

The Boey Score as a Quick Assessment Tool in the Prediction of Postoperative Mortality in Patients with Hollow Viscus Perforation: A Study in Karachi, Pakistan

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Abstract: Hollow viscus perforation (HVP) is a surgical emergency with significant morbidity and mortality. The Boey score, incorporating preoperative shock, medical comorbidities, and delay in surgical intervention, serves as a predictive model for postoperative outcomes. Early identification of high-risk patients through this scoring system may assist in optimizing treatment approaches and improving survival rates. **Objective:** To determine the frequency of mortality in patients with hollow viscus perforation according to their Boey score. **Methods:** This descriptive cross-sectional study was conducted at the Department of Surgery, Dr. Ruth K. M. Pfau Civil Hospital, Karachi, from July 2024 to January 2025. After ethical approval, 185 patients aged >18, of either gender, presenting with a confirmed diagnosis of HVP, were enrolled via non-probability consecutive sampling. Data were collected on demographic variables, clinical parameters, Boey score components, and outcomes. Statistical analysis was performed using SPSS version 25. Chi-square tests assessed associations between mortality and patient characteristics; a p-value <0.05 was considered statistically significant. **Results:** Out of 185 patients, mortality was observed in 21 cases (11.35%). Age and gender showed no statistically significant association with mortality ($p = 0.55$ and $p = 0.197$, respectively). However, a statistically significant relationship was found between delayed presentation (>24 hours) and increased mortality ($p = 0.034$). Among patients presenting within 24 hours, only 3 out of 65 died, whereas in those presenting after 24 hours, 18 out of 120 died. The Boey score effectively stratifies patients based on risk, with higher scores correlating with higher mortality. **Conclusion:** The Boey score is a reliable prognostic tool for assessing mortality risk in patients with hollow viscus perforation. Delayed presentation significantly increases mortality, emphasizing the need for prompt diagnosis and intervention.

Keywords: Perforation, Boey score, mortality, survival

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Introduction

Hollow viscus perforation (HVP) remains a life-threatening operating room emergency. Gastrointestinal tract perforations create both peritonitis and sepsis, and this can easily cause mortality if left untreated. Hospital staff need to assess risk for death accurately and promptly before and after HVP surgery to guide medical decisions that will enhance patient outcomes (1). Three clinical indicators, including 24-hour symptom duration, shock presentation, and premorbid comorbidities, form the Boey scoring system, which emerged in the 1980s (2). Medical practitioners have used this assessment tool to determine prognosis levels and death risks in peptic ulcer disease patients with perforations. The utility and predictive value of the Boey score must be extensively studied to extrapolate and determine its relevance in HVP, especially within Pakistani healthcare institutions (3).

Research studies conducted worldwide have established the proficiency of the Boey score to predict clinical outcomes. A research study showed a 0% mortality rate among patients with a Boey score of 0, but mortality increased to 10% at score 1, and reached 45% at score 2, and 100% at score 3. This showed an increase in mortality with an increase in score. The Boey score demonstrates excellent ability to accurately divide perforated peptic ulcer patients into risk categories (4). The research by Kumar et al. from India regarding duodenal ulcer perforations found that Boey scores of 0, 1, and 2 resulted in mortality rates of 3.5%, 22.2%, and 70% in South Asian patients, respectively (5). The scoring system proves useful in healthcare settings around Pakistan that have limited medical resources and require quick assessment of unstable patients. The Boey score functions extensively, yet researchers have not established its scope of use for different HVP forms (6). The scientific literature lacks detailed investigations about perforations unrelated to peptic ulcers, especially

when examining typhoid ileal perforations, which are widespread in Pakistan (7). The research results from Malik et al. demonstrated that delayed hospital arrival and admission shock rates dramatically raised mortality in typhoid ileal perforation patients, thus hinting at the value of Boey score parameters for these specific cases (8). The Boey score lacks consideration of important criteria such as patient nutritional condition, immune function, and surgical procedure observations. This adversely affects its potential to influence treatment results (9). The Mannheim Peritonitis Index (MPI) and the Acute Physiology and Chronic Health Evaluation II (APACHE II) score present wider variable assessment but prove difficult to utilize during emergency assessments primarily because of their complexity (10). HVP occurs frequently in Karachi, Pakistan, and validating the Boey score for this area-specific population becomes essential because of the abundance of infectious diseases and insufficient healthcare services. The predictive accuracy assessment of this tool enables better risk analysis for allocating resources while facilitating surgical decision-making to decrease mortality rates that result from HVP throughout this region (11). The objective of the present study is to observe the mortality frequency in patients with hollow viscus perforation according to their Boey score and also to observe the difference in mortality frequency between different regions of perforation in patients with the same Boey score on presentation.

