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Original Article

Emergency Surgical Score in Predicting Post-operative Complications in Emergency Laparotomy: A Prospective Tertiary Care Study

G Monisha[1], B D Manjunath[2], H R Harindranath[3]

[1]Postgraduate, Department of General Surgery, Bangalore Medical College and Research Institute, Bengaluru, Karnataka, India, [2]Assistant Professor, Department of General Surgery, Bangalore Medical College and Research Institute, Bengaluru, Karnataka, India, [3]Professor, Department of General Surgery, Bangalore Medical College and Research Institute, Bengaluru, Karnataka, India

Abstract

Background: The emergency surgical score (ESS) was recently validated as a scoring system to predict mortality in emergency laparotomy, which was accepted in February 2016. We sought to assess the efficacy and accuracy of ESS scoring in predicting post-operative morbidity and mortality in emergency laparotomy. The scoring is a pre-operative prediction using 22 factors.

Materials and Methods: A prospective study on 102 patients who underwent emergency laparotomy within 24 h of admission in Bowring and Lady Curzon and Victoria Hospitals between January 2018 and July 2018. Thirty-day post-operative complications were defined. Each patient-related ESS was calculated, and the correlation between ESS and post-operative complications was assessed and calculated using Fischer exact test.

Results: Out of 102 cases included in the study, ESS was validated. Forty-one (40.1%) patients were found to have at least one post-operative complications. Eighty-three patients had scores of 0–14 out of which morbidity was (22) 26.5%. Nineteen patients had scores ≥ 15 out of which mortality was (15) 78.9%, with $P < 0.001$. Fischer exact *t*-value was 7.187.

Conclusion: Based on this study, emergency surgical scores (ESS) can be used as a pre-operative tool for improving the quality of surgical care. The efficacy and accuracy of the ESS scoring system are henceforth proved.

Key words: Laparotomy, Prediction, Scoring, Validation

INTRODUCTION

The term laparotomy arises from the Greek word ("lapara") meaning "the soft part of the body between the ribs and hip and the suffix ("tomy").

The first successful laparotomy was performed by Ephraim McDowell in 1809 in Daville, Kentucky.

An emergency laparotomy is a lifesaving procedure, undertaken mostly in acute cases, without much preparation of the patient. Emergency laparotomy patients have an especially high risk of morbidity and mortality.[1] Internationally reported mortality rates following emergency laparotomy range from 13% to 18% at 30 days.[2] Mortality in age >65 years of patients has been reported[3] to be between 22% and 44% and morbidity of 50%.

Ideally, surgeons should have a reliable, easy to calculate scoring system to apply to all elderly people presenting for emergency surgery. An accurate prediction of outcome could then be made, allowing the surgical team to present a more informed choice to the patient on whether surgery or supportive care is the optimal management. Reduction of considerable morbidity and mortality after emergency laparotomy is the focus of several ongoing national and international audit and quality improvement programs.[4]

- National Emergency Laparotomy Audit,
- The Australian and New Zealand audit of Surgical Mortality,

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Corresponding Author: Dr. B D Manjunath, Assistant Professor, Department of General Surgery, Bangalore Medical College and Research Institute, Bengaluru, Karnataka, India. E-mail: gmonishachmc@gmail.com

- The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP),
- The Enhanced Peri-Operative Care for High-risk patients study.

Although such scoring systems started with an assessment of surgical risk with American society of anaesthesiologist (ASA) scoring system in 1941; nowadays, two commonly used scoring systems are APACHE II, and P-POSSUM, several other perioperative scores[5,6] have been developed to aid in this process and to facilitate audit and performance analysis.

Scoring must be
- Based on pre-operative variables
- Reliable
- Easy to calculate
- Aid in presenting informed choice regarding outcome.

Using data from the ACS-NSQIP[5] from 2008 to 2012, recently designed and validated an emergency surgery score (ESS) to predict mortality after emergency laparotomy.[1] ESS is calculated by adding the score assigned to each of 22 different demographic, comorbidity, and pre-operative laboratory variables. Apart from mortality, it is able to predict the risk of serious or any other post-operative complications. This scoring system also allows a bedside calculation of the risk assessment, with simple laboratory variables, which also proves to be cost effective.

