

Original research article

Assessment of the modified possum scoring system for perforative peritonitis

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Abstract

Background and objectives: Death and disability are both common results of perforative peritonitis. Most patients' postoperative recovery periods are uncertain even if they get to the hospital as soon as possible. Post-operative outcomes for patients are greatly influenced by the existence of these elements. We can determine whether patients are at a higher risk of mortality or complications through this prospective trial and treat them accordingly.

Methods: 40 patients hospitalized to Department of General Surgery, Ayaan Institute of Medical Sciences, Moinabad, Telangana, India with perforative peritonitis provided the clinical data for this study. Consent to participate in the study was acquired after patients were given information about it. The trial lasted for a full year, from December 2021 to November 2022, and the postoperative follow-up lasted for a full four weeks.

Results: The mortality rate was found to be 1.1 times the expected rate, and the morbidity rate was found to be 1.1 times the actual rate, all as a result of using linear analysis. Mortality and morbidity rates were similar to what was predicted by the data. The results were consistent with those of earlier research efforts. Perforation-to-operation time and the existence of co-morbidities were the two parameters investigated separately. There was shown to be a statistically significant relationship between these two factors and the end result.

Conclusion: In perforative peritonitis surgeries, POSSUM rating predicted post-operative outcomes. It could identify high-risk patients for specialist care. That's why it's crucial to adjust the scoring system to each surgical type: improved results and patient-centered treatment.

Keywords: Perforation to operation time, co-morbidity, and perforative peritonitis

Introduction

Mortality and morbidity from perforative peritonitis remain high, even in the present day. Peritonitis caused by a perforation of the hollow viscus is quite common in third world countries like India. After surgery, outcomes are still uncertain, even if the patient makes it to the hospital in time for treatment^[1-3]. Secondary peritonitis develops when the peritoneal cavity becomes infected because of the presence of contaminated organ contents. In most cases, the cause may be traced back to damage in the digestive tract^[4]. The perforation of the hollow viscus causes a variable death rate. There is a high rate of death and morbidity after surgery because of factors such as delays in operational intervention and co-morbidities. For the purpose of quality assurance and as a gauge for resource allocation, audits are indispensable in surgical practice, particularly when dealing with highly invasive operations^[4-6].

POSSUM would aid in determining which patients are at the most risk for complications and mortality. In 1999, Copeland and colleagues created POSSUM. Several different scoring systems have been established, such as the ASA for general risk prediction, APACHE III for intensive care, the Goldman Index for cardiac-related problems peri-operatively, and the ACPGBI^[7, 8]. These scoring systems have allowed for a more objective evaluation of patient health, allowing for more relevant comparisons to be made. Surgeons, however, are more familiar with the POSSUM system than the others, as the ASA is too basic and subjective, and the APACHE system is too complicated for widespread application. POSSUM and its revisions allow for a more accurate comparison of outcomes among surgeons, units, and healthcare systems for general surgical procedures by incorporating physiological, operational, and pathological data^[8-10].

The POSSUM tool was created by Copeland *et al.* in 1991 using data from a cohort of 1372 patients for the purpose of surgical audits. There are 12 pre-surgical physiological parameters and 6 operative criteria that go into the score. After developing equations using logistic regression analysis, we used the total score for each predictor to predict morbidity and mortality 30 days following surgery^[11, 12].

Although it shares the same variables and grading system as POSSUM, the P-POSSUM offers a more accurate approximation of the true mortality rate according to its revised equation. Procedures ranging

from general to vascular to colorectal to esophageal to laparoscopic have already benefited from its utilization. The research, however, have primarily been conducted in wealthy nations, where things like patient demographics, clinical presentation, and access to healthcare facilities are different from our own. Since even high-quality care may not prevent complications like delayed presentation and resource constraints, it is important to verify POSSUM in the Indian context ^[13, 14].

The purpose of this research was to evaluate the POSSUM scoring system for its usefulness in analyzing the post-operative outcome of patients with perforative peritonitis, a very dangerous condition. In addition to the time from perforation to surgery and the existence of co-morbidities, we have examined these parameters in our study because they have been shown to have a substantial impact on the outcome of patients with perforative peritonitis. Perforative peritonitis was the focus of this study, and the researchers wanted to see if the modified POSSUM score was an accurate indicator of the severity of the condition ^[13-15]. Aim and the objectives of this study was to evaluate the efficacy of POSSUM grading in predicting postoperative morbidity and death in patients undergoing emergency laparotomy for perforative peritonitis. Objective: To verify the role of perforation-to-operation time and co-morbid state in predicting post-operative outcome in patients with perforative peritonitis.