Methodology

After the ethical approval from the institutional review board, this cross-sectional study was conducted at the Department of Surgery in Dr. Ruth K. M. Pfau Civil Hospital Karachi, from July 2024 to January 2025. Through non-probability consecutive sampling, 185 patients, above 18 years of age, both genders, with HVP diagnosis were included in the



present study. Patients who had esophageal perforation were excluded from the study. Informed consent was taken from each patient. A pre-made form was entered details regarding each patient. biodata, time of onset of presenting complaints, vitals (including pulse, respiratory rate, temperature, systolic blood pressure, diastolic blood pressure and mean arterial pressure), diagnosis, method of diagnosis, specific surgical treatment given, and outcome of the patient (given as treated or in patient death). The Boey score was calculated within the form. Additionally, time of admission, time of start and end of surgery was recorded. The presence of comorbidity was assessed via history, and the Charlson comorbidity index score was calculated. The patient was followed for the period of their first admission related to hollow viscus perforation. SPSS version 27 processed the data gathered from the study. The research presented frequencies and percentages for qualitative study variables including gender and mortality together with diagnosis and surgical procedure and perforation site. The Kolmogorov-Smirnov test was used to check the normality of quantitative variables which included age, Boey score, vitals, hospital stay and Charlson Comorbidity Index. Data that followed a normal distribution received measurement as mean \pm standard deviation (SD) while deviated variables appeared with median and interquartile range (IQR). The Chi-square test analysed categorical variable data and ANOVA or Mann-Whitney U test provided continuous variable comparison results between groups. Mortality predictions by the Boey Score were determined using logistic regression analysis followed by survival trend evaluations through Kaplan-Meier analysis. All statistical tests rested at a significance level of $p < 0.05$.

Results

The study analysed data from a total of 185 patients diagnosed with hollow viscus perforation. The mean age of the patients was 33.05 ± 16.2 years. The majority were male, comprising 127 individuals (69%), while females accounted for 58 patients (31%). Regarding the duration of symptoms before hospital presentation, 65 patients (35%) reported symptoms lasting less than 24 hours, while 120 patients (65%) presented after more than 24 hours. A total of 51 patients (28%) had underlying comorbid conditions. Clinically, the mean pulse rate was recorded as 99.8 ± 21.8 beats per minute, with an average respiratory rate of 22.15 ± 6.5 breaths per minute. The mean temperature was $98.5 \pm 1.32^\circ\text{F}$. The systolic and diastolic blood pressures averaged 113.3 ± 18.9 mmHg and 74.3 ± 14.5 mmHg, respectively, resulting in a mean arterial pressure (MAP) of 89.4 ± 11.7 mmHg (Table 1).

Diagnostic approaches included clinical assessment with imaging in 81 patients (44%) and surgical exploration in 104 patients (56%). The surgical interventions varied: 62 patients (33%) underwent simple closure, 64 (34%) had resection and anastomosis, while 59 (32%) required ostomy creation. The mean size of the perforation was 1.3 ± 1.0 cm. The Boey Score, which assesses surgical risk, averaged 1.01 ± 0.74 among the cohort. The average length of hospital stay was 12.1 ± 21.5 days. In terms of clinical outcomes, 164 patients (87%) were successfully treated and discharged, while 21 patients (13%) succumbed to the illness (Table 2). Among the 185 patients analyzed, the ileum was the most frequently involved site of perforation, accounting for 74 cases (Figure 2). This was followed by the stomach, with 36 cases, and the jejunum, with 20 cases. Other sites included the colon (18 cases), appendix (14 cases), and caecum (11 cases). The duodenum and rectum were the least common sites, with 6 cases each. These findings highlight that small bowel perforations, particularly involving the ileum, are the predominant presentation among patients with hollow viscus perforation in this cohort. Stratification of outcomes revealed that younger patients had better survival rates (Table 3). In the 18–40 age group, 97 patients were

