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Original Research Article

A Prospective Study to Evaluate Possum Scoring System in Patients Undergoing Emergency Laparotomy

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Abstract:

The goal of this study was to see how well the POSSUM grading system predicted morbidity and mortality in patients having emergency midline laparotomy at our institution, a group that is known to be at high risk of complications and death.

Methods: A total of 100 patients who had emergency laparotomies in the general surgery department between July 2020 and September 2021 were evaluated. The POSSUM scoring method was used to grade them. Physiological scoring was completed upon admission, and operational scoring was completed intraoperatively. Follow-up was performed for the first 30 postoperative days, and any problems were reported. The observed morbidity and death rates were compared to the projected morbidity and mortality rates predicted by POSSUM.

Post-operative problems occurred in 43 individuals. The anticipated morbidity by POSSUM was 34 patients. The O: E ratio was found to be 1.26. There was no statistically significant difference in morbidity rates between observed and anticipated [Chi-Square value = 2.745, df = 6, p-value = 0.875]. 15 individuals died (a 15% mortality rate). The POSSUM projected that 12 people will die. A 1.25 O: E ratio was achieved. The observed and projected death rates did not vary statistically significantly. [The Chi-Square value is 4.123, the df is 9, and the p-value is 0.846.]

Conclusion: POSSUM score may correctly predict morbidity and death after emergency laparotomy.

Introduction

Surgical auditing has long been recognised not just as a research tool, but also as a primitive technique of assessing the performance of a surgical unit. It is now deemed necessary in several sections of the developed world.[1] Quality of treatment may be evaluated by discussing individual instances or examining a group of patients who received a certain surgical procedure. Due to variances in patient presentation, the general fitness of the local population, and the type of the operation performed, direct comparison across various surgeons, units, hospitals, and locations is inappropriate.[2] Because the method and timing of presentation, particularly in the Indian scenario, vary significantly, it would be inappropriate to compare one patient to another directly.

The importance of scoring systems is due to the necessity to precisely assess and efficiently monitor the appropriate delivery of healthcare and procedure results. Their uses include comparative auditing, research, case mix standardisation, and clinical management as a prognostic indication.[3] A good risk prediction model should be simple, repeatable, accurate, and objective, and it should be available to all patients. Various risk assessment scoring systems are used in surgery, and Copeland et al. developed the Physiological and Operative Severity Scoring for the Enumeration of Mortality and Morbidity (POSSUM) risk-adjusted scoring system as a method of normalising data so that direct comparison of patient outcome can be done despite major differences in case-mix.4 Emergency laparotomy is a routinely performed surgery with a high mortality rate, and in the Indian context, where issues such as delayed presentation and insufficient resources are widespread, there is a need to evaluate the POSSUM grading method in our environment.[5,6]

In a 1998 assessment, Whitely et al found that the POSSUM scoring method overpredicted mortality in their sample of patients, especially those with minimal operational risk. As a result, the original POSSUM equation was updated, resulting in the Portsmouth predictor equations for morbidity

mortality (P-POSSUM) using the same variables as the original POSSUM score.[7]

Numerous reports of morbidity and mortality overestimation in different specialities have resulted in numerous revisions to the scoring system in various specialised procedures such as colorectal surgery, gastrectomy, pancreatic resection, and fracture: neck of femur.[8,9,10,11] The original POSSUM equation was verified in orthopaedic surgery on a sample of 2326 orthopaedic procedures over a year in 2002 (using a modified operation categorization).[12]

Methodology

Inclusion Criteria

Patient that were of the age group 12 to 90 years that underwent emergency midline laparotomy.

Exclusion Criteria

- Patient age <12 yrs. and >90 yrs.
- Patients, who died prior to intubation and on-table deaths.
- Any case of re-exploration
- Any laparotomy where exploration was not via mid-line

POSSUM Score

POSSUM score consists of 12 Physiological variables and 6 Operative severity variables, each of which are divided into 4 grades. [Table1, 2]

The sum of the physiological and surgical variables was entered into the following mathematical equations which are used to calculate the risk of morbidity and mortality2:

POSSUM Equation for Morbidity:

Loge (R1/1 - R1) = - 5.91 + (0.16 x physiological score) + (0.19 x operative severity score),
R1-predicted risk of morbidity.
POSSUM Equation for Mortality:
Loge (R2/1 - R2) = - 7.04 + (0.13 x physiological score) + (0.16 x operative severity score),
R2 - predicted risk of mortality.

