, 90.9% required ICU admission, compared to only 19.4% of survivors ($p < 0.001$). These results are in agreement with existing literature, which highlights ICU admission as a marker of disease severity in peptic ulcer perforation cases.(26) The requirement for intensive care is typically driven by complications such as sepsis, multiorgan dysfunction, and prolonged shock, all of which significantly increase the risk of mortality.(6) ICU patients often require invasive mechanical ventilation, vasopressor support, and continuous hemodynamic monitoring, further highlighting the critical nature of their condition. A study by Søreide et al.(5) (2015) found that patients with peptic ulcer perforation who required ICU admission had significantly higher mortality rates due to the SIRS and organ dysfunction associated with delayed presentation and severe sepsis.

Our study found that the mean duration of ICU stay was significantly longer in non-survivors (4.3 days, SD = 1.5) than in survivors (2.2 days, SD = 1.2) ($p = 0.013$). Similarly, the mean hospital stay was significantly prolonged in non-survivors (9.7 days, SD = 2.1) compared to survivors (8.2 days, SD = 1.9) ($p = 0.041$). These findings align with previous research that has established prolonged ICU, and hospital stays as indicators of disease severity and poor prognosis.(16) Extended ICU stays are often associated with complications such as nosocomial infections, ventilator-associated pneumonia, and prolonged SIRS, all of which contribute to higher mortality rates.(5) A retrospective study by An et al.(27) (2021) found that prolonged hospital stays in peptic ulcer perforation cases were associated with increased rates of sepsis and reoperation, both of which significantly contributed to mortality. Strategies such as enhanced recovery after surgery (ERAS) protocols, early mobilization, and optimized antibiotic therapy may help minimize complications and improve survival rates.(17)

The ASA classification was significantly associated with mortality ($p < 0.001$), with a high proportion of non-survivors categorized as ASA grades III, IV, or V. Importantly, none of the patients in these categories survived, while 93.5% of survivors were classified as ASA grade I. Furthermore, the ASA classification

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exhibited the highest predictive accuracy for mortality, with an AUC of 0.893 (95% CI: 0.751–1.000, $p < 0.001$). A cut-off score of ≥3.0 for ASA had a sensitivity of 72.7% and specificity of 96.8%, making it a robust predictor of mortality. These findings are consistent with previous studies highlighting the ASA classification as a strong predictor of perioperative mortality in emergency gastrointestinal surgery.(28-30)

The PULP score was also significantly higher in non-survivors (10.3, SD = 3.8) compared to survivors (7.3, SD = 3.7) ($p = 0.025$), with an AUC of 0.727 ($p = 0.027$). A cut-off score of ≥9.0 demonstrated a sensitivity of 72.7% and specificity of 80.6%. Previous studies have reported similar findings, confirming that the PULP score effectively predicts mortality by incorporating multiple prognostic factors, including age, shock status, and comorbidities.(31, 32) The correlation between the PULP score and prolonged ICU and hospital stay further supports its utility in assessing the severity of peptic ulcer perforation and guiding postoperative care.(33)

Similarly, the Boey score was significantly associated with mortality, with a higher mean score among non-survivors (1.9, SD = 1.0) compared to survivors (1.2, SD = 0.7) ($p = 0.013$). A Boey score of 3 was observed in 36.4% of non-survivors, while none of the survivors had this score ($p = 0.006$), confirming its strong predictive value. The Boey score had an AUC of 0.711 ($p = 0.039$) with a cut-off of ≥2.0, a sensitivity of 63.6%, and a specificity of 64.5%. These results are in line with prior studies demonstrating that a higher Boey score is associated with increased mortality risk.(34) However, the Boey score had a lower predictive accuracy compared to the ASA classification and PULP score, suggesting that while it remains useful, it may not be as comprehensive in predicting mortality.

