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Original Article

EVALUATION OF THE USE OF POSSUM AND P-POSSUM SCORE AS A TOOL FOR PREDICTION OF SURGICAL OUTCOME

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Abstract

Background: There are many scoring systems that predict the risk of mortality with varying degrees of accuracy. The ideal scoring system for surgical outcome should be quick and easy to use and should be applicable to all general surgical procedures. POSSUM (Physiological and Operative Severity Score for enumeration of Mortality and Morbidity) and P-POSSUM (Portsmouth POSSUM) are the most appropriate scoring systems currently available in general surgery to predict thirty days mortality and morbidity.

Objective: The study was done to assess the value of POSSUM in predicting the morbidity rate and the value of P-POSSUM in predicting the mortality rate in general surgical patients of our country.

Methods: Aprospective study was performed in 120 general surgical patient. The risks of morbidity and mortality were calculated by using the POSSUM equation for morbidity and the P-POSSUM equation for mortality in each patient. The predicted risks were compared with the observed risks of morbidity and mortality for 30 days after surgery and statistically analysed.

Results: The difference in p value of predicted risk of morbidity by POSSUM equation and observed morbidity; calculated by chi square test(x2 =1.36, d.f=4,p=0.24,O/P ratio was 1.18); which was not statistically significant. The predicted mortality by P-POSSUM equation and observed mortality; calculated by Fisher's exact test(p=1) was not found statistically significant. The Pearson correlation has shown significant correlation at the 0.01 level (2 tailed) for the observed and predicted mortality and morbidity(r=0.701).ROC analyses showed both POSSUM and P-POSSUM scores to be good predictors of 30-day morbidity and mortality with area under the curve values (AUC) of 0.887 and 0.991 respectively.

Conclusion

POSSUM and P-POSSUM can be used as a valid tool for using risk prediction of morbidity and mortality in our set up.

Key Word: Possum and P-Possum, Mortality and Morbidity

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Introduction

POSSUM was first described by Copeland et al in 1991, as a method for normalizing patient data so that direct comparisons of patient outcome could be made despite varying patterns of referral and demographic characteristics[1]. In an effort to counteract the perceived shortcomings of POSSUM, Whiteley et al, devised the Portsmouth predictor equation for mortality (P-POSSUM), which is thought to be a more accurate predictor of mortality rate, which is an important and objective measure of outcome. It has already found use in general, vascular, colorectal, oesophageal and laparoscopic procedures but the studies mostly involved patients in developed countries, where patient's characteristics, presentation and available resources differ from our setup[2]. Hence, there is a need to test the validity of POSSUM and P-POSSUM scoring system in our scenario where malnourishment is a common problem, presentations frequently delayed and resources limited, all of which can influence the patient's complication rate, even with adequate quality of care provided.

Methods

This study was carried out after institutional ethical clearance. Participants were patients admitted to the department of general surgry at Comilla Medical College Hospital. A total of 120 patients undergoing elective or emergency surgery were included. 30 patients from each of four different groups of surgeries i.e minor, moderate, major and major plus, were included in this prospective study. All patients were scored before the operation using a physiological score and postoperatively using a operative severity score. POSSUM morbidity and P-POSSUM mortality were calculated by allocating a physiological score based on twelve physiological variables (age, Glasgow Coma Score, respiratory rate, urea level, pulse rate, haemoglobin, WBC count, ECG, cardiac signs, Na+, K+ level, systolic blood pressure) measured at the time of admission and then allocating a second score to the severity of operative procedure that the patient undergoes based on six operative variables (operative severity, multiple procedures, total blood loss amount, peritoneal soiling, cancer, mode of surgery).

The risks of morbidity and mortality were calculated by using the POSSUM equation for morbidity and the P-POSSUM equation for mortality (12 physiological and 6 operative variables) in each patient using exponential and linear analysis respectively. For each patient operated, they were followed up in wards until discharge. When the postoperative complications were reported, they were reexamined by the surgeons, treated and followed up for 30 days postoperatively. Phone contacts were used for the follow up. The primary data were gathered in a preformed structured data collection sheet. The predicted risks were compared with the observed risks of mortality and morbidity and statistically analyzed. Continuous data was presented as mean±SD.