discharged while only 5 died. Among those aged 41–60, 32 were discharged and 9 died, and in the 61 and above group, 25 were discharged compared to 6 deaths. However, this difference in outcomes across age groups was not statistically significant ($p = 0.55$). Gender-wise, 110 males and 54 females were discharged, whereas 17 males and 4 females died ($p = 0.197$), indicating no significant association. However, duration of symptoms showed a statistically significant relationship with outcomes ($p = 0.034$). Of those who presented within 24 hours, 62 were discharged and only 3 died, whereas delayed presentation (beyond 24 hours) was associated with a higher mortality rate (18 deaths out of 120 cases), emphasizing the importance of early intervention. Kaplan-Meier survival analysis revealed that patients with a Boey Score of 2 had the longest mean survival time (21.13 ± 1.21 days), while those with a Boey Score of 4 had the shortest survival (18.5 ± 0.35 days). The median survival was 22 days overall (Figure 3 and Table 4).

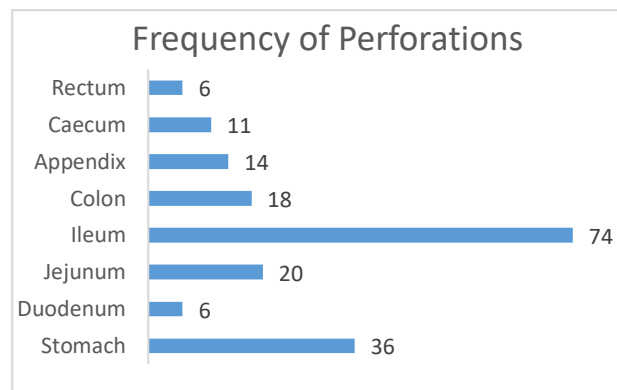


Figure 1: Perforation site

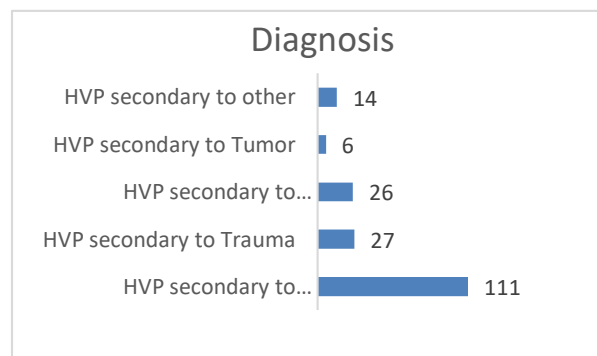


Figure 2: Diagnosis

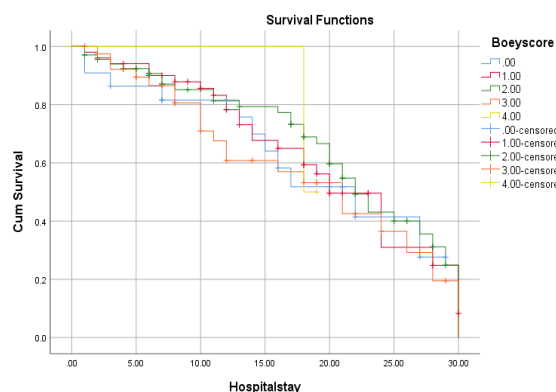


Figure 3. ROC curve analysis

Table 1: Demographic and Clinical Variables

Variables	Mean and Frequency
Age (years)	33.05±16.2
Gender	
Male	127 (69%)
Female	58 (31%)
Duration of Symptoms	
<24 hours	65 (35%)
> 24 hours	125 (65%)
Comorbid	51 (28%)
Pulse Rate (beat/min)	99.8±21.8
Respiratory Rate (per min)	22.15±6.5
Temperature °C	98.5±1.32
Systolic BP (mmHg)	113.3±18.9
Diastolic BP (mmHg)	74.3±14.5
Mean Arterial Pressure	89.4±11.7

Table 2: HPV diagnosis, treatment and outcomes

Variables	Mean and Frequency
Method of Diagnosis	
Clinical + Imaging	81 (44%)
Surgical Exploration	103 (56%)
Surgical Procedure	
Simple Closure	62 (33%)
Resection + Anastomosis	63 (34%)
Ostomy Creation	59 (32%)
Approximate Perforation Size (cm)	1.3±1.0
Boey Score	1.01±0.74
Length of Hospital Stay	12.1±21.5
Final Outcome	
Treated and discharged	164 (87%)
Death	21 (13%)

