

Assessment of surgical outcome in general surgery using Portsmouth possum scoring

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Abstract: *Objective:* The Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity (POSSUM) and its modification, Portsmouth POSSUM, are considered as methods of risk scoring. Application of this scoring system helps in assessing the quality of the health care provided & surgical outcome. Its utilization in our country where the level of healthcare and resources differ is limited. Hence, a prospective study to assess the outcome of surgeries using P Possum scoring system in a teaching hospital at district level and compare with other health care facilities with similar and different settings was taken up. *Methods:* 175 major surgeries were studied. Using P-POSSUM equation, predicted mortality rates were calculated & compared with the actual outcome. The predicted mortality & actual outcome was compared with other studies done in similar and different health care levels. *Results:* An observed to expected ratio of 0.96 was obtained, indicating there was no significant difference between expected to observed mortality rates suggesting a reasonably good quality of outcome in comparison with other health care systems. *Conclusion:* The quality of surgical care provided and surgical outcome are comparable to other health care systems with observed to expected mortality ratio being nearly same. P Possum can be used as a tool for outcome audits.

Keywords: Portsmouth POSSUM, risk scoring; surgical audit, general surgical operations

Introduction

The basic aim of any surgical procedure is reduction in morbidity and mortality rates. By comparing the influence on adverse outcome; assessment of the efficiency of that particular procedure and the quality of care provided can be done. But comparison using crude morbidity and mortality rates is fallacious because of differences in general health of the local population and variable presentation of the patient's condition [1-3]. Risk scoring seeks to quantify a patient's risk of adverse outcome based on the severity of illness derived from data available at an early stage of the hospital stay [4]. The determination of outcome of surgery helps to plan and implement more effective treatment regimen. Possum & P Possum are accepted methods of risk scoring. [5-6] P Possum has predicted morbidity and mortality accurately in various settings and indirectly assesses the quality of health care provided [7]. It is often used as a tool to assess and audit the performance of individuals and institutions [7-9]. It is often called surgeon based scoring system. It has already found use in general surgery [7, 10] vascular [11-16] colorectal

[15-17] esophageal [18] laparoscopic and hepatic resections [8]. All these studies mainly involve patients from developed countries. Few studies have been taken up in developing countries [10,19] regarding risk adjusted audits of general surgical patients. Keeping in mind the different category of patients who seek surgical care at our hospital, [delayed presentation, malnutrition limited resources] it was felt that P Possum scoring could be used to assess the health care provided, outcome and compare with others. Hence this prospective study was taken up in a teaching hospital at a district place catering mainly to the rural population.

Material and Methods

This prospective study was carried out on patients undergoing major general surgical procedures [emergency and elective] admitted in department of general surgery during two years for from April 2004 to March 2006 with 30 days follow up period. Patients undergoing any of the following major surgical procedures as defined by the

POSSUM scoring system [5], i.e, any laparotomy, bowel resections, cholecystectomy with choledochotomy, peripheral vascular procedures and major amputations were included in the study.

Informed consent was taken. The protocol was approved by the Institutional Ethical Committee. During hospitalisation, appropriate work up as deemed necessary was done and operated. The patients were then scored depending on their physiological parameters and the intra operative findings [19].Then final expected mortality rate was calculated after 30 days. The scores ranged from 12 to 88 in Physiological score and Operative scores were 9 to 44.

Statistical Methods: The equations used were: For mortality: $\text{Log}_e [R/1-R] = (0.1692 \times \text{PS}) + (0.155 \times \text{OS}) - 9.065$. Where R = risk of mortality [20]. The expected mortality rate was obtained using linear regression analysis and the O: E [observed to expected] ratio was calculated. Chi square test was then applied to obtain the **p** value to note any significant difference between the predicted death rate and the actual outcome. These values were compared with other studies.

Results

A total of 180 major surgical operations were performed between April 2004 and March 2006. Five patients were referred to higher centres before the study protocol could be completed. 175major surgical operations were available for

final analysis. 14 underwent two procedures. There were 119 emergency and 56 elective procedures. Out of the 175 procedures studied, there were 27 deaths resulting in crude mortality rate of 15.43%.

Sl. No.	Indications	No. of patients
1.	Duodenal perforation	44
2.	Intestinal obstruction	23
3.	Ileal perforation	22
4.	Malignancy	20
5.	Gastric perforation	10
6.	Appendicular perforation	9
7.	Gangrene of limb requiring amputation	9
8.	Obstructed hernia	5
9.	Abdominal dehiscence	3
10.	Others	25
	Total	175

Observed: Expected mortality rate: Comparison of observed and P-POSSUM predicted mortality rates was done using linear analysis represented in table 2. An observed to expected ratio (O: E) of 0.96 was obtained and there was no significant difference between the predicted and observed values ($\chi^2 = 1.667, 9 \text{ d.}, P = 0.9957$).