Results

Out of 120 patients operated 52.5% were males and remaining (47.5%) were females. Morbidity and mortality was found increasing with increasing age group($p<0.01$). 90(75%) patients underwent elective and 30(25%) patients underwent emergency procedure.Morbidities and mortality were found more in emergency procedures which was statistically significant ($p<0.001$ and <0.002). The Pearson correlation has shown significant correlation at the 0.01 level (2 tailed)

Table.2: Comparison of observed and predicted morbidity by POSSUM score

Risk of morbidity	Mean ± SD	Total	Predicted	Observd	O/P ratio	p-value
0-≤20	11.93±3.67	46	6	7	1.17	0.09,† 0.76ns
>20-≤40	29.05±6.01	21	7	9	1.29	0.40,† 0.53ns
>40-≤60	49.60±6.41	15	8	10	1.25	0.56,† 0.46ns
>60-≤80	70.15±4.78	20	14	16	1.14	0.53,† 0.47ns
>80-≤100	93.0±6.27 41.50±30.63	18	16	18	1.13	2.12,† 0.15ns
Total(n)		120	51	60	1.18	1.36,† 0.24ns

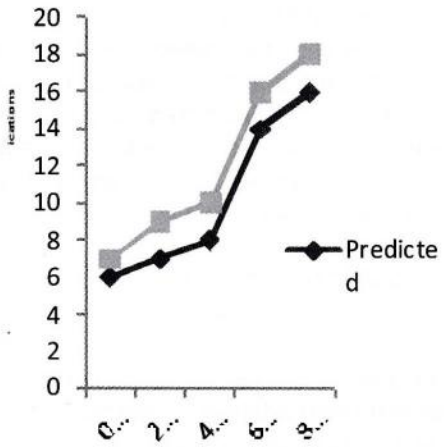

Fig:1 Observed complications closely follow the predicted morbidity

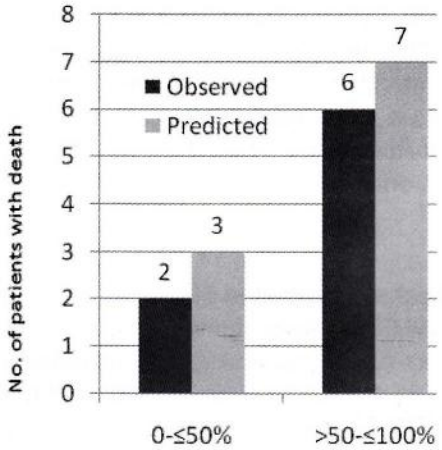

Figure: 2 Observed deaths closely follow the predicted mortality

for the observed and predicted mortality and morbidity(r=0.701). Among 120 patients 60 complications and 8 death observed.(Table1). Using exponential analysis the predicted risk of morbidity by POSSUM equation and observed morbidity; calculated by chi square test(x2 =1.36, d, f=4,p=0.24,O/P ratio was 1.18); which was not statistically significant. Applying linear analysis, the predicted mortality by P-POSSUM equation and observed mortality; calculated by Fisher's exact test(p=1) was not found statistically significant and an observed to expected ratio of 1.18 was obtained, indicating a significant fit for predicting the post operative adverse outcome.ROC analyses showed both POSSUM and P-POSSUM scores to be good predictors of 30-day morbidity and mortality with area under the curve values (AUC) of 0.887 and 0.991 respectively(Fig.3)A positive correlation was found between observed morbidities and mortalities with higher POSSUM and P-POSSUM score.(Fig4)