Table 3: Stratification of outcomes

Variables	Outcome		P Value
Age	Treated and Discharged	Death	0.55
18-40	97	5	
41-60	32	9	
61 above	25	6	
Gender			0.197
Male	110	17	
Female	54	4	
Duration of symptoms			0.034
<24 hrs	62	3	
>24 hrs	102	18	

Discussion

The findings from the current study on hollow viscus perforation (HVP) show consistency with the pattern of global literature particularly with predictors of morbidity and mortality. Nevertheless, detailed geographical, demographic and healthcare system specific nuances and variations are brought out by a critical analysis.

Although age stratification did not uncover a statistically significant relationship with mortality ($p = 0.5$), the increasing deaths with age pattern resembles other clinical observations. Gallo et al. (2024), for example, reported that elderly patients (more than 60 year) with perforations of the gastrointestinal tract had a higher mortality because of delayed diagnosis, underlying comorbidities as well as poor physiological reserve (12). Another study of colonic perforations also found a threefold increased mortality in those patients over 70 years of age (13). Causes for

the lack of statistical significance in the present study may be sample size limitations or a young cohort with a mean aged of 33.05 ± 16.2 years. Further study is required in order to uncover differences between studies. Results demonstrated that a statistically significant predictor of outcome was duration of symptoms before intervention ($p = 0.034$). It is consistent with numerous other studies indicating that delays beyond 24 hours deteriorate outcome as a result of progression of peritonitis and septic shock. Gaurav et al. (2024) studied the patient presenting more than 24 hours after the onset of symptoms in India and found that it is associated with more complications like wound infection, intra-abdominal abscess and mortality (14). Notably, in the present cohort, only 3 out of 65 patients that would present early (within <24 hours) died, compared to 18 of 120 late presenters, which illustrates that HVP management is time sensitive. Further support this by reminding that early resuscitation and surgery are critical.

In the present study, the gender-wise mortality differences were not statistically different ($p = 0.197$). This results in a trend of a higher proportion of males (69%) which would be reported in surgical emergencies. Cohorts with perforated peptic ulcers or typhoid ileal perforations may be dominated by males perhaps as they smoke more frequently, have an increased use of NSAIDs or have a higher occupational exposure (15). However, some of the literature suggests that the sociocultural barriers present females later, but this was not evident here. According to a study from Pakistan by Bhatti et al. (2024) as in this study, the male predominance was also found, with male and female outcomes not differing significantly (16).

A further point is that surgical exploration (56%) is far more common than diagnosis by imaging (44%) and may indicate limited diagnostic infrastructure or an emergent nature of many presentations. On the contrary, advanced imaging conditioned developed countries with CT scans for preoperative diagnosis resulting in better risk stratification and minimally invasive procedures (Fig. 3). Similarly, the surgical choices made (simple closure 33%, resection with anastomosis 34%, ostomy 32%), as reported in a large multicenter study of the World Society of Emergency Surgery (WSES), also reflect the varied nature of perforations and surgeon judgement (17).

Kaplan-Meier survival analysis in this study indicated that patients with a Boey score of 2 had the longest mean survival time (21.13 ± 1.21 days), whereas those with a score of 4 had the shortest (18.5 ± 0.35 days). This trend underscores the Boey score's utility in identifying high-risk patients, although the differences in survival times were modest. Similarly, a study highlighted that higher Boey scores correlated with increased mortality rates, reinforcing its role in risk stratification (18). Interestingly, a low Boey score did not correlate with any major difference in mean survival time.

Conclusion

Importantly, this study observes the consistency in prognostic values of HVP across the globe, particularly the importance of early presentation and age. Gender and comorbidities were less clear and failed to predict as in other international studies leading on to need to further analyse these factors at a larger scale. The Boey score showed some ability to predict mortality, but is far from a fool-proof method. Resource limited settings could be better served if targeted public awareness campaigns for early symptom recognition and usage of simple and quick diagnostic tools are initiated, though this requires more work. The impact of the usage of such scores remains to be seen.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-MMNCS-0331d-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

HMS (Postgraduate)

Manuscript drafting, Study Design,

Review of Literature, Data entry, Data analysis, and drafting article.

MZ (Postgraduate Trainee)

Conception of Study, Development of Research Methodology Design, Study Design, manuscript review, critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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