The study found a strong positive correlation between the PULP score and ICU stay duration ($r = 0.676$, $p = 0.004$), indicating that higher PULP scores were associated with prolonged ICU admission. Similarly, a moderate positive correlation was observed between the PULP score and hospital stay duration ($r = 0.490$, $p = 0.001$), suggesting that increased severity of peptic ulcer perforation led to longer hospitalization. These findings align with prior research demonstrating that patients with higher PULP scores have greater perioperative morbidity, requiring intensive monitoring and extended hospital care.(27) In contrast, the correlation between the Boey score and ICU stay was weak and not statistically significant ($r = 0.220$, $p = 0.412$), suggesting that the Boey score may not be a reliable predictor of ICU stay duration. However, a moderate positive correlation was found between the Boey score, and hospital stay ($r = 0.523$, $p < 0.001$), indicating that higher Boey scores were significantly associated with prolonged hospitalization.

The present study has several limitations. Firstly, as a single-centre study conducted at JSS Medical College, Mysuru, the results may not be fully applicable to other healthcare settings with different patient demographics, surgical expertise, and postoperative care protocols. Additionally, the study used a non-probability purposive sampling technique, which may introduce selection bias and affect the external validity of the results. Another limitation is the observational study design, which does not establish causal relationships between scoring systems and outcomes but rather highlights associations. Furthermore, factors such as surgeon experience, variations in postoperative care, and hospital resource availability were not accounted for, potentially influencing patient outcomes. The study also did not explore long-term follow-up data, such as recurrence of complications or quality of life after discharge, which could provide a more comprehensive assessment of prognostic scoring systems.

Conclusion

The present study highlights the clinical utility and comparative effectiveness of the PULP and Boey scoring systems in predicting the severity and outcomes of peptic ulcer perforation. The findings demonstrate that delayed presentation, preoperative shock, and ICU admission are significant predictors of mortality. Among the scoring systems, the ASA classification showed the highest predictive accuracy for mortality, followed by the PULP and Boey scores. Additionally, the PULP score exhibited a strong correlation with ICU and hospital stay duration, reinforcing its role in assessing disease severity and guiding postoperative management. While the Boey score was moderately associated with hospital stay, its predictive value for ICU stay was weaker.

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Table 1: Baseline Demographic, Clinical, and Operative Characteristics of Patients with Peptic Ulcer Perforation (N = 42)

		Number (N = 42) (n)	**Percentage (%)**
Age (in years), Mean (SD)		64.6 (9.1)	
Age (in years)	≤60	15	35.7
	>60	27	64.3
Gender	Male	31	73.8
	Female	11	26.2
Onset of illness	≥24 hours	17	40.5
	<24 hours	25	59.5
Preoperative shock	Present	6	14.3
	Absent	36	85.7
Duration of surgery (in hours), Mean (SD)		3.0 (0.0)	
Size of perforation (in cm), Mean (SD)		0.8 (0.2)	

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American Society of Anaesthesiologists Physical Status Classification System	I	31	73.8
	II	2	4.8
	III	5	11.9
	IV	3	7.1
	V	1	2.4
Peptic Ulcer Perforation score, Mean (SD)		8.0 (3.9)	
Boey score, Mean (SD)		1.4 (0.9)	
Boey score	0	7	16.7
	1	17	40.5
	2	13	31.0
	3	5	11.9
ICU admission	Yes	16	38.1
	No	26	61.9
Duration of ICU stay (in days), Mean (SD)		2.7 (1.5)	
Duration of hospital stay (in days), Mean (SD)		8.6 (2.1)	
In-hospital mortality	Yes	11	26.2
	No	31	73.8
SD, Standard deviation			

Table 2: Comparison of Clinical and Operative Parameters Between Survivors and Non-Survivors in Peptic Ulcer Perforation (N = 42)

