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EVALUATION OF P-POSSUM SCORING IN ASSESSING THE MORTALITY IN GENERAL SURGERY PATIENTS

Surgery

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ABSTRACT

P-POSSUM score is a scoring system used in assessment of mortality in exclusively surgical patients. In this study we aimed to evaluate P-POSSUM scoring in predicting in-patient mortality in elective and emergency surgeries separately. 300 patients undergoing any general surgical procedures were included in the study. Predicted mortality rates were calculated using P-POSSUM equation by linear analysis and compared with the raw mortality observed. On analysis O: E ratio of 1.05(χ^2=0.006; 4 df; p-value=0.99) was obtained in elective cases and 1.08(χ^2=0.02; 4 df; p-value=0.99) in emergency cases showing no statistical difference between the observed and P-POSSUM predicted mortality rates. There have been several attempts at creating a scoring system to predict mortality risk after surgery. Of the few available P-POSSUM appears to be the most appropriate and is claimed to produce a closer fit with the observed patient mortality rate.

KEYWORDS

P-POSSUM, Mortality, Elective, Emergency Surgeries.

1. INTRODUCTION:

In the culture of increased scrutiny, surgeons must be able to clearly and accurately demonstrate how they perform, through comparative audit of their surgical outcomes[1]. Copeland et al in 1991[2] developed a scoring system that they hoped could easily be used to help provide both retrospective and prospective analysis of the risk of post-surgical mortality and morbidity. This scoring system was named POSSUM (Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity). The POSSUM system is a 2-part scoring system that includes a physiological assessment and a measure of operative severity. The physiological part of the score includes 12 variables and the operative severity part includes 6 variables. Once these scores are known, it is possible to estimate the predicted risk for Mortality and morbidity using the following equations (where RI indicates mortality and R2, morbidity):

LogeR1/ (1- RI) = - 7.04 + (0.13×Physiological Score) + (0.16×Operative Severity Score)

LogeR2/ (1-R2) = - 5.91 + (0.16 ×Physiological Score) + (0.19 × Operative Severity Score)

TABLE 1: Physiological Score Of Possum

	1	2	4	8
Age	<60	61-70	>71	
Cardiac signs Chest radiograph	No failure	Diuretic, digoxin, antianginal or antihypertensive Therapy	Peripheral edema, warfarin therapy Borderline Cardiomegaly	Raised jugular venous pressure Cardiomegaly
Respiratory history Chest radiograph	No Dyspnea	Dyspnea on exertion	Limiting Dyspnea Mild COPD	Dyspnea at rest>30 Fibrosis or Consolidation
Systolic Blood Pressure (mm hg)	110-130	131-170 100-109	≥171 90-99	≤89
Pulse(beats /min)	50-80	81-100 40-49	101-120	≥121 ≤39
Glasgow coma Scale	15	12-14	9-11	≤8
Hemoglobin	13-16	11.5-12.9 16.1-17	10-11.4 17.1-18	≤9.9 ≥18.1
White cell count(10^3/dl)	4-10	10.1-20 3.1-4	≥20.1 ≤3.1	
Urea(mmol/l)	≤7.5	7.6-10	10.1-15	≥15.1
Sodium(mmol/l)	≥136	131-135	126-130	≤125
Potassium (mmol/l)	3.5-5	3.2-3.4 5.2-5.3	2.9-3.1 5.4-5.9	<2.8 >6
ECG	Normal		Atrial fibrillation Rate 60-90/min	Any other abnormalRhythm

TABLE 2: Operative Score Of Possum And P-possum

	1	2	4	8
Operative severity	Minor	Moderate	Major	Major+
Multiple procedures	1		2	>2
Total blood loss(ml)	<100	100-500	501-999	>1000
Peritoneal soiling	None	Minor	Local pus	Free bowel content, pus or blood
Presence of malignancy	None	Primary only	Nodal metastasis	Distant metastasis
Mode of surgery	Elective		Emergency resuscitation of >2h possible, Operation< 24 h after admission	Emergency (immediate surgery <2 h needed)

Later, other researchers discovered that the mortality rate predicted by POSSUM grading was higher than the actual mortality rate[3]. Moreover, exponential analysis was used in POSSUM, which is not a standard statistical technique to calculate the predicted mortality.[4] To solve this problem; Whiteley et al[5] developed Portsmouth POSSUM (P-POSSUM) in 1996. This scoring system continued to use the risk factors and grades of POSSUM, but revised its regression equation constant and weight to predict inpatient mortality. The P-POSSUM scoring system used the linear analysis technique, which is a standard method of analysis.

