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The Role of Physiological and Operative Severity Score for the Evaluation of Mortality and Morbility in the Stratification of Abdominal and Extrabdominal Surgery Patients

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Abstract: *Background*: Adequate stratification and scoring of risk is essential to optimize clinical practice; the ability to predict operative mortality and morbidity is important to choose the gold therapy and a proper use of resources. The Physiological And Operative Severity Score For The Evaluation Of Mortality And Morbility (POSSUM) has been proved to be the most appropriate scoring system in providing an estimation of postoperative mortality for patients undergoing abdominal surgery. The aim of our study was to verify the predictive accuracy of POSSUM in patients undergoing elective extrabdominal surgery.

Patients and Methods: Our study included 189 patients, all admitted to Intensive Care Unit (ICU) at S.Andrea Hospital in Rome. The sample was divided in 2 groups: group A, abdominal surgery; group B, extrabdominal surgery.

All types of surgery were included except for cardiac surgery, pediatric surgery and urgent surgery. For each patient was determined the POSSUM score. Age, sex and preoperative information, surgical diagnosis, severity of the procedure , time of hospitalization, post operative complications were also recorded.

The two groups were divided in classes, based on the rate of morbidity and mortality. For each class was calculated the relation between predicted and observed deceases, and the relation between predicted and observed complications, scoring 1 if present and 0 if not present, in order to assign a reliability score to each group. Furthermore, basing on the length of stay, were individuated three subgroups of patients: hospitalization < 3 days, between 4 and 7 days, > 7 days. For each group was evaluated the correlation between observed and predicted morbidity.

Results: Above 189 patients, 49 developed postoperative complications, with a real morbidity rate of 25,9% (95%CI: 20%-32%) and a predicted rate of 51,3%; the relation between observed and predicted complications (O/P ratio) was 0,50. For the A group the O/P ratio was 0,45, with a real morbidity rate of 25,53% (95% CI: 17%-34%) over a predicted rate of 56,4%. In the B group the O/P ratio was 0,53, with a real morbidity rate of 26,31% (95%CI: 17,2%-34,8%), and a predicted rate of 49%. Above 189 patients, 5 deceased, with a real mortality rate of 2,64% (95% CI: 0,4%-4,8%), over a predicted rate of 16,4%; the relation between observed and predicted deaths (O/P ratio) was 0,16. For the A group, O/P ratio was 0,11, with a real mortality rate of 2,1% (95% CI: 0-5%) over a predicted rate of 18,08%; for the B group, O/P ratio was 0,25, with a real rate of 3,16% (95% CI: 0-436,7%) over a predicted rate of 12,63%. Correlation between time of hospitalization and POSSUM morbidity has an average strength expressed by a ρ value = 0,4.

Conclusion: Observed data confirm the possibility to extend the POSSUM score in the stratification of patients undergoing extrabdominal surgery. Even though it overpredicted the value of morbidity and mortality, as widely known, POSSUM score shows an impressive uniformity and concordance between the main groups A and B. Furthermore, there is a good correlation between time of stay in ICU and the POSSUM morbidity.

Our results suggest that POSSUM can be an adequate perioperative mean, recommended to evaluate the real condition of a patient after surgery and to determine the requirement of an admission to the postoperative ICU.

Keywords: POSSUM, severity score system, extra-abdominal surgery, post-operative complications, intensive care unit, morbility, mortality.

BACKGROUND

Adequate stratification and scoring risk is essential to optimize clinical practice in every medical and surgical field; the ability to predict operative patient's mortality and morbidity is important to choose the gold therapy and a proper use of resources.

The Physiological And Operative Severity Score For The Evaluation Of Mortality And Morbility (POSSUM) has been proved to be the most appropriate scoring system to estimate the postoperative mortality in patients undergoing abdominal surgery [1].