Variable	Points
Demographics	
Age > 60 years	2
White race	1
Transfer from outside emergency department	1
Transfer from an acute care hospital inpatient facility	1
Comorbidities	
Ascites	1
BMI < 20 kg/m^2	1
Disseminated cancer	3
Dyspnea	1
Functional dependence	1
History of COPD	1
Hypertension	1
Steroid use	1
Ventilator requirement within 48 hrs preoperatively	3
Weight loss > 10% in the preceding 6 months	1
Laboratory values	
Albumin < 3.0 U/L	1
Alkaline phosphatase > 125 U/L	1
Blood urea nitrogen > 40 mg/dL	1
Creatinine > 1.2 mg/dL	2
International normalized ratio >1.5	1
Platelets < 150 x 10^3/μL	1
SGOT > 40 U/L	1
Sodium > 145 mg/dL	1
WBC, x 10^3/μL	
<4.5	1
>15 and ≤25	1
>25	2
Maximum Score	29

ESS, Emergency Surgery Score; BMI, body mass index; COPD, chronic obstructive pulmonary disease; WBC, white blood cell

Objectives of the Study

The objectives are as follows:
- To assess the efficacy and accuracy of emergency surgical score(ESS) in predicting the outcome of post-operative morbidity and mortality in emergency laparotomy
- To assess and improve the quality of surgical care based on the scoring
- To establish the accuracy of emergency surgical score in predicting the post-operative complications.

MATERIALS AND METHODS

Study Design

This was a prospective study.

Study Period

The study was from January 2018 to July 2018.

Place of Study

The study was conducted at the General Surgery Department in the hospitals attached to Bangalore Medical College and Research Institute.

Sample Size

The sample size was 102.

Inclusion Criteria

The following criteria were included in the study:
1. Age >18 years
2. All patients who were taken up for emergency laparotomy
3. Patients who were feasible to follow-up to 30th post-operative day.

Exclusion Criteria

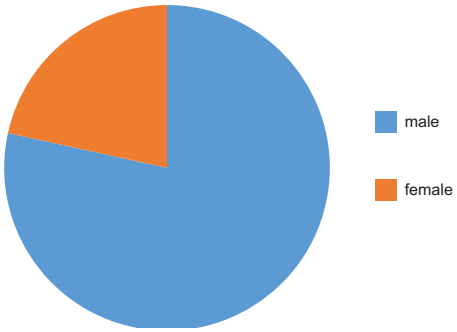
The following criteria were excluded from the study:
1. Age < 18 years
2. Patients not feasible for follow-up to 30th post-operative day.

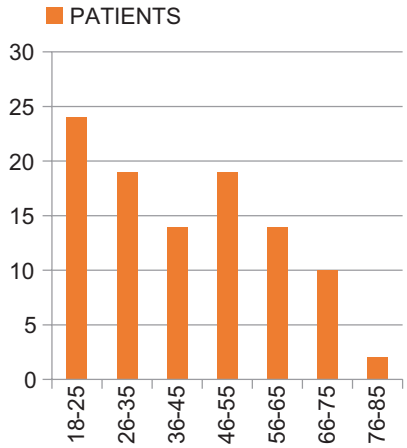
Methodology

The study was conducted in the Department of General Surgery in Victoria and Bowring and Lady Curzon Hospitals on 102 patients who fulfilled the inclusion criteria history, clinical examination, including pre-operative investigations were recorded. They were given a scoring based on emergency surgical scoring. At 30th post-operative day, the outcome of patients was categorized as three groups – fair (no post-operative complications), intensive care unit (ICU) (morbidity), and death (mortality). Correlation of emergency surgical score (ESS) with outcome was assessed. Odds of the individual 22 factors in predicting the post-operative mortality and morbidity were analyzed.