Methodology

40 patients hospitalized to Department of General Surgery, Ayaan Institute of Medical Sciences, Moinabad, Telangana, India with perforative peritonitis provided the clinical data for this study. Consent to participate in the study was acquired after patients were given information about it. The trial lasted for a full year, from December 2021 to November 2022 and the postoperative follow-up lasted for a full four weeks.

Patients admitted to the Department of Surgery who were slated to undergo emergency laparotomy were evaluated using a proforma sheet that included both inclusion and exclusion criteria, with patients being graded based on their physiological and operational findings. Two additional considerations were included.

Inclusion criteria

1. Older than 12 years old.
2. Individuals who had hollow viscus perforation and developed peritonitis.
3. Patients with an intra-peritoneal abscess brought on by a perforated hollow viscus.

Exclusion criteria

1. 12 years of age or younger.
2. Patients who require an emergency exploratory laparotomy for reasons other than abdominal trauma.
3. Those who have primary peritonitis from lupus erythematosus, TB, alcoholism, nephrotic syndrome, or heart failure.
4. The members of the College Ethics Committee accepted the study procedure.

The predicted death and morbidity rate was computed by assigning points to the study's physiological and operative parameters. Clinical observation was used to evaluate complications. While we did not perform routine bacteriological screening or post-operative imaging, we did conduct these tests to validate our clinical suspicions.

By treating the outcome as a dichotomous dependent variable, we were able to use the 2 test to evaluate the statistical significance of the differences between the expected and actual rates of morbidity and death. Unpaired t tests were used to analyze the statistical significance of differences in quantitative variables between the groups.

Results

For the purpose of this study, we gathered information from forty patients who had surgical treatment for perforative peritonitis. In accordance with the operative guidelines, a total of 29 major surgeries and 11 moderate surgeries were performed, and every one of these procedures was regarded as being an emergency.

Table 1: Indications

Sr. No.	Indications	No. of patients
1.	Gastric malignancy perforation	1
2.	Duodenal and antral perforation	20
3.	Ileal perforation	7
4.	Appendicular perforation	10
5.	Sigmoid volvulus perforation	2
	Total	40

The patient underwent a total of 29 major surgeries, including perforation closure, resection anastomosis, colostomy, ileostomy, and feeding jejunostomy. Eleven moderate procedures, including appendicectomy, were also conducted.

Table 2: Types of surgeries

Sr. No.	Type of Surgery	No. of patients
1.	Perforation closure with omental patch	22
2.	Appendicectomy	10
3.	Resection anastomosis	6
4.	Stoma	2
	Total	40

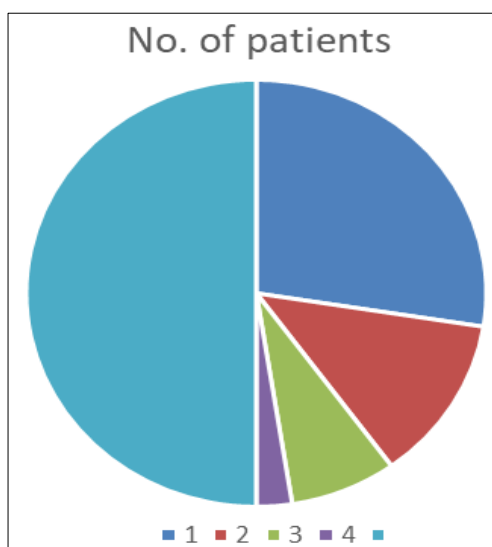


Fig 1: Types of surgeries

Eight of the forty individuals analyzed in the study succumbed to their illness, giving us a crude fatality rate of 18%. Crude morbidity rate was calculated as 22 patients out of the remaining 40 who experienced at least one problem. None of the other 18 patients experienced any complications.

Expected mortality rates

A linear model was used to make a comparison between the death rates that were predicted by POSSUM and those that were actually seen. It was discovered that the predicted values and the actual values did not significantly differ from one another, which resulted in an O: E ratio of 1.1.