		Mortality		**P value**
		Yes N = 11	**No N = 31**	
		n (%)	**n (%)**	
Age (in years), Mean (SD)		71.8 (7.5)	62.1 (8.3)	0.001*
Age (in years)	≤60	1 (9.1)	14 (45.2)	0.032*
	>60	10 (90.9)	17 (54.8)	
Gender	Male	6 (54.5)	25 (80.6)	0.091
	Female	5 (45.5)	6 (19.4)	
Onset of illness	≥24 hours	9 (81.8)	8 (25.8)	0.001*
	<24 hours	2 (18.2)	23 (74.2)	
Preoperative shock	Present	6 (54.5)	0 (0.0)	<0.001*
	Absent	5 (45.5)	31 (100)	
Duration of surgery (in hours), Mean (SD)		3.1 (1.0)	2.9 (0.9)	0.482
Size of perforation (in cm), Mean (SD)		0.8 (0.2)	0.7 (0.4)	0.614
*Statistically significant at p<0.05 SD, Standard deviation				

Table 3: Association of ASA Classification, Risk Scores, ICU Admission, and Hospital Stay with Mortality in Peptic Ulcer Perforation (N = 42)

	Mortality	**P value**

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		Yes N = 11 n (%)	No N = 31 n (%)	
American Society of Anaesthesiologists Physical Status Classification System	I	2 (18.2)	29 (93.5)	<0.001*
	II	1 (9.1)	1 (3.2)	
	III	4 (36.4)	1 (3.2)	
	IV	3 (27.3)	0 (0.0)	
	V	1 (9.1)	0 (0.0)	
Peptic Ulcer Perforation score, Mean (SD)		10.3 (3.8)	7.3 (3.7)	0.025*
Boey score, Mean (SD)		1.9 (1.0)	1.2 (0.7)	0.013*
Boey score	0	1 (9.1)	6 (19.4)	0.006*
	1	3 (27.3)	14 (45.2)	
	2	3 (27.3)	11 (35.5)	
	3	4 (36.4)	0 (0.0)	
ICU admission	Yes	10 (90.9)	6 (19.4)	<0.001*
	No	1 (9.1)	25 (80.6)	
Duration of hospital stay (in days), Mean (SD)		4.3 (1.5)	2.2 (1.2)	0.013*
Duration of ICU stay (in days), Mean (SD)		9.7 (2.1)	8.2 (1.9)	0.041*
*Statistically significant at p<0.05 SD, Standard deviation				

Table 4: ROC analysis showing area under the curve of ASA grading, PULP scores and Boey scores in predicting mortality among patients with peptic ulcer perforation

	AUC (95% CI)	Cut off	Sensitivity (%)	Specificity (%)	P value
ASA	0.893 (0.751 to 1.000)	≥3.0	72.7	96.8	<0.001*
PULP score	0.727 (0.546 to 0.908)	≥9.0	72.7	80.6	0.027*
Boey score	0.711 (0.512 to 0.910)	≥2.0	63.6	64.5	0.039*
ASA, American Society of Anaesthesiologists Physical Status Classification System; PULP, Peptic Ulcer Perforation score; AUC, Area under the curve; CI, Confidence interval					

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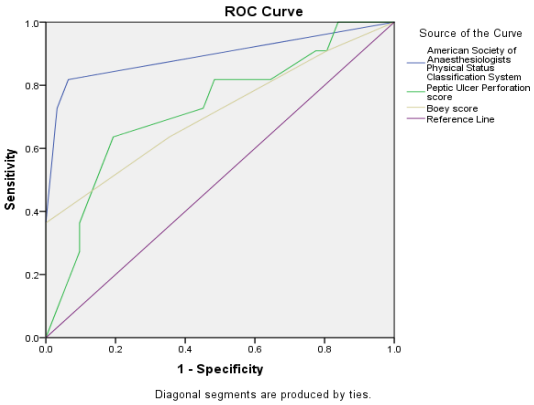

Figure 1: ROC analysis showing area under the curve of ASA grading, PULP scores and Boey scores in predicting mortality among patients with peptic ulcer perforation