2. AIMS AND OBJECTIVES:

The aim of the study is to evaluate PORTSMOUTH-POSSUM scoring system in predicting the anticipated mortality rate and to compare with the actual mortality rate in both elective and emergency general surgical patients separately.

3. Patients and methods:

Based on available literature the sample size of 286(143 per group)

was obtained. Considering 5% of attrition rate sample size of 143 +7.5 ≈ 150 samples in each group was included in this study. Hence this prospective study was carried out on a total of 300 patients (each 150 cases of elective and emergency) undergoing any general surgical procedures admitted in department of general surgery Unit-I at Alluri Sitarama Raju academy of medical sciences hospital from September 2015 to August 2017.

4. Criteria for evaluation:

Inclusion criteria: Patients undergoing both emergency and elective general surgical procedures under general, epidural, and spinal anesthesia.

Exclusion criteria: Patients who had day-care surgery and/or surgery under local anesthesia were excluded from the study. Vascular, neurosurgery and urology cases were not included.

5. METHODOLOGY:

Patients were informed regarding the aims and objectives of study and consent was taken prior to inclusion into the study. The physiological data were entered in proforma sheet at admission in emergency cases and a day before in elective cases. Necessary investigations were done for all patients. The operative data was obtained from the records and by personal communication with the surgeon. The scoring system used to classify patients was similar to that of Copeland et al.[2]

STATISTICALANALYSIS: The sample size was estimated by using G* Power 3.1.3 version software with 95 % confidence level, power of 90%. The collected data were entered in Microsoft Excel and analyzed using P-POSSUM formula for mortality by linear analysis.To describe about the data descriptive statistics, frequency analysis, and percentage analysis were used for categorical variables using SPSS statistics software 23.0 Version. To find the significance in categorical data Chi-Square test and Fisher's Exact test were used.

P-POSSUM equation applied for mortality as follows:
In log (R/I-R) = -9.37 + (0.19 x physiological score) + 0.15 x operative severity score).

For a given range of risk, the number of operations within that range was given together with the mean risk for the operations and the predicted number of deaths was calculated i.e. number of operations × mean risk. This was compared with the observed number of deaths using the linear method of analysis. The ratio of observed to predicted death (O: E) was calculated for each analysis and frequency tables were compared for statistical significance by means of the Hosmer-Lemeshow goodness-of-fit test and p value was derived.

6. RESULTS:

Out of 300 surgeries performed the types of surgeries done were as indicated in Table 3.

TABLE:3 TYPE OF SURGERIES PERFORMED	
PROCEDURE	**NUMBER**
MAJOR APMUTATIONS	25
LAPAROTOMY FOR BENIGN CONDITIONS	80
LAPAROTOMY FOR MALIGNANT CONDITIONS	15
CHOLECYSTECTOMY	25
THYROIDECTOMY	32
BREAST SURGERIES	18
APPENDICECTOMY	22
OTHERS (HERNIA, VARICOSE VEINS, MINOR AMPUTATIONS, SSG etc.)	83

OUTCOME OF SURGERY: Out of 150 elective and 150 emergency surgeries mortality was noted in 5 cases (3.3%) and 16 cases (10%) respectively with total crude mortality in 21(7%).

Out of 300 patients operated in our study 183(61%) patients were male and 117(39%) were female.

OBSERVED: EXPECTED MORTALITY RATE IN EMERGENCY SURGERIES:

Out of 150 emergency surgeries numbers of predicted deaths by P-POSSUM when done by linear analysis were 14.76 while the numbers of observed deaths were 16. Mean ± SD of physiological score was 19.89±5.91 while mean ± SD of operative score was 14.9±5.05 in emergency surgeries. The O: E ratio was 1.084 and Hosmer-Lemeshow Goodness-of-fit shows that P-POSSUM is good in emergency surgeries and the difference between the predicted and the actual mortality rates is not statistically significant (χ^2=0.02; 4 df; p-value=0.99).