The patients were followed up for 15 days postoperatively and complications as described in the original score were noted.

Table 1: Physiological Score (12-88)[2]

Score	1	2	3	4
AGE (years)	<60	61-70	>71	
Cardiac signs	No failure	Diuretic, Digoxin, anti- angina or hypertensive therapy	Peripheral edema, warfarin therapy, borderline cardiomegaly	Raised JVP, cardiomegaly
Respiratory history	No dyspnea	Dyspnea on exertion	Limiting dyspnea (one on flight)	Dyspnea at rest (rate>30/ min)
Chest Radiography		Mild CAOD	Moderate CAOD	Fibrosis or consolidation
Systolic BloodPressure (mmHg)	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(g/dl)	13-16	11.5-12.9 16.1-17.0	10.0-11.4	<9.9 >18.1 17.1-18.0
White cellcount (x10^9/l)	4-10	10.1-20.0 3.1-4.0	>20.1 <3.0	
Urea (mEq/l)	<7.5	7.6-10.0	10.1-15.0	>15.1
Sodium (mEq/l)	>136	131-135	126-130	<125
Potassium(mEq/l)	3.5-5.0	3.2-3.4 5.1-5.3	2.9-3.1 5.4-5.9	<2.8 >6.0
ECG	Normal		Atrial fibrillation (rate 60-90)	Any other abnormal rhythm or >5 ectopic beats/min Q-Waves or ST/ T wave changes

Table 2: Operative Score (9-44)[2]

Score	1	2	4	8
Operative severity	Minor	Moderate	Major	Major+
Multiple Procedures	1		2	>2
Total blood loss (ml)	<100	101-500	501-999	>1000
Peritoneal soiling	None	Minor (serous fluid)	Local pus	Free bowel content, pus or blood
Presence of Malignancy	None	Primary only	Nodal metastasis	Distant Metastases
Mode of surgery	Elective		Emergency resuscitation of >2h possible <24h after admission	Emergency (Immediate) surgery <2h needed

Results

We looked at 100 people who underwent emergency midline laparotomies. In our research, 68% of patients were men, with a male-to-female ratio of 17:8. The patients varied in age from 13 to 90 years old, with a mean age of 45.53 16.62 years. The majority of patients (46%), were between the ages of 41 and 60. In our investigation, three individuals had cardiac risk, two of whom were on diuretic medication and one of whom showed symptoms of congestive heart failure. With 13 patients, respiratory risk was more common. Because this research only covered midline emergency laparotomies, the surgical severity was determined to be significant in all instances. Furthermore, in all instances, the manner of operation was emergency (2-24 hours). Morbidity occurred in 43 of 100 patients, with wound-related problems being the most prevalent cause, followed by pulmonary issues.

Table 3: Complications

Prevalence of Morbidity	No. of cases	Percentage
Anastomotic Leak	2	2.00%
Atelectasis	3	3.00%
Chest Infection	5	5.00%
Deep Infection	3	3.00%
Deep Vein Thrombosis	2	2.00%
Hypotension	2	2.00%
Urinary Tract Infection	5	5.00%
Wound Dehiscence	5	5.00%
Wound Infection	16	16.00%
No complication	57	57.00%
Total	100	100.00%

Table 4: Causes of Death

Prevalence of Mortality	No. of cases	Percentage
MODS	5	33.34%
Sepsis	6	40.00%
Cardiac Failure	2	13.33%
Respiratory Failure	2	13.33%
Total	15	100.00%

Table 5: Indications for Laparotomy

Indication for Laparotomy	No. of cases	Percentage
Ileal perforation	25	25.0%
Gastric perforation	18	18.0%
Blunt injury abdomen	7	7.0%
Duodenal perforation	7	7.0%
Ileal stricture	6	6.0%
Sealed Appendicular Perforation	6	6.0%
Acute intestinal obstruction	5	5.0%
Subacute intestinal obstruction	4	4.0%
Caecal gangrene	3	3.0%
Gallstone Ileus	3	3.0%
Obstruction, Ca Ascending colon	2	2.0%
Others	14	14.0%

Ileal perforation (25%) was the commonest indication of laparotomy followed by gastric perforation (18%) and blunt trauma abdomen (7%).

