ORIGINAL ARTICLE

Evaluation of possum and p-possum in patients undergoing emergency laparotomy

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Abstract

Background: Physiological and Operative Severity Score for Enumeration of Mortality and Morbidity(POSSUM) and Portsmouth modification(P-POSSUM) are the most appropriate scoring systems currently available in general surgery to predict 30 days mortality and morbidity. These have been used extensively in UK for risk adjusted audit.
In this study validity of these scores is evaluated in our circumstances.
Patients and methods: Fifty adults (above 13 years of age) patients from Accident & Emergency, both males and females, who underwent emergency laparotomy were recruited for study. The predicted mortality and morbidity was calculated by POSSUM and P-POSSUM equations. After surgery the patient's observed mortality and morbidity was noted for one month and compared with the predicted outcomes. Chi-square analysis and Pearson Correlation were made. A p-value of 0 .05 or less was taken as significant.
Results: Among 50 cases operated in emergency, the predicted mortality(P) by POSSUM was 9 , observed mortality(O) was 6 and O/P ratio was 0.66,while predicted mortality(P) by P-POSSUM was 6, observed mortality(O) was also 6 and their O/P ratio was 1. The predicted morbidity(P) by POSSUM was 28.17, observed morbidity(O) was 22 and O/P was 0 .78. The Pearson correlation has shown significant correlation at the 0.01 level (2 tailed) for the observed and predicted mortality and morbidity.
Conclusion: POSSUM can be used in emergency laparotomy to predict mortality and morbidity, however it over predicts both mortality and morbidity but P-POSSUM is more accurate in predicting mortality.

Keywords: POSSUM, P-POSSUM , Mortality, Morbidity, Emergency laparotomy

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Introduction:

In this modern era, surgeons are more accountable for the outcome of the treatment given to the patients. Their treatment outcome whether in the form of mortality or morbidity is not only dependant on the performance of individual surgeon but also on the acute and chronic physiological status of the patient, severity of his current illness, nature and extent of surgical intervention and co- morbid conditions. The raw mortality and morbidity rates are inaccurate and misleading for comparative surgical audit .For this purpose different scoring systems were developed to predict risk adjusted mortality and morbidity.[1-4]

POSSUM, Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity was developed by G P Copland et al, which would be mainly used in surgical audit. It has 12 physiological (pulse rate, systolic blood pressure, respiratory rate, cardiac signs and Glasgow coma scale, hemoglobin, white blood count, Urea, Sodium, Potassium, ECG and CXR) and 6 operative variables (operative severity, total blood loss, multiple procedures, peritoneal soiling, cancer and mode of surgery) [1-6], Each factor is assigned 1, 2, 4 or 8 points depending upon the severity of abnormality [7].

The Portsmouth predictor modification

(P.POSSUM) was developed to overcome the over prediction of mortality by POSSUM in low risk patients. In P-POSSUM same physiologic variables are used but equation and method of analysis is different.[1-4]

Since 1990, this scoring system has been used extensively in UK and in some other countries to compare surgical patients treated in different health care systems [4]. The variety of cases undergoing emergency laparotomy in developing countries is different from UK. Their nutritional status, low socioeconomic status and delayed presentation also affect their prognosis. Comparing the outcome of such patients using data from developed countries may be misleading [8].

The aim of present study is to evaluate the predictive accuracy of POSSUM and P-POSSUM in predicting mortality and morbidity in patients undergoing emergency laparotomy in our circumstances. This system may be useful to audit different surgeons, units and hospitals in future.

Methodology:

This study was conducted in South Surgical Ward, Mayo Hospital Lahore, from January 2008 to December 2008. A total of 50 patients who met the inclusion criteria were included in this study. The following groups of patients were excluded from the study.

- Patients unfit for General Anesthesia
- Patients requiring cardiopulmonary resuscitation before surgery
- Mentally retarded patients
- Patient less than 13 years of age
- Patients requiring damage control surgery before definitive treatment.

Informed consent was obtained from all patients. Their demographic information (age, sex, weight, etc) was recorded. The physiological variables like pulse rate, systolic blood pressure, respiratory rate, cardiac signs and Glasgow coma scale, hemoglobin, white blood count, urea, sodium, potassium, ECG and chest X-ray were recorded just before surgery. During the surgical procedure six operative variables like operative severity, total blood loss, multiple procedures, peritoneal soiling, cancer and mode of surgery were recorded by the operating surgeons. The predicted mortality and morbidity of each patient was calculated using the POSSUM and P-POSSUM calculator available on the internet and recorded. The patients were followed up for 1 month on 1st, 3rd, 7th, 15th, 30th post operative days for morbidity and mortality. The observed(O) and predicted(P) mortality and morbidity was compared and O/P tables were made for different age groups. Chi-square analysis was made for the test of significance. A p value of .05 or less was taken significant. The Pearson correlation was also used to show the significant correlation at the 0.01 level (2 tailed) for the observed and predicted mortality and morbidity.