Predicted Mortality rate (%)	No. of procedures	Observed no. of deaths (O)	Expected no. of deaths (E)	O:E
<10	119	4	6	0.67
>10 to <20	17	2	3	0.67
>20 to <30	9	2	2	1.00
>30 to <40	7	2	2	1.00
>40 to < 50	4	2	2	1.00
>50 to < 60	6	3	3	1.00
>60 to < 70	5	4	3	1.33
>70 to < 80	4	4	3	1.33
>80 to <90	3	3	3	1.00
>90 to <100	1	1	1	1.00
Total	175	27	29	0.96

Table-3: Complications: The post operative complications noted during the 30 day follow up period are listed		
Sl. No	Type	No of cases
1	Wound infection	92
2	Chest infection	70
3	Anastomotic leak	18
4	Hypotension	18
5	Respiratory failure	15
6	Deep dehiscence.	13
7	Superficial dehiscence.	10
8	Impaired renal function	08
9	Septicaemia	06
10	Deep infection	06
11	Urinary tract infection	03
12	Deep vein thrombosis	01
13	Cardiac failure	01
14	Others	12
Total		273

Table-4: RISK FACTORS: The analysis of risk factors for low outcome in our study is represented					
S.No	Risk factors	Correlation	Rate of increment per score	T	P
1.	Mode of surgery	1	0.0493		
2.	Malignancy	0.1737	0.0121	6.0092	0.0265
3.	Electrocardiogram	1	0.1243		
4.	Peritoneal contamination	0.7006	0.0290	1.3886	0.2994
5.	Total blood loss	0.9987	0.1502	19.7862	0.0321
6.	Potassium	0.9190	0.0471	3.2983	0.0809
7.	Sodium	0.9671	0.1263	5.3803	0.0329
8.	Blood urea	0.9960	0.0656	15.8079	0.004
9.	White cell count	0.9995	0.0403	33.5723	0.019
10.	Haemoglobin	0.6665	0.0119	1.2644	0.3335
11.	Glasgow coma scale	0.8675	0.2689	1.7444	0.3314
12.	Pulse rate	0.8696	0.0555	2.4913	0.1303
13.	Blood pressure	0.8469	0.0424	2.2531	0.153
14.	Respiratory system	0.8919	0.0713	2.7904	0.108
15.	Cardiovascular system	0.7989	0.1143	1.8787	0.2011
16.	Age	0.9144	0.1091	2.2596	0.2652
17.	Multiple surgeries	1	0.1428		
(p < 0.05 = significant)					

Discussion

Discussion: The basic tenet in the health care is to provide quality health care with reduction in adverse outcome. By comparing adverse outcome rates, assessment of adequacy of care provided can be done and evolve new strategies for better outcome. However comparison using crude mortality rate can be misleading as it does not account for the patients' condition and the disease process. To overcome this shortcoming, POSSUM a risk adjusted scoring system was proposed [5]. Later P-POSSUM, a modification of POSSUM, was proposed as it correlates better with the observed mortality rate [19-20]. But P-POSSUM has to be correlated to the general condition of the local population for it to be effective.[9,15-16,19-20]. This is important for patients in developing countries like India where the general health of the population is variable and presentation frequently delayed.[9,10,19]. In our study we applied P-POSSUM scoring in 175 major general surgeries by comparing the observed mortality rate with expected mortality rate. 27 patients died (mortality rates of 5.35% (elective) and 20% (emergency), the total crude mortality rate being 15%). Tekkis and others obtained similar results (elective = 3.9%, emergency 25% and overall mortality rate of 11.1%). [16] However on using P-POSSUM the expected mortality rate was 29 deaths. On analysis, there was no statistically significant difference between the observed and expected mortality rates ($\chi^2 = 1.667$, 9 d.f., $p = 0.9957$). An O: E ratio of 0.96 was obtained. Similar findings were obtained by Yii MK and Ng KJ [9] (O: E = 1.28), Tekkis [16] (O: E = 0.98) and Mohil[10] (O: E = 0.66, $\chi^2 = 5.33$, 9 d.f., $p = 0.619$). It is observed that the various quoted studies had similar results. On analysing the risk factors it was found that there was positive rate of increment with all the risk factors studied but it was found to be statistically significant with

respect to malignancy ($p = 0.0265$), total blood loss ($p = 0.0321$), serum sodium ($p = 0.0329$), blood urea ($p = 0.004$) and white cell count ($p = 0.019$).

Tekkis and others found that total blood loss was not significant enough to alter their statistical analysis in their study but their study predominantly involved elective cases (66%) in a super speciality setting [16]. Wound infection (92 cases, 34%) and chest infections (71 cases, 26%) accounted for the majority of complications. Similar results were obtained by Mohil RS (35% and 20% respectively) [10]. Menon.K.V evaluated P-POSSUM for analysing the outcome of MRSA infected cases undergoing surgery in 1132 patients of which 30 were positive. The outcome was compared with non infected group having similar predicted mortality rate as per P-POSSUM [21]. There was no statistical difference between the two groups. They suggested use of P Possum scoring for standardising patient data so that comparison can be made amongst diverse groups of patients.

Conclusion

To conclude, the present study suggests that the outcome of surgical patients is reasonably good and comparable with similar other health care facilities in spite of variable presentation. P-POSSUM is a good tool for assessing the outcome of surgery and in turn assesses the quality of surgical care provided in variable settings. It can be used for surgical audit.

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