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Mortality and Morbidity Prediction of P-POSSUM in Open Abdominal Surgeries

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Abstract

Objectives and Background: P-POSSUM (Physiological and operative severity score for the enumeration of mortality and morbidity) predicts mortality and morbidity in general surgical patients providing an adjunct to surgical audit. The Physiological and operative severity score for the enumeration of mortality and morbidity (POSSUM) and its modification the Portsmouth POSSUM, have been proposed as a method for standardising patient data so that direct comparisons can be made in spite of differing pattern of referral and population. In this prospective study, P-POSSUM is applied in predicting the mortality and morbidity patients undergoing abdominal surgery. *Methods*: A total of 130 abdominal surgery were performed. The mortality and morbidity was calculated using P-POSSUM equations. The estimatedrates were compared with observed rates using P-POSSUM equations. The estimated rates were compared with observed rates using both linear and exponential methods of analysis. *Results*: A total of 21 deaths observed. P-POSSUM with linear method of analysis predicted deaths of 22 with O:E ratio of 0.95, whereas with exponential method it under predicted the death(16 patients) with O:E ratio of 1.5, which was both clinically and statistically insignificant. With the linear analysis though it was clinically significant, statistically it was insignificant. On analysis of morbidity 81 patients had developed complications, with the predicted value of 86, with O:E ratio0.94, which was clinically significant but statistically insignificant. *Interpretation and Conclusion*: with linear method for P-POSSUM equation, the scoring systems are valid in predicting details and complications which were comparable to observed mortality and morbidity. However, P-POSSUM scoring system with exponential method over predicted the mortality

Keywords: P-POSSUM; Predictors; Mortality; Morbidity; Scoring.

Introduction

Surgeons live in challenging and changing times. The clinical practise of surgery is under intense scrutiny and performance is demonstrated through comparative audit of mortality and morbidity rates [1]. Surgical quality improvements are receiving increasing scrutiny, where baseline patient risk is often high, procedures are intrinsically expensive, and complications are frequent and costly. Process and systems improvement have, to date, successfully advanced quality of patient care in the operative and postoperative settings. Yet, the climate of surgery now affords unprecedented opportunities to understand better the impact of preoperative morbidity on postoperative outcomes [2].

How to evaluate the risk of surgery based on patients preoperative health status and general condition is a question that clinicians have to face everyday [3]. Simple collection of crude numbers of the deaths and complications alone is insufficient to reflect the qualityof care, as to compare morbidity and mortality would assume the original populations are identical. Risk adjusted analysis is required to allow

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for differences in case mix between surgeons and surgical units [1]. Scoring systems such as ASA, APACHE2, and POSSUM are in place to assess the risks involved for patients in various specialities [4]. Proposed method of comparison was developed as a modification of original POSSUM equation described by Copeland et al in 1991, which was shown to overestimate mortality, especially for low risk procedures [1]. P-POSSUM was shown to provide an accurate method of comparative surgical audit in a large series of general surgical patients [1]. Already found useful in general [5], vascular [6,9], colorectal [10-12], oesophageal [13], laparoscopic [14] procedures but, studies mostly involved patients in developed countries. Hence, there is a need to test the validity of P-POSSUM scoring system in the Indian scenario where presentation is late and with limited resources

Methodology

The patients admitted to surgical units at Karnataka Institute of Medical sciences, Hubli and who underwent abdominal surgery in the period December 2012 to January 2014 were included in this prospective study. Data was collected prospectively on a proforma prepared for the study from the patients undergoing abdominal surgery. All such patients would have their physiological score recorded on admission. An operative severity score was calculated based on findings recorded by the operating surgeon on the proforma. The risk of morbidity and death was calculated using P-POSSUM equations

POSSUM Equation for Morbidity

In [R1 / (1-R1)] = -7.04 + (0.13 x physiological score) + (0.16 x operative severity score),

In [R2 / (1-R2)] = -5.91 + (0.16 x physiological score) + (0.19 x operative severity score)

WhereR1 is the predicted risk of mortality; R2 is the predicted risk of morbidity.

P-POSSUM equation for mortality:

In [R / (1-R)] = -9.065 + (0.1692 x physiological score) + (0.1505 x operative severity score)

Where R is the predicted risk of mortality.