Table 3: O: E mortality rate

Sr. No.	Predicated	No. of	Observed no.	Expected no.
1.	<10	2	0	0
2.	10 to 20	6	0	0
3.	20 to 30	3	0	0
4.	30 to 40	7	0	0
5.	40 to 50	3	0	0
6.	50 to 60	1	0	0
7.	60 to 70	4	2	1.8
8.	70 to 80	7	1	2.78
9.	80 to 90	3	2	2.14
10.	90 to 100	4	3	2.57
	Total	40	8	8.87

Comparing the actual morbidity rates with the POSSUM projections was accomplished through the use of linear analysis. The ratio of the observed values to the projected values was exactly 1.1 since there was no obvious difference between the projected and observed values.

Table 4: Mean POSSUM vs Outcome

Sr. No.	Group	No. of patients	Mean total POSSUM score
1.	Alive	32	46.02
2.	Death	8	68.82
	Total	40	57.42

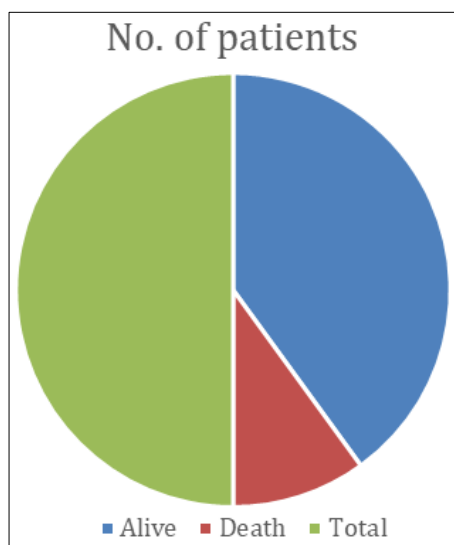


Fig 2: Mean POSSUM vs Outcome

Table 5: Risk factors

Sr. No.	Risk factors	p value	Inference
1.	Age	>0.04	Not significant
2.	Cardiovascular system	>0.04	Not significant
3.	Respiratory system	<0.04	Significant
4.	Blood pressure	<0.04	Significant
5.	Pulse rate	>0.04	Not significant
6.	Glasgow coma scale	<0.01	Significant
7.	Hemoglobin	>0.04	Not significant
8.	White cell count	>0.04	Not significant
9.	Blood urea	>0.04	Not significant
10.	Sodium	<0.04	Significant
11.	Potassium	<0.01	Significant
12.	ECG	>0.04	Not significant
13.	Operative Complexity	>0.04	Not significant
14.	Multiple procedures	<0.01	Significant
15.	Total blood loss	<0.04	Significant
16.	Peritoneal contamination	>0.04	Not significant

Perforation-operation time and the presence of co-morbid status were independently confirmed as risk variables in the study that significantly affect mortality in patients with perforative peritonitis. Both of these factors were associated with an increased risk of death. The level of statistical significance required for these factors was met. So, by carefully monitoring the patient and promptly fixing any problems that arise, one can improve the patient's overall health while simultaneously lowering their risk of passing away or becoming disabled. It is vital to enhance public awareness in order to stimulate prompt referrals, assure prompt diagnosis, and immediately initiate treatment in order to cut down on the amount of time that passes between the initial perforation and the operation and to keep secondary conditions under control.

Discussion

Over the past few years, the value of surgical audit has grown as a tool for gauging the quality of surgical care and as a method of teaching about surgical procedures. The use of the crude mortality rate can be deceiving in modern times. Forty patients were assessed in this study; all of them had had emergency laparotomy due to peritonitis caused by hollow viscus perforation. There were 40 total emergency operations, 29 of which were important and 11 which were minor. Perforations of the duodenum and antrum, appendix, ileum, stomach, esophagus, and sigmoid volvulus were all reasons for surgery. These patients were given entrance and intra-operative scores using the POSSUM system ^[15-17].

Patients were monitored for 4 weeks after surgery to detect the occurrence of death or complications. In our investigation, we observed 8 deaths, which is in line with the projected mortality rate of 17.9%. Neither the observed nor the POSSUM predicted mortality rates differed statistically. Twenty-six people experienced problems. There was no discernible discrepancy between the expected and actual values; hence, an O: E ratio of 1.001 was calculated. The existence of malignancy, the manner of surgery, the length from perforation to operation, the number of surgeries, the total amount of blood lost, and the patient's co-morbidity were all determined to be important after being analyzed [18-20].

