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Abstract

POSSUM, a Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity, is a scoring system which assesses perioperative surgical risks (Copeland GP et al.: Br J Surg, 1991, Vol 78, 356-360). The POSSUM scoring system consists of two categories of assessment to assess the risk of surgery. A 12-factor (age, cardiac status, pulse rate, systolic blood pressure, respiratory status, Glasgow Coma Score, serum concentration of urea, potassium and sodium, hemoglobin concentration, white cell count and findings on electrocardiography) and 4-grade physiological score (PS) were developed. This was combined with a 6-factor (type of surgical procedure, number of procedures, blood loss, peritoneal soiling, presence of malignancy and mode of surgery) and 4-grade operative severity score (OSS). The present paper attempts to validate it retrospectively. Postoperative hospitalization period and duration of antibiotics administration were both significantly correlated with OSS, but not with PS. These results suggest that the POSSUM scoring system is useful for predicting the postoperative clinical course.

KEYWORDS: surgical risk, Physiological and Operative Severity Source for the enUmeration of Mortality and morbidity

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Brief Note

Can POSSUM, a Scoring System for Perioperative Surgical Risk, Predict Postoperative Clinical Course?

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POSSUM, a Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity, is a scoring system which assesses perioperative surgical risks (Copeland GP et al.: Br J Surg, 1991, Vol 78, 356-360). The POSSUM scoring system consists of two categories of assessment to assess the risk of surgery. A 12-factor (age, cardiac status, pulse rate, systolic blood pressure, respiratory status, Glasgow Coma Score, serum concentration of urea, potassium and sodium, hemoglobin concentration, white cell count and findings on electrocardiography) and 4-grade physiological score (PS) were developed. This was combined with a 6-factor (type of surgical procedure, number of procedures, blood loss, peritoneal soiling, presence of malignancy and mode of surgery) and 4-grade operative severity score (OSS). The present paper attempts to validate it retrospectively. Postoperative hospitalization period and duration of antibiotics administration were both significantly correlated with OSS, but not with PS. These results suggest that the POSSUM scoring system is useful for predicting the postoperative clinical course.

Key words: surgical risk, Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity

Several scoring systems have been devised that predict the risk of mortality attendant to surgery. However, morbidity is almost universally ignored. Several scoring systems have been devised which are ideally suited to specific types of surgical procedures or to assessing particular types of complications. Some scoring systems are ideal for assessing the risk of mortality and, to a lesser extent, morbidity in particular groups of surgical patients, such as those with gastrointestinal diseases (1-3), or for assessing the risk of developing particular complications (4). Others are of use in particular surgical settings, such as patients requiring intensive care. Probably the best known and most widely used scoring system is APACHE II (5), which is ideal for intensive care patients but requires 24h of observation and weighting tables for individual disease states. Whereas such a score can be applied to the majority of general surgical patients, it only assesses the risk of mortality.

Recently, a simple scoring system was introduced: POSSUM (Physiological and Operative Severity Score for enUmeration of Mortality and morbidity) (6). This system uses multivariant-discriminant analysis to assess the risk of surgery. A 12-factor four-grade physiological score (PS) was developed that includes age, cardiac status, pulse rate, systolic blood pressure, respiratory status, Glasgow coma score, serum concentrations of urea, potassium and sodium, hemoglobin concentration, white cell count and findings on electrocardiography. This was combined with a six-factor operative severity score (OSS), which compensate for the type of surgical procedure and includes type and number of procedures, volume of blood loss, peritoneal contamination, presence

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and extent of malignancy and timing of the operation.

The aim of the present study was to assess the POSSUM scoring system retrospectively in relation to postoperative hospitalization and duration of antibiotics administration.

Patients and Methods

The subjects of our assessment were 126 patients who had undergone rectal or recurrent tumor resection during the last ten years (with a mortality rate of 2.4 % and a morbidity rate of 15.9 %) and 32 patients who had undergone radical mastectomy during the last five years (with no mortality or morbidity). Operative mortality is defined as death within 6 weeks of surgery and morbidity is defined as the complications of anastomotic leakage (8 cases), pelvic abscess (9 cases), sepsis (2 cases) and severe postoperative pneumonia (1 case). The 126 rectal cancer and 32 breast cancer patients were scored using the POSSUM system (Tables 1 and 2). The PS was calculated prior to surgery and the OSS at the time of surgery except for the histology. Postoperative hospitalization period and duration of antibiotics administration were also collected retrospectively. Patients' profile, POSSUM score and their outcomes are shown in Table 3. Statistical significance was assessed by Wilcoxon's rank-sum test and simple regression analysis was used to evaluate the relation between specific variables.