Results

Table 1: Sex wise distribution of patients

Sex	No of Patients	% of Patients
Male	102	78.46
Female	28	21.54
Total	130	100.0

Table 2: Comparison of observed and predicted mortality rate by P-POSSUM using exponential analysis

Mortality group	No of patients	Observed deaths	Expected deaths	O:E
0-10	77	9	2	4.5
11-20	19	2	2	1
21-30	25	8	5	1.6
31-40	15	7	5	1.4
41-50	8	2	3	0.6
51-60	4	2	2	1
61-70	9	2	5	0.4
71-80	4	0	3	0.00
81-90	2	0	2	0.00
91-100	2	0	2	0.00
0-100	130	21	14	1.5

Table 3: Comparison of observed and predicted mortality rate by P-POSSUM using linear analysis

Mortality Group	No of Patients	Observed Deaths	Expected Deaths	O:E
0-10	77	9	3	3.0
11-20	19	2	3	1
21-30	10	1	3	1.6
31-40	7	4	2	1.4
41-50	4	1	2	0.6
51-60	4	2	2	1
61-70	5	2	3	0.4
71-80	2	0	2	0.00
81-90	0	0	0	0.00
91-100	2	0	2	0.00
0-100	130	21	22	0.95

Table 4: Comparison of observed and predicted morbidity rate by using linear analysis

Morbidity Group	No of Patients	Observed Morbidity	Expected Morbidity	O:E
0-10	1	0	0	0
11-20	9	1	1	1
21-30	10	5	3	1.6
31-40	8	2	3	0.66
41-50	8	3	4	0.75
51-60	10	7	6	1.16
61-70	20	11	13	0.84
71-80	13	9	10	0.9
81-90	19	16	16	1
91-100	32	27	30	0.9
0-100	130	81	86	0.94

Discussion

This study mainly evaluated mortality because it is of greater importance and more objective. Comparison using crude mortality rates can be misleading, as it cannot adequately account for the patients, general condition and the disease process for which he underwent surgery.

P-POSSUM, a modification of POSSUM, has been proposed as a better scoring system as it better correlates with the observed mortality rate

But P-POSSUM has to be correlated to the general condition of the local population for it to be effective. This is especially true in patients in developing countries like India where general health of the population is poor; malnutrition is a common problem and presentation frequently delayed.

In this study we assessed the validity of P-POSSUM in 130 abdominal surgeries by comparing the observed with expected mortality and morbidity rate.

Table 5: Comparison of mortality with other studies

Study groups	Observed Deaths	Expected deaths	O;E ratio	Chi square value	P value
Present study	21	22	0.95	7.96	0.241
Mohil et al	16	24	0.66	5.33	0.619
Tekkis et al	11.1	11.3	0.98	0.715	0.715
Yii MK and Ng KJ et al	6.1	4.8	1.28		
MJ winter et al	14	27	0.51	9.00	0.17
V j Ramesh et al	9	9	1	2.8	0.424

Though P-POSSUM has been evaluatedfor accurately predicting the adverse outcome following major surgery, in this study P-POSSUM under predicted the mortality, however, on linear analysis, it was found to be closely associated with the observed mortality but it was statistically insignificant.

Table 6: Comparison of morbidity with other studies

Study groups	Observed morbidity	Expected morbidity	O;E ratio	Chi square value	P value
Present study	81	86	0.94	1.15	0.997
Vijay Parihar et al(j-possum)	153	273	0.55	68.69	<0.00
M J Midwinter et al	126	114	1.10	14.5	0.11

On analysing the risk factors it was found to be statistically significant with respect to age, cardiovascular system, blood pressure, serum potassium, and statistically closely associated with pulse rate and serum sodium

Conclusion

We studied 130 major general surgeries, both elective and emergency cases with 21 deaths. On applying P-POSSUM, we found that the expected number of deaths for our study group was 14 and 22 with the exponential and linear analysis respectively.

In the present study, P-POSSUM SCORING system for predicting post-operative adverse outcome mortality and morbidity are better correlated with linear analysis than exponential among patients undergoing major general surgeries.

On analysing the risk factors it was found to be statistically significant with respect to age, cardiovascular system, blood pressure, serum potassium, and statistically closely associated with pulse rate and serum sodium. Hence adequate and prompt correction of these factors could decrease the mortality rate.

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