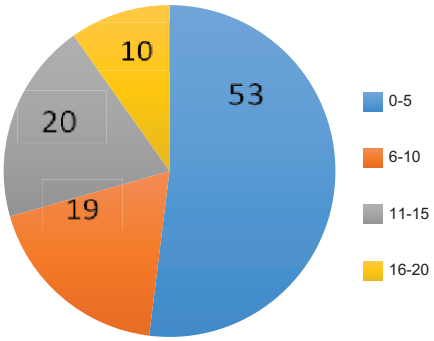
RESULTS

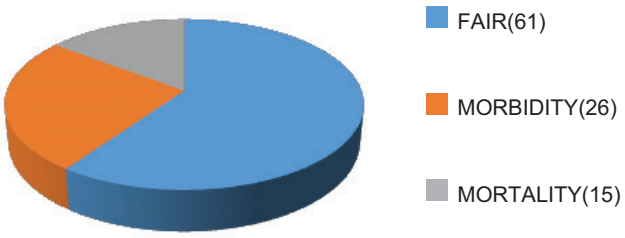
Out of 102 patients, 22 were female and 80 were male. Age distribution was maximum in 18–25 years (24), followed by 26–35 years (19), 46–55 years (19), 36–45 years (14), 56–65 years (14), 66–75 years (10), and 76–85 years (2).

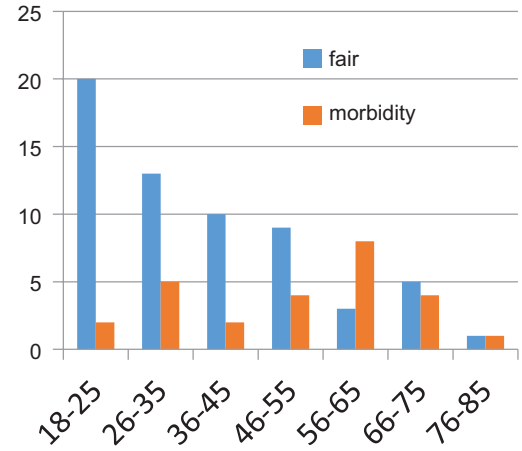


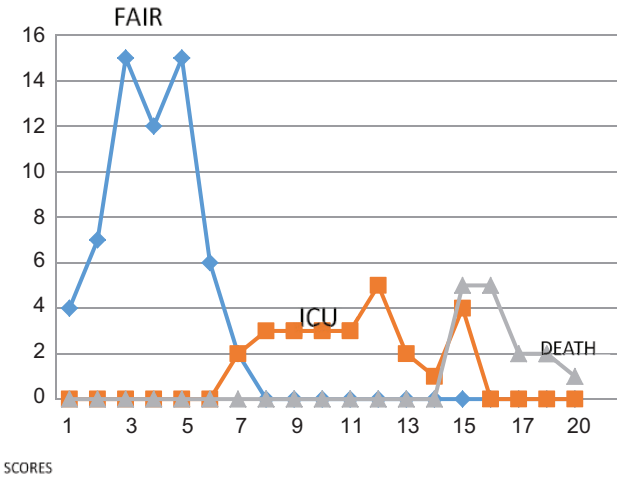


Indications for laparotomy were maximum for hollow viscus perforation (72), intestinal obstruction (20) followed by penetrating injury (6), blunt trauma (3), and bleeding cyst (1). Emergency surgical scores were applied and 53 had a score of < 5, 19 had score 6–10, 20 had a score 11–15, and 10 had a score of 16–20. These patients were followed up to their 30th post-operative day, and the outcome was grouped into fair outcome (61), morbidity (26) requiring ICU admissions such as lower respiratory tract infection, burst abdomen, acute kidney injury, metabolic acidosis, and death/mortality (15).