Results and Discussion

The patients' profile, POSSUM scores and their outcomes are illustrated in Table 3. There were statistically significant differences between the rectal cancer group and the breast cancer group for OSS. In contrast, no significant differences were apparent for PS. Both postoperative hospitalization and duration of antibiotics administration were significantly longer in the rectal

Table 1 Physiological score (to be scored at the time of surgery)

	Score			
	1	2	4	8
Age (years)	⩽ 60	61–70	⩾ 71	
Cardiac signs	No failure	Diuretic, digoxin, antianginal or hypertensive therapy	Peripheral oedema; warfarin therapy	Raised jugular venous pressure
Chest radiograph			Borderline cardiomegaly	Cardiomegaly
Respiratory history	No dyspnoea	Dyspnoea on exertion	Limiting dyspnoea (one flight)	Dyspnoea at rest (rate ⩾ 30/min)
Chest radiograph		Mild COAD	Moderate COAD	Fibrosis or consolidation
Blood pressure (systolic) (mmHg)	110–130	131–170	⩾ 171	—
		100–109	90–99	⩽ 89
Pulse (beats/min)	50–80	81–100	101–120	⩾ 121
		40–49		⩽ 39
Glasgow coma score	15	12–14	9–11	⩽ 8
Haemoglobin (g/100ml)	13–16	11.5–12.9	10.0–11.4	⩽ 9.9
		16.1–17.0	17.1–18.0	⩾ 18.1
White cell count ($\times 10^{12}$/l)	4–10	10.1–20.0	⩾ 20.1	
		3.1–4.0	⩽ 3.0	
Urea (mmol/l)	⩽ 7.5	7.6–10.0	10.1–15.0	⩾ 15.1
Sodium (mmol/l)	⩾ 136	131–135	126–130	⩽ 125
Potassium (mmol/l)	3.5–5.0	3.2–3.4	2.9–3.1	⩽ 2.8
		5.1–5.3	5.4–5.9	⩾ 6.0
Electrocardiogram	Normal		Atrial fibrillation (rate 60–90)	Any other abnormal rhythm or ⩾ 5 ectopics/min
				Q waves or ST/T wave changes

COAD: Chronic obstructive airways disease.

(Copeland GP *et al.*: Br J Surg Vol. 78, 358–360, 1991)

cancer group than in the breast cancer group. These results reflect higher rate of mortality and morbidity in the rectal cancer group.

In addition, a strong positive correlation was found between postoperative hospitalization and OSS ($r = 0.32$, $P < 0.0001$). Duration of antibiotics administration was also significantly correlated with OSS ($r = 0.46$, $P < 0.001$). There was no correlation between PS and post-

Table 2 Operative severity score. (Definitions of surgical procedures with regard to severity are guidelines; not all procedures are listed and closest should be selected)

	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 metastases	Distant metastases
Mode of surgery	Elective		Emergency resuscitation of > 2 h possible † Operation < 24 h after admission	Emergency (immediate surgery < 2 h needed)

*Surgery of moderate severity includes appendicectomy, cholecystectomy, mastectomy transurethral resection of prostate; major surgery includes any laparotomy, bowel resection, cholecystectomy with choledochotomy, peripheral vascular procedure or major amputation; major + surgery includes any aortic procedure, abdominoperineal resection, pancreatic or liver resection, oesophagogastrectomy; † indicates that resuscitation is possible even if this period is not actually utilized. (Copeland GP *et al.*: Br J Surg Vol. 78, 358–360, 1991)

Table 3 Patients' profile, Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity (POSSUM) score and Outcome

	Rectal cancer	Breast cancer	*P* value
Patients' profile			
Number of patients	126	32	—
Primary	97	32	
Recurrence	29	0	
Period	1988–1997	1993–1997	—
Age	61.2 ± 10.5	50.6 ± 12.5	$P < 0.05$
Sex ratio (M:F)	79:47	0:32	—
Operative procedure	Miles' 31	Mastectomy 32	—
	Anterior resection 58		
	Hartmann 8		
	Others 34		
POSSUM score			
Physiological score (PS)	15.9 ± 4.2	14.4 ± 2.1	NS
Operative severity score (OSS)	21.2 ± 5.4	10.8 ± 2.1	$P < 0.05$
Outcome			
Mortality	3	0	—
Morbidity	20	0	—
Postoperative hospitalization (days)	52.7 ± 41.0	37.9 ± 14.0	$P < 0.05$
Duration of antibiotics administration (days)	15.5 ± 15.9	4.8 ± 2.0	$P < 0.05$

Values represent mean ± SD. Statistical significance was assessed by Wilcoxon's rank-sum test.
NS: Not significant.

operative hospitalization or antibiotics administration period (Fig. 1). These results suggest that higher OSS are followed by longer hospitalization and longer antibiotics administration due to higher mortality and/or morbidity.

