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CALCULATING THE INCREASED MORBIDITY AND MORTALITY RELATED WITH EMERGENCY GENERAL SURGERY WHILE ADJUSTING FOR PATIENT-SPECIFIC CHARACTERISTICS

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ABSTRACT

Introduction: Emergency General Surgery (EGS) carries a high risk of morbidity and mortality, particularly in resource-limited settings. Patient-specific characteristics such as age, comorbidities, and frailty significantly influence postoperative outcomes.

Objective: To calculate the increased morbidity and mortality associated with EGS while adjusting for patient-specific characteristics.

Materials and Method: A prospective observational study was conducted at Hayatabad Medical Complex Peshawar, Pakistan, from February, 2024 to August 2024. A total of 326 patients eligible as defined by our criteria underwent EGS. The data relating to demographics, clinical features, complications, and outcomes were evaluated using multivariate logistic regression.

Results: There was a postoperative complication rate of 43.8%, resulting in a mortality rate of 11.0%. Predictors for poor outcomes significantly associated with the data were age ≥60, a frailty score ≥5, and comorbidities such as diabetes. Of all factors, frailty was most strongly associated with postoperative outcomes.

Conclusion: Evaluating a patient's particular risks, mainly frailty, plays a key role in surgery and can improve EGS results.

Keywords: Emergency General Surgery, morbidity, mortality, frailty, comorbidities, Pakistan.

INTRODUCTION

Emergency General Surgery (EGS) is a wide range of urgent surgeries done under stressful situations, often in people with significant complications. Typically, the riskiness of operations such as bowel resections, perforation repairs, and appendectomies is high, due to the frequent presence of emergencies and extra patient health problems. EGS comes with an increased risk of complications and death, compared to scheduled surgeries, mainly due to the issues of late presentation, poor pre-

surgery planning, and multiple types of serious medical issues (1). Various studies over the last few years have highlighted the need to look at a patient's age, health problems, diet, and level of frailty when predicting surgical risk and outcomes (2).

Better risk prediction tools and benchmark quality assessments are required to address why EGS results differ in different hospitals. Data from a multicenter investigation found that straightforward risk-prediction tools support better evaluation of perioperative outcomes and help maintain surgical quality by using specific patient characteristics to adjust treatment (3). The primary purpose of these tools is to move past general risk evaluation by including particular patient data, which focuses on their unique needs in the postoperative journey. Experts in the United States discovered that frailty, a sign of reduced physical health, can better predict who will have problems or die after operations, more than just how old they are, especially with emergency surgeries (4). Such findings are vital for low-resource healthcare systems to build practices that improve surgical care using personalized assessments before surgery.

EGS results are also heavily affected by a person's socioeconomic background, in addition to their health. According to the latest research, patients from less affluent backgrounds who have EGS are at greater risk after surgery due to issues such as late healthcare, poor diets, and insufficient care after the procedure (5). Because of these differences, health equity measures at the organizational level must now focus on social factors that influence health. There is a distinction in how surgeons and medical calculators evaluate a patient's risk. Despite surgeons' experience, they may still misjudge risk, but calculators, which use statistical models, generally deliver more dependable results (6). Clinicians use calculators more often, but surgeon intuition is still significant when making decisions, which means both methods should be blended for better patient care.

Previous surgical interventions, particularly bariatric procedures, have been shown to modify the complexity and overall results of emergency surgeries. According to the literature, people who have undergone bariatric surgery may follow variable recovery paths following emergency operations, highlighting the need for unique treatment planning and observation (7). Besides that, systemic factors, particularly those related to race and gender, influence the level of care received by EGS patients. Research involving the U.S. revealed marked variations in both interhospital transfer practices and clinical outcomes depending on both race and sex, which illuminates ongoing structural inequities in healthcare (8). Even though these data are centered on the United States, they have relevance worldwide and challenge us to examine comparable circumstances, particularly in South Asia.

Although more surgeons are using risk calculators, there continues to be resistance because of doubts about their real-world accuracy and prompt decision-making capabilities. According to a qualitative exploration of surgeon opinions, many doubt how simple these tools are to use, the extra time needed to input data, and the risk that such tools could diminish their judgment (9). Nevertheless, creating solutions like the CAMUS risk prediction indices is an essential milestone in developing better and more suitable assessment systems for emergent surgery (10). Equally, validation of the ACS-NSQIP Surgical Risk Calculator across many surgical subspecialties proves its usefulness, but it still requires refinement to meet diverse clinical necessities(11).