The distribution of outcome was assessed; morbidity and mortality were more in male (49%). Morbidity and mortality were more for the elderly population with almost 100% morbidity and mortality in age >75 years, and 16% of morbidity, and mortality in age <25 years. With advancing age, the post-operative outcome was poor at the 30th post-operative period. The correlation of the emergency surgical score with that of the outcome was assessed, and the graphical representation was made which shows that a score <5 correlated with a uneventful post-operative period and a score 6–12 correlated with 45% of post-operative morbidity and mortality with ICU admissions. A score >15 had a

100% post-operative complications. Hence, the higher scores correlated with a poorer outcome. The data were analyzed with SPSS version 23. Odds correlation was applied, *P* value was found to be significant for all factors except for two factors – ascites and steroid use.

Factors	Odds ratio	*P* value
Age	0.236 (0.089, 0.624)	0.002
Race	-	-
Transfer op	0.140 (0.046, 0.423)	<0.001
Transfer from ip	0.140 (0.046, 0.423)	<0.001
Ascites	0.229 (0.027, 1.979)	0.237
BMI <20	0.166 (0.069, 0.399)	<0.001
Malignancy	0.069 (0.008, 0.574)	0.002
Dyspnea	0.072 (0.027, 0.189)	<0.001
Dependence	0.150 (0.055, 0.407)	<0.001
Copd	0.100 (0.026, 0.376)	<0.001
Hypertension	0.069 (0.008, 0.574)	0.002
Steroid	0.154 (0.017, 1.433)	0.155
Ventilator requirement	0.021 (0.003, 0.169)	<0.001
Weight loss <10%	0.052 (0.006, 0.422)	<0.001
Albumin	0.091 (0.035, 0.234)	<0.001
BUN	0.096 (0.038, 0.243)	<0.001
ALP	0.064 (0.090, 0.775)	0.012
Creatinine	0.055 (0.020, 0.153)	<0.001
INR	0.126 (0.042,0.381)	<0.001
Platelet	0.154 (0.054, 0.439)	<0.001
Sgot	0.154 (0.054, 0.439)	<0.001
Sodium	0.059 (0.007, 0.489)	0.001
WBC	0.096 (0.038, 0.243)	<0.001
ESS	0.537 (0.40, 0.71)	<0.001
Odds correlation	*P*<0.001 (significant)	
Fischer's exact test	Pearson correlation=0.584	
Pearson correlation test applied		

Results	Score	Score	*P* value
Outcome	0–14	≥15	*P* < 0.001
Fair	61	0	
Intensive care unit	22	4	
Death	0	15	

DISCUSSION

Many scoring systems have been validated and had few set backs.[4,7,8] Pre-operative P-POSSUM scoring, ASA grade, and lactate were moderate predictors of mortality.[8]

Scoring system	Limitations
ASA (1941)	Poor correlation with outcome
Apache (1981)[6]	To be used in critically ill (saps scoring, sepsis scoring)
BOEYS scoring(1987)	High false positive in ppu patients
Pulp score[9]	Did not predict the post-operative mortality
Charlson comorbidity index (1987)	Low specificity
Mannheim[10] peritonitis index (2002)	Poor prediction of mortality
Possum scoring (1996)	Post-operative scoring than a pre-operative prediction
P possum scoring (2005)[9]	Over prediction of the outcomes
SOFA[11]	Other morbidity apart from sepsis was not considered
Surgical mortality probability model (S-MPM)[12]	Validity in an emergency is still not ascertained

Unlike other existing risk-classification systems such as the ASA, APACHE 6; ESS is based on objective, well-defined, and pre-operative variables.

Limitations of the Study

1. Race could not be applied
2. Only ICU admissions (shock, renal failure, respiratory failure, burst abdomen, and hypotension) were considered for morbidity.

CONCLUSION

1. ESS is an excellent predictor of 30 days of complications in emergency laparotomy
2. The efficacy and accuracy of emergency surgical score are henceforth significant
3. ESS can also be used as a tool in developing a national audit program for emergency laparotomy.

Based on this study, ESS can be used as a pre-operative tool for

1. Counseling patients and relatives regarding outcome
2. Improving the quality of surgical care
3. To accurately predict the post-operative complications in emergency laparotomy.

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