Quantity of surgical care is easy to measure; the number of patients seen, waiting times and operations performed can all be determined. Measurement of the quality of surgical care, however, is a greater challenge. Rate of morbidity and mortality are often used to determine the quality of surgical care, as postoperative complications and death are definable parameters of outcome. Therefore, the ideal scoring system for the assessment of risk attendant to surgery would assess mortality and morbidity and would take into account the degree of surgical success.

This scoring system should be quick and easy to use and should be applicable to all general surgical procedures in both the emergency and elective setting. It should be of use in all types of hospitals and should provide educational information. The POSSUM scoring system is validated by multivariate discriminant analysis, is simple to calculate (1), and is easy to integrate into preexisting audit programs with a minimum of disruption.

The present study shows that the POSSUM scoring system can predict postoperative clinical course in terms of hospitalization and antibiotics treatment period. Further research is necessary to elevate the sensitivity and specificity of the scoring system with regard to perioperative surgical stress.

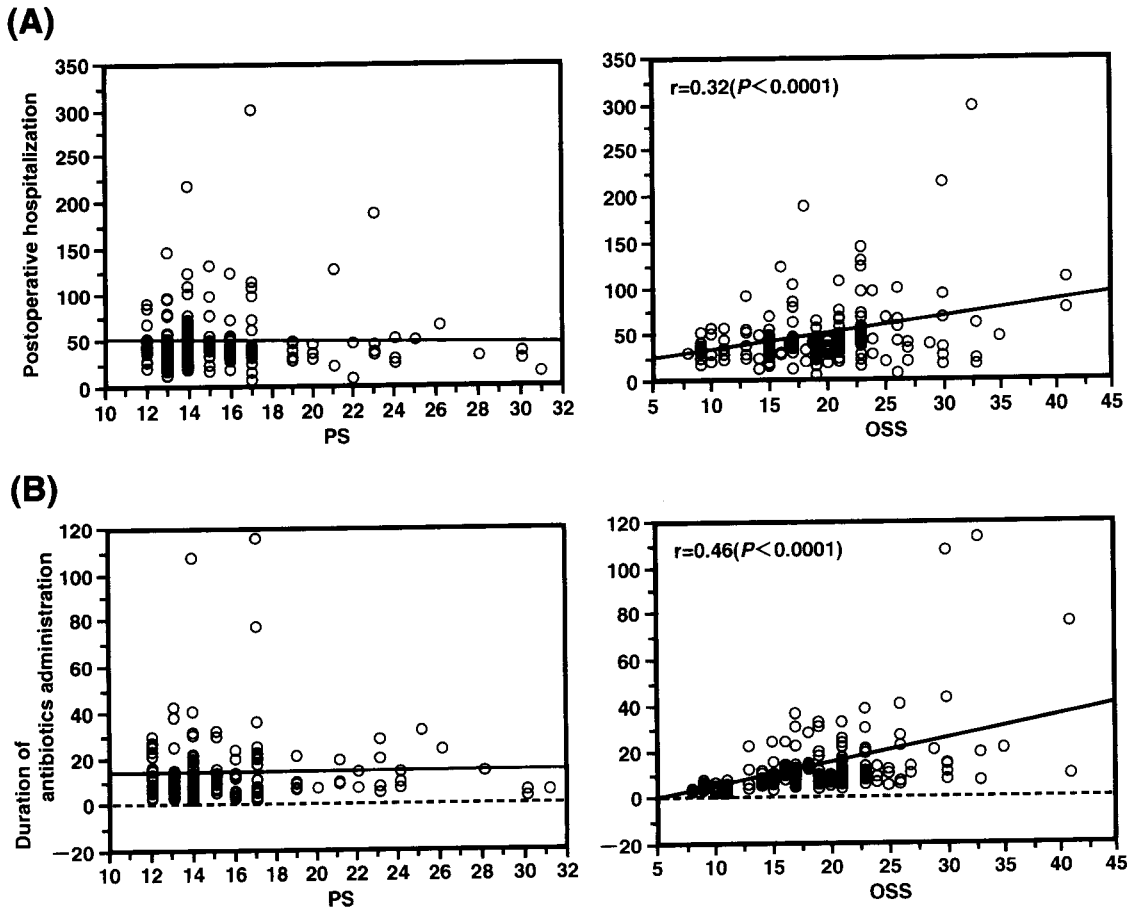

Fig. 1 The correlation of postoperative hospitalization (A) and duration of antibiotics administration (B) to PS and OSS. PS: Physiological score; OSS: Operative severity score. Simple regression analysis was used to evaluate the relation between specific variables. r: Coefficient value.

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