Results:

Out of 50 patients operated in emergency 88% were males and 12% were females. Male to female ratio was 7:1. The leading cause of laparotomy in these patients was Tuberculosis abdomen -10 (20%) patients, followed by fire arm injury abdomen -8(16%) patients and blunt trauma -7(14%) patients (Table.1). The most common complication of the procedure was wound infection -5(10%) patients, followed by anastomosis leak -2(4%) patients (Table. 2). The observed(O) mortality was 6(12%),while POSSUM predicted(P) 9(18%) and P-POSSUM predicted(P) 6(12%). The O/E ratio for POSSUM was 0.6 and P-POSSUM was 1. The observed (O)morbidity was 22(44%) while POSSUM predicted 28.17(56.34%) and O/E was 0.78. When data was split for different age groups, POSSUM overpredicted mortality and morbidity for younger group (15-30 years), as compared to other groups (table 3,4). The results were tested by Chi-square goodness of fit tests as proposed by Hosmer and Lemeshow. The Pearson correlation has shown the significant correlation at the 0.01 level (2 tailed) for the observed and predicted mortality and morbidity.

Discussion:

In this culture of increased scrutiny surgeons must be able to demonstrate clearly and accurately how they perform through comparative

Table 1: *Indications for emergency laparotomy*

Indications	Frequency	Percentage
Tuberculosis abdomen	10	20
Fire arm injury	8	16
Blunt trauma abdomen	7	14
Duodenal ulcer perforation	6	12
Typhoid perforation	3	6
Carcinoma colon	2	4
Others	1	2

Table 2: *Complications of emergency laparotomy*

Complications	Frequency	Percentage
Wound infection	5	10
Anastomosis leak	2	4
dehiscence	2	4
Deep infection	2	4
Others	1	2

Table 3: *Comparison of Observed (O) and Predicted (P) Mortality using POSSUM and P-POSSUM*

Age	Frequency	Sum of Observed Mortality	Sum of Predicted Mortality POSSUM	Sum of Predicted Mortality P-POSSUM	o/p 1 possum	o/p p-possum
15-30	27	1	4.45	2.41	.224	.41
31-45	10	1	1.56	.67	.64	1.49
46-60	7	0	0.36	0		0
61-75	6	4	2.63	2.92	1.52	1.36
N	50	6	9	6	.66	1

Table 4: *Comparison of Observed and Predicted Morbidity by POSSUM*

Age	Frequency	Observed morbidity	Predicted morbidity	o/p*
15-30	27	9	15.04	.59
31-45	10	5	5.15	.97
46-60	7	1	2.16	.46
61-75	6	7	5.82	1.20
N	50	22	28.17	.78

**Values <1 indicate over prediction of mortality and vice versa*

audit of mortality and morbidity rates. Thus audit of an individual surgeon, a unit or a hospital can be done simply by monthly meetings of mortality and morbidity or by many sophisticated scoring systems. POSSUM and P-POSSUM is such a scoring system which predicts mortality and morbidity.

POSSUM and P-POSSUM is extensively used in UK since its introduction and proved to be valid not only in general surgery[2-4,8-9], but also tested in oesophagogastric surgery[10-11], colorectal[12-13], pancreatic[14-15], vascular surgery[16], orthopaedics[17], gynecology[18], and emergency surgery[19]. However this scoring system needs prior validation before being used outside of their original setting. There is limited data on its use in Pakistan[7,20], India[3], and Malaysia, so the predictive accuracy of this scoring system was evaluated in our setup in emergency laparotomy.

Observed/predicted(O/E) mortality ratio for POSSUM and P-POSSUM was 0.6, 1 and morbidity ratio was 0.78. Although this scoring system predicted both mortality and morbidity well but both over predicted mortality especially in low risk patients. Most of the patients in this study were between 15-30 years (54%) and their observed mortality(1) and morbidity (9) was less as compared to other groups but their predicted mortality(4.45) and morbidity (15.04) by POSSUM and P-POSSUM (2.41) was high. These patients were younger, relatively fit without any co morbid condition. In higher risk group between (61-75 year), both predicted well. But as a whole both predicted well in our setup in emergency. Our study is comparable with a number of other studies.[2-4]

The predicted and observed rates showed significant correlation according to Pearson correlation and x2 analysis.

This study showed that POSSUM and P-POSSUM are good method of risk evaluation in general surgery ward. Both can be used to audit different units, hospitals, even the performance of different surgeons can be assessed. These scores can be used as a part of informed consent by providing the patient as much information as possible.

This scoring system has certain limitations. Most notably it persistently over predicts mortality in low risk patients. Secondly the formula used in this system is complex and still matter of some debate. Thirdly data required for it is not available for every patient.

Conclusion:

Based on this study, POSSUM and P-POSSUM can be used to predict 30 days mortality and morbidity in general surgical procedures in Pakistan. However P-POSSUM predicts mortality more accurately as compared to POSSUM.

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