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Table 1. POSSUM Score

Variable	1	2	4	8
Age,y	≤60	61-70	≥71	NA
Cardiac signs	No failure	Diuretic,digoxin,antianginal, or hypertensive therapy	Peripheral edema; warfarin sodium therapy	Raised jugular venous pressure
Chest radiograph (heart)	NA	NA	Borderline cardiomegaly	Cardiomegaly
Respiratory history	No dyspnea	Dyspnea on exertion	Limiting dyspnea (1 flight)	Dyspnea ar rest (rate,≥30/min)
Chest radiograph (lung)	NA	Mild COPD	Moderate COPD	Fibrosis or consolidation
Mean systolic blood pressure, mmHg	110-130	131-170	≥171	≤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	13.0-16.0	11.5-12.9 16.1-17.0	10.0-11.4 17.1-18.0	≤9.9
White blood cell count, $x10^3/\mu l$	4.0-16.0	10.1-20.0 3.1-3.9	≥20.1 ≤3.0	NA
Serum urea, mg/dl	≤21	22-28	29-41	≥42
Serum sodium, mEq/l	≥136	131-135	126-130	≤125
Serum 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
Electrocardiogram	Normal	NA	Atrial fibrillation (rate, 60-90)	Any other abnormal rhythm or ≥5 ectopics/min Q waves or ST/T-wave changes
Operative severity	Minor	Moderate	Major	Major plus
Multiple procedures	1	NA	2	>2
Total blood loss, ml	≤100	101-500	501-900	≥1000
Peritoneal soiling	None	Minor (serous fluid)	Local pus	Free-bowel content, pus, or blood
Presence of malignancy	None	Primary only	Nodal metastases	Distant metastases
Mode of surgery	Elective	NA	Emergency resuscitation within 2 h possible operation<24 h after admission	Emergency (immediate surgery <2 h needed)

Possum score consists of 18 parameters, 12 physiological and 6 surgical, and was created by G. P. Copeland *et al.* in 1991 Table **1**. Since then, it has been spreading extensively in Great Britain and in other countries for the surgical trend to acquire accurate data of operative outcome and to supply to patients as much information as possible in order to achieve an informed consent.

Moreover, a correct scoring system could become an essential tool for the *clinical governance*, that is a strategy, used by healthcare organizations, to be responsible for the continuous improvement of services quality and achievement-maintenance of high standards of care [2, 3].

In addition, it is demonstrated that patients admitted to ICU on basis of pre-operative POSSUM score, have experienced less post-operative complications [4].

The validity of this scoring system was verified by a comparison between predicted and observed data [5].

The aim of our study was to prove the same predictive meaning of POSSUM in patients undergoing both abdominal surgery and extra-abdominal surgery, in order to use this score as one of the criteria for the admission of all surgical patients in Post-operative Intensive Care, in addition to clinical evaluation.