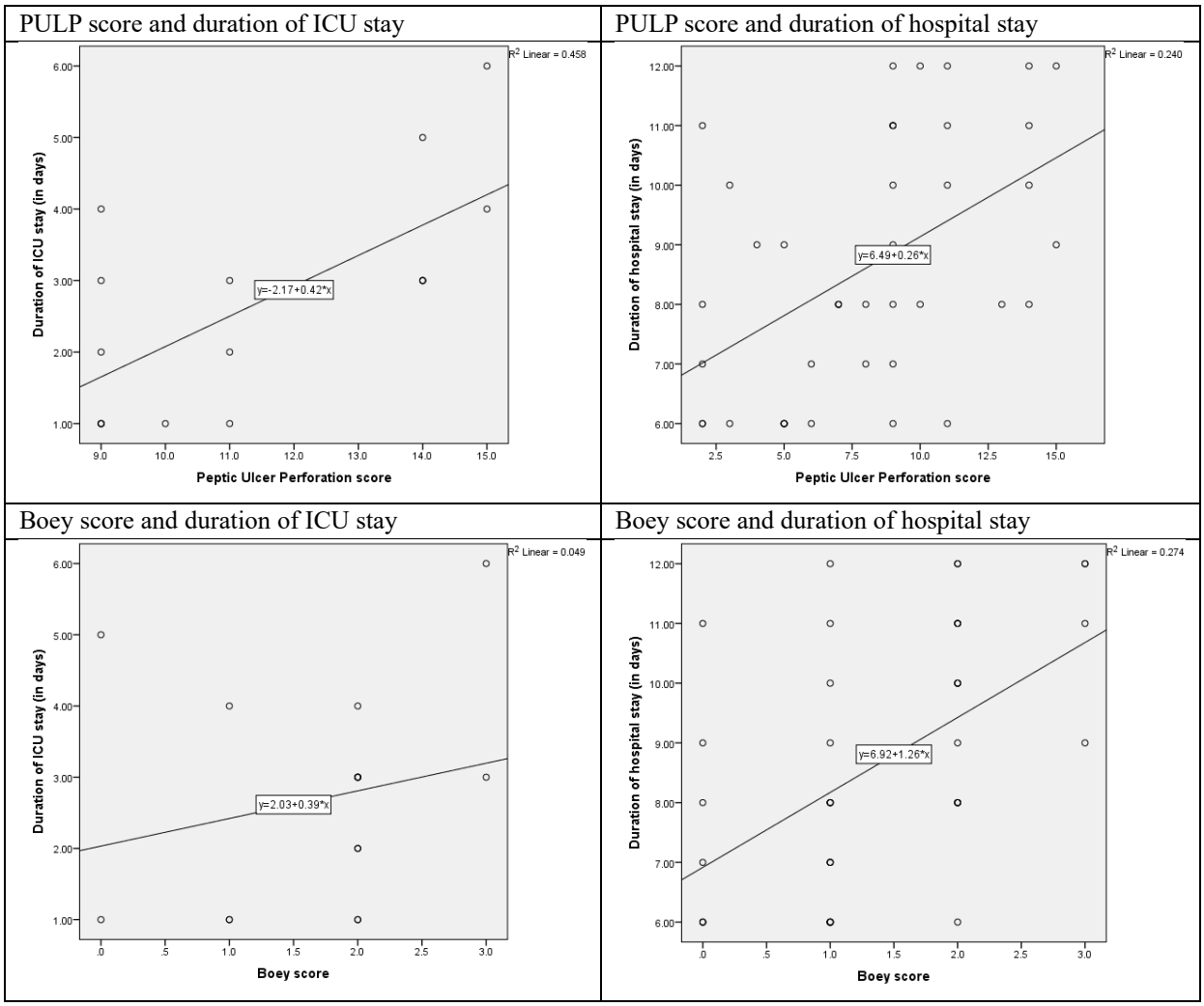

Figure 2: Correlation between severity of peptic ulcer perforation assessed using PULP score, Boey score and duration of ICU/hospital stay