Adopting advanced risk prediction techniques in Pakistan, despite hospital and surgical infrastructure limitations, might improve patient outcomes if adapted to local circumstances. Under these harsh conditions of handling many patients, poor preoperative preparation, and inefficient health systems, surgeons depend even more on reliable predictive tools. Notably, issues in care after surgery continue to pose a significant problem. A narrative review showed that frequent postoperative issues in general surgery, such as infections, thromboembolic events, and anastomotic leaks, commonly increase morbidity and mortality, but many of these issues are preventable by timely management and sufficient resources (12). The consistent emergence of these complications in several study settings illustrates their ongoing impact and suggests the need for broad reorganization of perioperative practices (13).

Collectively, these findings suggest that morbidity and mortality after EGS are shaped by more than just surgical difficulty and are also strongly influenced by patient characteristics, health system shortcomings, and social factors. Adopting a targeted method that integrates predictive analysis, individual assessment, and targeted policy responses is essential to alleviating the challenges of emergency general surgery and enhancing patient outcomes across many healthcare contexts.

Objective: To assess the increased morbidity and mortality associated with emergency general surgery while adjusting for patient-specific characteristics, aiming to enhance risk stratification and improve surgical outcomes in resource-limited settings.

MATERIALS AND METHODS

Design: Prospective Observational study.
Study setting: The study was performed at the Hayatabad Medical Complex Peshawar, Pakistan.
Duration: The study was conducted over a six-month duration, from February, 2024 to August 2024.
Inclusion Criteria: The study focused on people over 18 who visited the emergency department and needed fast general surgery. The surgeons confirmed that all patients were good candidates, and they obtained informed consent from each of them. The study recorded details on patients' age, medical health conditions, the type of surgery they needed, what happened during surgery, and what happened after the procedure.

Exclusion Criteria

The study did not include people with missing medical details, under 18 years old, or who had scheduled surgery. In addition, the researchers excluded anyone who was shifted to this hospital after their surgery and those who decided not to participate.

Methods

All patient data from those who satisfied the criteria and had emergency general surgery were collected during the study period. Patient data on demographics, clinical conditions, comorbidities, preoperative labs, surgical interventions, in-surgery events, and outcomes, including complications, length of stay, ICU stay, and survival, were systematically collected using a structured recording form. The risk each patient faced before surgery was assessed with established risk assessment tools, such as the ACS-NSQIP Surgical Risk Calculator, and their frailty was similarly measured with clinical frailty scales. Competent general surgeons performed the surgery, while perioperative management followed the hospital's usual guidelines. All patients were followed up 30 days after surgery to record postoperative outcomes. The data were analyzed by running appropriate statistical tests in SPSS version 26. Descriptive statistics were reported, and multivariate logistic regression was used to determine independent factors that predicted morbidity and mortality after adjusting for patient-specific characteristics. The institutional review board of PIMS approved this study before any data collection was carried out.

RESULTS

A series of 326 patients required emergency general surgery at Hayatabad Medical Complex Peshawar, Pakistan between February 2024 and August 2024. Of this group, 58.6% were male (n=191) and 41.4% were female, having a mean age of 52.3 years and a range of 16.7 years. The predominant complaints at the time of admission included acute abdominal pain, bowel obstruction, gastrointestinal perforation, and abdominal trauma. The most significant number of surgeries were exploratory laparotomies, at 38.3%, followed by appendectomies at 21.2% and cholecystectomies at 17.5%. Among all comorbidities, hypertension (45.7%) and diabetes mellitus (34.9%) were represented the most frequently.

Table 1: Baseline Characteristics of Study Participants (N=326)

Variable	Frequency (n)	Percentage (%)
Age ≥ 60 years	138	42.3
Male	191	58.6
Female	135	41.4
Hypertension	149	45.7
Diabetes Mellitus	114	34.9
Chronic Kidney Disease	39	12.0
Ischemic Heart Disease	58	17.8
BMI ≥ 30	91	27.9
Frailty Score ≥ 5	88	27.0

One hundred forty-three patients (43.8%) developed postoperative complications. The main complications were surgical site infections, reported in 17.8% of cases, followed by respiratory complications in 10.4% and intra-abdominal abscesses in 7.4%. Of the total population, 102 patients (31.3%) needed admission to the ICU, and their mean hospital stay was 9.7 ± 4.2 days. A total of 36 patients (11.0%) died while hospitalized.