Septicemia, deep infections, wound infections, chest infections, and numerous complications were reported in 58% of patients. For death, the PPV was 100%, the NPV was 78%, the sensitivity was 95%, and the specificity was 100%; for morbidity, the PPV was 94%, the NPV was 82%, the sensitivity was 71%, and the specificity was 96%. To address these deficiencies, it was suggested to use a POSSUM with a risk adjustment. The late manifestation of an illness is associated with higher death rates and more difficulties in a developing country like India because of poverty and lack of education. Those patients at highest risk for mortality or complications can be pinpointed with the help of the POSSUM score system. However for greater accuracy, POSSUM needs to be connected with the state of the local population as a whole [21-23].

Analysis of mortality and morbidity rates before and after emergency laparotomy for perforative peritonitis in 40 patients helped researchers determine the reliability of the POSSUM grading system. As a result, the overall mortality rate was 18% (9 patients). Septicemia was the leading cause of death. Similarly high death rates (19.1%) were found by Prytherach DR, *et al.* In our analysis, the POSSUM death rate forecast for participants was 17.9%. Of the 41 individuals who made it, 16 showed no signs of problems, whereas 25 had some sort of problem. There was no discernible discrepancy between the expected and actual values; hence, an O: E ratio of 1.001 was calculated [24-26].

A total POSSUM score of 57.42 was found to be the study's mean. Death group average was 69.56, while survival group average was 47.05. The split between the groups was statistically significant (p 0.01). Our results suggest that the risk of death was significantly higher for patients with a POSSUM total score of greater than 51.10. To predict mortality, logistic regression had a 100% positive predictive value, a 78% negative predictive value, a 95% sensitivity, and a 100% specificity. Positive predictive value was 94%, negative predictive value was 82%, sensitivity was 71%, and specificity was 96% for morbidity. The POSSUM scoring method identified the following variables as significant predictors of mortality: respiratory system, blood pressure, Glasgow coma scale, serum sodium, serum potassium, number of procedures, total blood loss, presence of cancer, and kind of surgery. Post-operative mortality, as measured by the POSSUM score, may have multiple underlying causes, including but not limited to ventilation perfusion mismatch, impaired tissue perfusion and ischemia to vital organs, impaired mental status due to hyponatremia and hypokalemia, cancer cachexia, and prolonged operative time [27-29].

Mortality from perforative peritonitis was found to be strongly affected by two independent risk factors: perforation-operation time and the existence of co-morbid status. These parameters were sufficient to reach statistical significance. Hence, increasing the patient's overall health and decreasing mortality and morbidity can be achieved through strict monitoring and early repair of these factors. The period from perforation to surgery can be shortened and complications can be kept under control if more people are made aware of the issue, referred to specialist's right once, diagnosed accurately, and given treatment without delay [28-30].

Five people with septicemia, four people with deep infections, four people with wound infections, three people with chest infections, and fifteen people with numerous sequelae were all detected in the study. Gross peritoneal pollution, impaired immune function, a higher diaphragm, incisions in the upper abdomen, and the existence of co-morbid conditions such as asthma, COAD, diabetes mellitus, anemia, and hypo-proteinemia are all to blame.

Conclusion

The mortality rates that were seen and those that were predicted were not statistically different. Among the 41 people who made it, 26 had some sort of complication from their treatment, while the other 16 showed no signs of trouble. There was no discernible discrepancy between the predicted and observed values, as evidenced by the O: E ratio of 1.1. Furthermore, the risk of dying can be predicted by looking at the mean total POSSUM score. Average POSSUM scores were 57.14 across all participants. Overall, the average score for the group that did not make it, while the average score for those. Differences between the two groups were statistically significant. The results of this study provide support for the feasibility of using the POSSUM scoring system to predict mortality and morbidity in patients undergoing surgery for perforative peritonitis. The scoring system can be enhanced by including additional data, such as the time from perforation to operation and the presence of co-morbidities. As a result, the surgical outcome can be enhanced by adapting the scoring system to reflect the nature of the procedure.

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Conflict of interest

Nil

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