TABLE: 4 Predicted & Observed Mortality By P-possum In Emergency Surgeries

PREDICTED MORTALITY RISK	MEAN OF PREDICTED MORTALITY	NUMBER OF PATIENTS	PREDICTED DEATHS	OBSERVED DEATHS	O:E
0-5%	1.86	99	1.84	2	1.08
5-10%	9.11	18	1.63	2	1.22
10-20%	19	14	2.66	3	1.12
20-100%	45.36	19	8.61	9	1.04
0-100%	9.84	150	14.76	16	1.08

OBSERVED: EXPECTED MORTALITY RATE IN ELECTIVE SURGERIES:

Out of 150 elective surgeries numbers of predicted deaths by P-POSSUM when done by linear analysis were 4.75 while the numbers of observed deaths were 5. Mean ± SD of physiological score was 18.01±5.2 while mean ± SD of operative score was 10.76±4.11 in elective surgeries. The O: E ratio was 1.05 and Hosmer-Lemeshow Goodness-of-fit shows that the fitness of P-POSSUM is good in elective surgeries and the difference between the predicted and the actual mortality rates is not statistically significant (χ^2=0.006; 4 df; p-value=0.99).

TABLE: 5 Predicted & Observed Mortality By P-possum In Elective Surgeries

PREDICTED MORTALITY RISK	MEAN OF PREDICTED MORTALITY	NUMBER OF PATIENTS	PREDICTED DEATHS	OBSERVED DEATHS	O:E
0-5%	1.51	129	1.94	2	1.03
5-10%	9.5	10	0.95	1	1.05
10-20%	11.11	9	0.99	1	1.01
20-100%	43	2	0.86	1	1.16
0-100%	3.17	150	4.75	5	1.05

7. DISCUSSION:

In the past, various scoring systems such as ASA and APACHE II have been used to predict both mortality and morbidity in surgical patients. These existing scoring systems are either too simple or too complex and do not completely meet the expectations as being readily applicable to audit. POSSUM and P-POSSUM scoring systems have been proven useful for comparative audit and have been validated in numerous studies but POSSUM generally over predicts mortality particularly in lower risk groups and over prediction results in most surgeons appearing to perform favorably. P-POSSUM was developed to avoid this over prediction in low risk groups and it proved to be a better.

Hence in the present study out of 150 emergency surgeries numbers of predicted deaths by P-POSSUM done by linear analysis were 14.76 while the numbers of observed deaths were 16. The O: E ratio was 1.084 and is found to be statistically not significant (χ^2=0.02; 4 df; p-value=0.99). Out of 150 elective surgeries numbers of predicted deaths by P-POSSUM when done by linear analysis were 4.75 while the numbers of observed deaths were 5. The O: E ratio was 1.05 and is found to be statistically not significant (χ^2=0.006; 4 df; p-value=0.99). There were many similar studies done to evaluate P-POSSUM equation for predicting mortality, as a tool of surgical audit and it effectiveness in various locations. Studies also showed similar results in predicting the mortality using P-POSSUM which were **M.K.Yii** [3] evaluated in 605 patients using linear analysis. POSSUM overestimates the mortality while P-POSSUM equation was used with O: E ratio of 1.2. **Mahesh G et al**[6] evaluated P-POSSUM in 493 patients of which 26 deaths occurred while the predicted deaths were 30 with O: E ratio of 0.86 (χ2=0.73, 4 d.f, p>0.5). **Mohil et al**[7] evaluated in 120 patients and they found an O: E ratio of 0.62 for

POSSUM (*x2* test = 10.79, 9 d.f., p = 0.148) and 0.66 using P-POSSUM (*x2* test = 5.33, 9 d.f., p = 0.619) stating no statistical difference between the predicted and observed mortality which was similar to the present study. **Tekkis et al**[8] who analyzed a total of 505 patients using POSSUM and P-POSSUM and results were O: E ratio of 0.98 for P-POSSUM (p= 0.51) but it was 0.45 to 0.56 for POSSUM (p=<0.001).**K Yadav et al**[9] also predicted mortality in 100 general surgery patients using P-POSSUM and obtained O: E ratio of 1.5 (p=0.622) and **TH Chieng et al**[10] predicted mortality in 381 patients and obtained O: E ratio of 0.72 (p=0.477) and **S.Hong et al**[11] predicted mortality in 612 carcinoma stomach patients and obtained O: E ratio of 0.91. **Brooks et al**[12] predicted in 949 general surgery patients and attained O: E ratio of 1.51 while **Poon JT et al**[13]examined the accuracy of P-POSSUM in predicting the mortality of 160 patients who underwent operations for obstructing colorectal cancer and found that the observed and predicted mortality was found to have no significant lack of fit (chi-squared = 5.98; degree of freedom = 3; P = 0.11). **Ashish Tyagi et al**[14]applied P-POSSUM in fifty major general surgeries and attained results i.e. O: E was 0.86 (χ^2 = 00.258, 4 df, P = 0.992).