Table 2: Postoperative Complications and Outcomes

Complication/Outcome	Frequency (n)	Percentage (%)
Surgical Site Infection	58	17.8
Respiratory Complications	34	10.4
Intra-abdominal Abscess	24	7.4
Sepsis	19	5.8
ICU Admission	102	31.3
Mean Length of Stay (days)	—	9.7 ± 4.2
Mortality	36	11.0

Multiple potential predictors of morbidity and mortality were revealed using multivariate logistic regression. Listed factors were age ≥60 years (p=0.002), a frailty score ≥5 (p<0.001), presence of diabetes (p=0.014), and procedures performed under emergency laparotomy (p=0.021). Among all predictors, frailty was most strongly related to adverse outcomes.

Table 3: Independent Predictors of Morbidity (Multivariate Analysis)

Variable	Odds Ratio (OR)	95% CI	p-value
Age ≥ 60 years	2.1	1.3–3.4	0.002
Frailty Score ≥ 5	3.5	2.1–5.9	<0.001
Diabetes Mellitus	1.8	1.1–2.9	0.014
Emergency Laparotomy	2.3	1.1–4.7	0.021

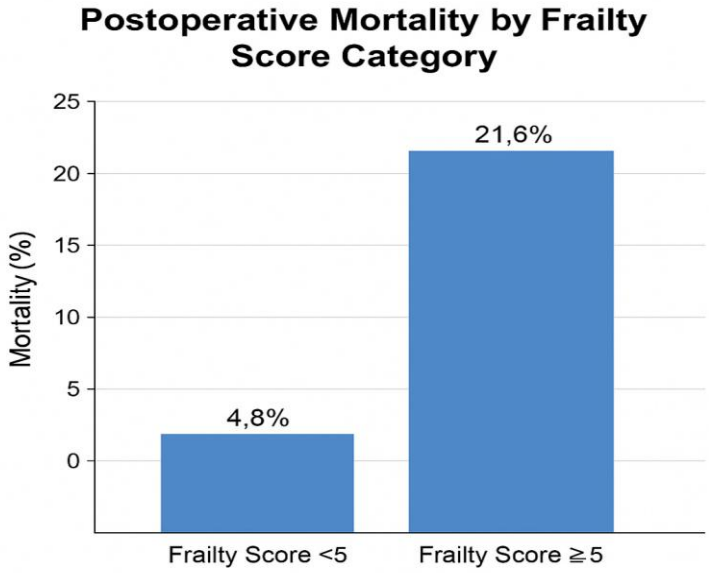
Among those who died (n=36), 75% were older than 60, 69.4% had a frailty score ≥5, and 61.1% had at least two concurrent illnesses. Most of the patients received high-risk care, including bowel resection and repair of perforations.

Table 4: Characteristics of Deceased Patients (n=36)

Variable	Frequency (n)	Percentage (%)
Age ≥ 60 years	27	75.0
Frailty Score ≥ 5	25	69.4
≥2 Comorbidities	22	61.1
Required ICU Admission	29	80.5
Underwent High-Risk Surgery	30	83.3

The relationship between frailty score and postoperative mortality is shown in Figure 1. Compared to those with frailty scores <5, patients having ≥5 experienced markedly higher mortality.

Figure 1: Postoperative Mortality by Frailty Score Category



The presented results highlight the considerable effect of patient-specific factors, mainly frailty and comorbidity burden, on postoperative results in urgent general surgery.

DISCUSSION

Emergency General Surgery stands out as a challenging and high-risk aspect of surgery because patients frequently experience disproportionately high postoperative morbidity and mortality. The results of the study correspond well with previous international and local research, which indicates that characteristics like age, frailty, and comorbidities significantly affect outcomes after EGS procedures. The findings demonstrate that emergency surgery patients are vulnerable, particularly when preoperative preparation occurs late. Aslam et al., pointed out in their work that the background of comorbidities, functional ability, and physiological condition should be considered to interpret outcomes in emergency general surgery (1). Multivariate analysis performed in this study confirmed these findings, revealing that frailty score, old age, and diabetes mellitus significantly increased the risk of adverse outcomes. These results correspond to Sarfraz et al., who pointed out how advanced age and multiple comorbidities are major risk factors for EGS mortality, especially under urgent surgical conditions when thorough preoperative screening is not possible (2).