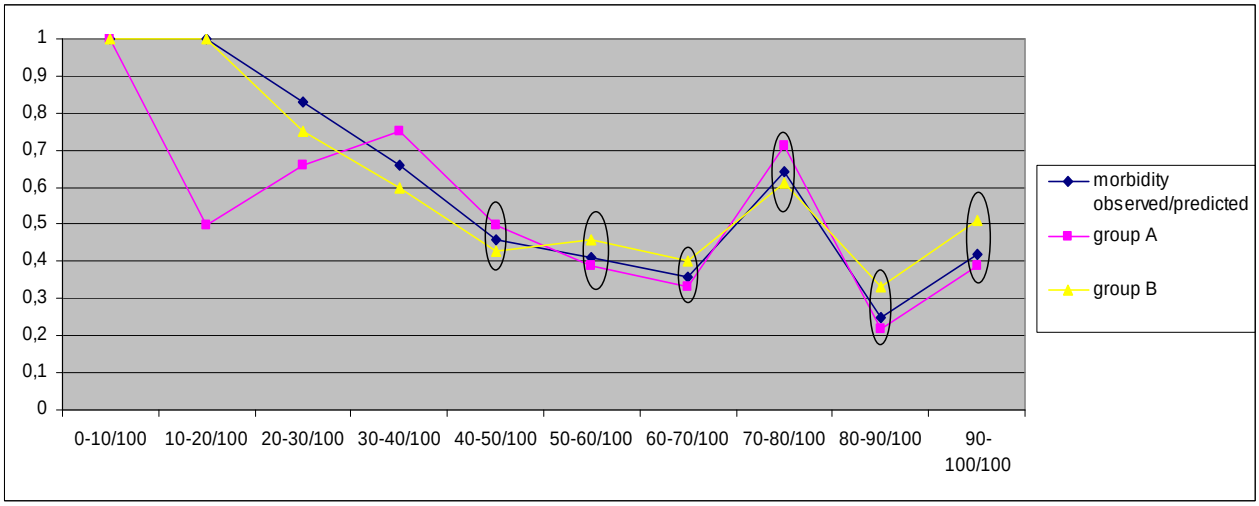

Fig. (1). Correlation between morbidity in group A and morbidity in group B.

The second endpoint concerned the correlation between time of hospitalization in ICU and POSSUM score of predicted morbidity.

PATIENTS AND METHODS

Our study included 189 patients, all admitted to Intensive Care Unit (ICU) at S.Andrea Hospital in Rome. The sample was divided in 2 groups: group A, abdominal surgery; group B, extrabdominal surgery.

All types of surgery were included except for cardiac surgery, pediatric surgery and urgent surgery. For each patient the POSSUM score was determined. Age, sex and preoperative information, surgical diagnosis, severity of the procedure, time of hospitalization, post operative complications were also recorded.

The two groups were divided in classes, based on the rate of morbidity and mortality. For each class the relation between predicted and observed decease was calculated, and the relation between predicted and observed complications, scoring 1 if present and 0 if not present, in order to assign a reliability score to each group. Furthermore, on the basis of the length of stay, were individuated three subgroups of patients: hospitalization < 3 days, between 4 and 7 days, > 7 days. For each group the correlation between observed and predicted morbidity was evaluated.

RESULTS

On 189 patients, 49 developed postoperative complications, with a real morbidity rate of 25,9% (95%CI: 20%-32%) and a predicted rate of 51,3%; the relation between observed and predicted complications (O/P ratio) was 0,50. For the A group the O/P ratio was 0,45, with a real morbidity rate of 25,53% (95% CI: 17%-34%) over a predicted rate of 56,4%. In the B group the O/P ratio was 0,53, with a real morbidity rate of 26,31% (95%CI: 17,2%-34,8%), and a predicted rate of 49%. Above 189 patients, 5 deceased, with a real mortality rate of 2,64% (95% CI: 0,4%-4,8%), over a predicted rate of 16,4%; the relation between observed and predicted deaths (O/P ratio) was 0,16. For the A group, O/P ratio was 0,11, with a real mortality rate of 2,1% (95% CI: 0-5%) over a predicted rate of 18,08%; for the B group, O/P ratio was 0,25, with a real rate of 3,16% (95% CI: 0-436,7%) over a predicted rate of 12,63%. Correlation between time of hospitalization and POSSUM morbidity has an average strength expressed by a ρ value = 0,4. (Fig. **1**)

CONCLUSIONS

Observed data confirm the possibility to extend the POSSUM score in the stratification of patients undergoing extrabdominal surgery. Even though it overpredicted the value of morbidity and mortality, as widely known [6], POSSUM score shows an impressive uniformity and concordance between the main groups A and B. Furthermore, there is a good correlation between time of stay in ICU and the POSSUM morbidity.

Our results suggest that POSSUM can be an adequate perioperative tool, recommended to evaluate the real condition of a patient after surgery and to determine the requirement of an admission to the postoperative ICU.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

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Declared none.

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