8. CONCLUSION:

This study there by concluded that P-POSSUM is an accurate scoring system for predicting post-operative mortality in both emergency and elective general surgery patients and also validates P-POSSUM as a valid means of assessing adequacy of care provided to the patient and the present study has confirmed that it can be used in patients attending tertiary hospitals in a developing country like India for both emergency and elective surgeries. It requires collection of simple physiological and operative scores. The linear comparison analysis using the P-POSSUM equation is straightforward and easy to apply, which is relevant in developing countries with limited resources and can be used for surgical audit to assess and improve the quality of surgical care and result in better outcome to the patient.

REFERENCES

1. Yadav, K., Singh, M., Griwan, M., Mishra, Ts., Kumar, N., & Kumar, H. (2011). Evaluation of POSSUM and P-POSSUM as a tool for prediction of surgical outcomes in the Indian population. The Australasian Medical Journal, 4(7), 366–373.
2. Copeland, G. P., Jones, D., & Walters, M. (1991). POSSUM: A scoring system for surgical audit. British Journal of Surgery, 78(3), 355–360.
3. Yii, M. K., & Ng, K. J. (2002). Risk-adjusted surgical audit with the POSSUM scoring system in a developing country. Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity. British Journal of Surgery, 89(1), 110–113.
4. Neary, W. D., Heather, B. P., & Earnshaw, J. J. (2003). The Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity (POSSUM). British Journal of Surgery, 90(2), 157–165.
5. Whiteley, M. S., Prytherch, D. R., Higgins, B., Weaver, P. C., & Prout, W. G. (1996). An evaluation of the POSSUM surgical scoring system. British Journal of Surgery, 83(6), 812–815.
6. Mahesh G, Gabriel R, Sunil Kumar, Gokuldas S. Evaluation of P-POSSUM mortality predictor equation and its use as a tool in surgical audit. The Internet Journal of Surgery. 2003 Vol 5 no. 1-5.
7. Mohil, R. S., Bhatnagar, D., Bahadur, L., Rajneesh., Dev, D. K., & Magan, M. (2004). POSSUM and P-POSSUM for risk-adjusted audit of patients undergoing emergency laparotomy. British Journal of Surgery, 91(4), 500–503.
8. Tekkis PP, Kocher HM, Bentley AJ, Cullen PT, South LM, Trotter GA et al. Operative mortality rates among surgeons: comparison of POSSUM and p-POSSUM scoring systems in gastrointestinal surgery. Dis Colon Rectum. 2000 Nov;43(11):1528–32, discusssion 1532-4.
9. Yadav, K., Singh, M., Griwan, M., Mishra, Ts., Kumar, N., & Kumar, H. (2011). Evaluation of POSSUM and P-POSSUM as a tool for prediction of surgical outcomes in the Indian population. The Australasian Medical Journal, 4(7), 366–373.
10. Chieng, T. H., Roslan, A. C., & Chuah, J. A. (2010). Risk-adjusted analysis of patients undergoing laparotomy using POSSUM and P-POSSUM score in Queen Elizabeth Hospital, Sabah. The Medical Journal of Malaysia, 65(4), 286–290.
11. Hong, S., Wang, S., Xu, G., & Liu, J. (2017). Evaluation of the POSSUM, p-POSSUM, o-POSSUM, and APACHE II scoring systems in predicting postoperative mortality and morbidity in gastric cancer patients. Asian Journal of Surgery, 40(2), 89–94.
12. Brooks, M. J., Sutton, R., & Sarin, S. (2005). Comparison of Surgical Risk Score, POSSUM and p-POSSUM in higher-risk surgical patients. British Journal of Surgery, 92(10), 1288–1292.
13. Poon, J. T., Chan, B., & Law, W. L. (2005). Evaluation of P-POSSUM in surgery for obstructing colorectal cancer and correlation of the predicted mortality with different surgical options. Diseases of the Colon and Rectum, 48(3), 493–498.
14. Tyagi, A., Nagpal, N., Sidhu, D. S., Singh, A., & Tyagi, A. (2017). Portsmouth physiological and operative severity score for the Enumeration of Mortality and morbidity scoring system in general surgical practice and identifying risk factors for poor outcome. Journal of Natural Science, Biology, and Medicine, 8(1), 22–25.