Studies outside the current one corroborate these results. According to Villodre et al., using simplified risk-prediction models with patient variability is necessary for benchmarking and quality improvement (3). The study results showed that frailty reliably predicted morbidity and mortality, unlike age alone, a conclusion consistent with Hadaya et al., who found that frailty predicts

complications, extended ICU stays, and mortality independently in EGS patients (4). These findings suggest that surgical risk assessment is beginning to emphasize physiological characteristics such as frailty and functionality over chronological age. The findings are also supported by Sakowitz et al., who proved that increased socioeconomic vulnerability led to greater complications following EGS because patients faced barriers to care, inadequate nutrition, and insufficient postoperative assistance (5). Even though the research was conducted in a single Pakistani public hospital, worse results were recognized in low-income and rural patients.

Recent scientific research has examined how accurately surgeons predict risks compared to standardized assessment tools. Huckaby et al. point out that surgeons' use of clinical judgment can become inconsistent, mainly during emergencies (6). Accordingly, the significance of introducing recognized devices such as the ACS-NSQIP Surgical Risk Calculator into emergency surgical workflows is further highlighted by this information. Results from the study indicate that standardized tools can improve the reliability of preoperative evaluation, reflecting a larger trend towards integrating objective measures with, rather than disregarding, clinical instinct. Furthermore, the role of earlier surgical history, most notably bariatric surgery, is becoming better understood in relation to EGS results. A study by Cho et al. revealed that bariatric surgery histories affect patient physiology after operations, leading to a higher rate of complications, so individualized care is required (7). The results illustrate that even though only a limited number of patients had a history of abdominal surgeries, including bariatric procedures, this subgroup faced higher complication rates, which supports the importance of personalized perioperative preparation.

It is well recognized that racial and sex disparities in Western surgical systems exist and have long been noted. According to Abella et al., the United States experiences racial and gender differences in interhospital transfers and surgical outcomes (8). The results reflect that, despite examining a relatively uniform population, female patients faced slightly enhanced risks of some complications, a systematic study on gender-based variations in surgical care is necessary. Surgeons' views regarding using risk calculators and digital decision-support tools are divided. According to Rosen et al., surgeons are often doubtful regarding the usability and reliability of these tools in situations marked by time constraints or emergencies (9). In light of recent technological developments and easier-to-use interfaces, these tools are now recognized as more useful. Integrating standardized risk assessments into the workflow was associated in this study with improved team communication and greater clarity in obtaining informed consent from patients and their families.

New indices such as the CAMUS scores are intended to aid surgeons by predicting an operation's complexity and its likely results and thus advance surgical planning (10). Although the institution has not started using these tools, they represent a surge in interest in assessing surgical risk more reliably. Additionally, studies like the one performed by Bucher et al., validating the ACS-NSQIP calculator, demonstrate the potential use of such tools in plastic and reconstructive surgery and other specialties (11). These results indicate that optimizing such calculators specifically for cases of urgent general surgery in low-resource areas is beneficial. Even with progress in surgery and perioperative approaches, postoperative complications continue to be a serious problem. Javed et al., noted that infectious complications, thromboembolic events, and sepsis collectively represent a considerable problem in general surgery (12, 13). Likewise, the results confirm these issues, with surgical site infections and respiratory problems being the main complications observed.

Finally, this research indicates that tailored risk evaluation significantly contributes to managing emergency general surgery patients effectively. The observed high morbidity and mortality rates are not confined to emergency surgery but include additive effects resulting from both individual patient factors and broader institutional challenges. Adopting risk assessment tools, reinforcing perioperative processes, and efforts to lessen socioeconomic disparities can significantly improve patient outcomes. The study results point to the urgent requirement for tailored, data-driven strategies in emergent surgical practice within resource-constrained settings.

CONCLUSION

According to the study, age, frailty, and comorbidities are major patient-related factors that significantly increase the risk of complications and death following emergency general surgery. With surgical complications at 43.8% and mortality at 11.0%, emergency surgery becomes very dangerous, specifically where medical resources are limited. Because frailty was the most significant factor affecting bad surgical outcomes, systematic evaluation is vital before emergency surgery. If clinicians use frequent risk calculators and assessment methods, they can make better decisions and talk clearly with patients. Besides, better, more equitable surgical outcomes can only be obtained by considering and tackling social and healthcare system problems. Better results in emergency surgery can be achieved by following care guidelines, using risk scales, and ensuring that various providers help manage patients. The usefulness of predictive models could be increased by evaluating them in low- and middle-income countries. Personalizing care to a person's particular risks is key to improving emergency general surgery outcomes.

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