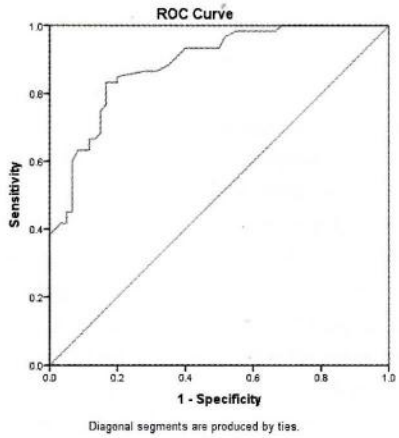

Figure 3: Receiver-operating characteristic (ROC) curve for assessing accuracy of POSSUM scoring sustem

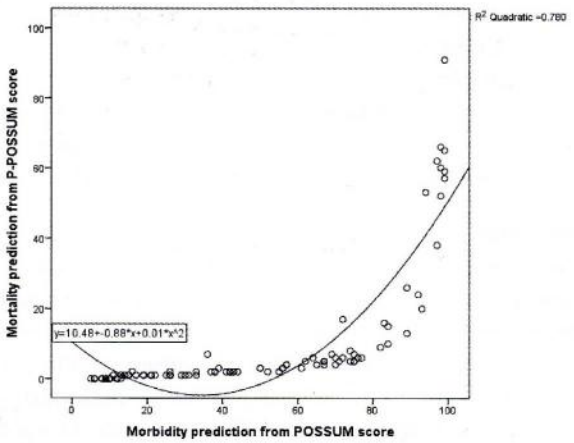

Figure: 4 Correlation of morbidity and mortality by scatter plot diagram

Discussion

Comparison using crude morbidity and mortality rates can be misleading as it cannot adequately account for the patient's general condition and the disease process for which he was subjected to surgery. To overcome this shortcoming POSSUM, a risk adjusted scoring system was proposed by Copeland et al[1]. P-POSSUM a modification of POSSUM, has been proposed by Whiteley et al as a better scoring system as it better correlates with the observed mortality rate. POSSUM and P-POSSUM is extensively used in UK since its introduction and proved to be valid not only in general surgery but also tested in oesophagogastric surgery, colorectal, pancreatic, vascular surgery, orthopaedics, gynecology, and emergency surgery[2]. POSSUM and P-POSSUM has to be correlated to the general condition of the regional population for it to be effective[3]. This is especially true in patients in developing countries like Bangladesh where the general health of the population is poor, malnutrition is a common problem and presentation frequently delayed. In this study we assessed the validity of POSSUM and P-POSSUM scoring system in 120 cases

of general surgical procedures by comparing the observed morbidity and mortality rate with predicted morbidity and mortality rate in our setup.

However Prytherch et al[4] reported that POSSUM over predicted mortality more than two fold. For that reason we did not use it for mortality prediction.

Values of chi square test was calculated in this study showed that POSSUM and P-POSSUM stand up well in predicting surgical outcomes. The study confirmed that both the equations are valuable in assessing the patient outcome after a surgical procedure which has a clear advantage over crude morbidity and mortality rates. The study showed that increasing risk of morbidity increases risk of adverse surgical outcome. POSSUM predicts morbidity closely to observed morbidity; better in high risk than low risk groups. On the other hand P- POSSUM showed a closer fit for high risk group (Figure2). Overall the P- POSSUM equation for mortality predicted death closely , so this can be used reliably. Similar to our findings Mohil et al in 2004 observed that POSSUM was a good predictor of both morbidity and mortality whereas P- POSSUM predicted mortality well in patients undergoing emergency laparotomy[5]. The predicted and observed rates showed significant correlation according to Pearson correlation and Chi square analysis. Receiver operating characteristic (ROC) curve analysis showed POSSUM have good predictive value for morbidity with area under curve (AUC) 0.887 and P-POSSUM for mortality with area under curve(AUC) 0.991.(Fig.3) This result of ROC analysis is similar with other studies of Copeland GP[6] and Jones HJ[7].

Conclusion

The present study suggests that POSSUM and P-POSSUM is an accurate scoring system for predicting postoperative adverse outcome among patients undergoing general surgeries from all severities. It gives us an idea of the sort of morbidity and mortality rate to be expected in patients with different physiological states who are undergoing surgery. Hence adequate and prompt correction of these physiological and operative factors could decrease the morbidity and mortality rate.

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