Table 6: Analysis of Observed to Expected Morbidity Ratio

Predicted morbidity	No. of patients	Observed Morbidity	Expected Morbidity	O.E. Ratio
<10%	0	0	0	-
10-20%	0	0	0	-
20-30%	1	0	0	-
30-40%	15	6	7	0.85
40-50%	18	9	3	3
50-60%	10	6	4	1.5
60-70%	15	6	5	1
70-80%	12	5	5	1
80-90%	6	2	2	1
90-100%	23	10	8	1.25
Total	100	43	34	1.26

Table 7: Analysis of Observed to Expected Mortality Ratio

Predicted morbidity	No. of patients	Observed	Expected	O.E. Ratio
<10%	32	3	0	-
10-20%	27	2	1	2
20-30%	14	1	1	1
30-40%	4	1	0	-
40-50%	6	1	2	0.5
50-60%	7	1	1	1
60-70%	3	1	1	1
70-80%	2	1	1	1
80-90%	2	1	2	0.5
90-100%	3	3	3	1
Total	100	15	12	1.25

Discussion

In today's world, when patient safety and good treatment are paramount, determining the predicted result of an operation is critical. Recognising patients at high risk of complications and those with a high possibility of death would enable us to take the required precautions, enabling us to effectively manage the patient. Because to poverty, illiteracy, and other circumstances, the presentation of a specific disease in developing nations such as India is often delayed and unpredictable, resulting in increased complication rates and high fatality rates.[13]

We examined 100 patients who underwent emergency midline laparotomies at the Govt. Medical College in Amritsar's Department of General Surgery. The purpose of this research was to investigate the validity and accuracy of the POSSUM scoring system for predicting morbidity and death. Because this research only included emergency patients, it was not feasible to adjust all physiological factors prior to surgery. Furthermore, preoperative cancer diagnosis was not achievable or accessible in all cases. Because all patients had midline laparotomies, the operational severity remained consistent, and all patients obtained a score of 4. Because re-exploration instances were excluded, the variable multiple operations' was likewise a constant (all patients got a score of 1). A total of 43 individuals had post-operative problems. The bulk of the problems were caused by wound infections (16%) and chest infections (8%). The estimated morbidity computed by POSSUM was 34. The chi-square test revealed no statistically significant difference between observed and predicted morbidity rates [Chi-Square value = 2.745, df = 6, p-value = 0.875], yielding an O.E. ratio of 1.26. Mohil RS et al [14] got comparable findings. (35% and 20%, respectively) and Rana DS et al [15] [27% of chest infections and 17% of wound infections]. The high prevalence of wound infections might be attributed to the significant number of patients who had peritoneal soiling as a consequence of hollow viscus perforation, which contaminated the incision site. An elevated diaphragm, incision extension to the upper abdomen, and significant peritoneal contamination all contributed to greater risks of chest infections.

Six patients died from sepsis, five from MODS, and four from cardio-pulmonary problems among the 15 who died in the postoperative period. The predicted mortality rate was determined using the POSSUM score to be 12 deaths. The chi-square test revealed no statistically significant difference between observed and predicted death rates [Chi-Square value = 4.123, df = 9, p-value = 0.846],

yielding an O.E. ratio of 1.25. Sreeharsha et al.[16] (O: E=0.71) and Chatterjee AS et al.13 (O: E = 1.005) found similar results. As a result, we may infer that in our research, the POSSUM grading system successfully predicted the unfavourable outcomes after midline emergency laparotomy.

Conclusion

We may infer that, even in a resource-constrained setting, the POSSUM score can correctly predict unfavourable outcomes after emergency laparotomy. POSSUM is one of the most accurate scoring systems for predicting morbidity and mortality risk. It has been confirmed by several writers worldwide and has shown to be an effective tool for surgical auditing.

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