



Association of Postoperative Outcomes with the Pre-op Categorization Based on the American Society of Anesthesia Class in Emergency General Surgery Patients

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ABSTRACT

Introduction: Emergency general surgery patients are at higher risk of postoperative complications and mortality compared to elective surgery patients. The American Society of Anaesthesiologists' (ASA) classification system is a tool for assessing the pre-operative co-morbidity status and predicting peri-operative risk and mortality.

Aims & Objectives: This study aimed to evaluate the association between ASA class and postoperative outcomes in emergency general surgery patients.

Place and Duration of Study: Hayatabad Medical Complex, MTI, Peshawar, from September 2022 to March 2023.

Materials & Methods: This cross-sectional study involved 192 emergency general surgery patients enrolled through a non-probability, consecutive sampling technique. ASA class using the ASA scoring system, demographic data, comorbidities, and postoperative outcomes (including cardiac complications, surgical site infections, readmissions, and mortality) were recorded. Statistical analysis was conducted using SPSS version 23, with a significance level set at $p \leq 0.05$.

Results: Patients were classified into ASA classes I to IV, with varying rates of comorbidities and postoperative outcomes across the groups. Significant associations were observed between ASA class and cardiac complications ($p = 0.008$), surgical site infections ($p = 0.038$), and mortality ($p = 0.001$). However, no significant association was found for venous thromboembolism ($p = 0.127$) or readmissions ($p = 0.465$).

Conclusion: ASA class is significantly associated with postoperative outcomes, including cardiac complications, surgical site infections, and mortality, in emergency general surgery patients. While venous thromboembolism and readmissions did not show significant associations, higher ASA classes still indicated a greater risk.

Keywords: Outcomes, morbidity, American Society of Anaesthesiologists, Risk stratification

INTRODUCTION

Emergency general surgery patients differ from elective surgery patients due to their higher risk of postoperative complications and mortality¹. Surgical morbidity is a major global public health concern. Despite the existence of prediction tools, research indicates that both senior and resident anaesthesiologists struggle to accurately estimate surgical risks based on pre-operative data. Moreover, while prediction-based research holds promise, applying risk assessment tools to individual patients continues to be challenging³.

Over 230 million surgical procedures are performed annually, with an estimated mortality rate of at least 0.4% and morbidity ranging from 3% to 17%. Complications during the perioperative period can have extensive implications, as perioperative morbidity is linked to decreased long-term survival^{1,2}. Clinical judgment alone is insufficient for predicting adverse outcomes. Accurate risk stratification is essential for identifying patients at higher risk of perioperative complications who may benefit from specific interventions such as preoperative optimization, intraoperative goal-directed fluid therapy, postoperative respiratory support, and critical care admission¹⁻⁴.

The American Society of Anesthesiologists (ASA) physical status classification system was initially developed to assess and summarize patients' preoperative comorbidity status. Over time, it has become widely utilized for enhancing risk adjustment, guiding reimbursement decisions, and predicting perioperative risk and mortality⁵.

Several studies have demonstrated a link between ASA classification and perioperative mortality,

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indicating its utility as a predictor of patient outcomes. A study by Olter UW et al., found a strong association between ASA classification and postoperative outcomes, revealing that mortality rates escalated significantly with higher ASA scores, from 0.1% in ASA I to 93.3% in ASA V. Patients classified as ASA IV experienced a 2–3 times greater incidence of postoperative complications, including bronchopulmonary and cardiac issues, compared to ASA I patients. Intraoperative blood loss was 5–20 times greater in ASA IV patients than in ASA I–III, and the duration of postoperative ventilation increased 2–6 times with higher ASA classifications. Additionally, ASA II–IV patients had longer intensive care stays (1–5 days) and total hospital stays (7–11 days) compared to ASA I patients⁶.

ASA scoring holds clinical and health services importance. Although not solely for predicting perioperative risks, it independently predicts perioperative morbidity and mortality^{5,6,7}. It is part of several widely used risk assessment tools, including the National Surgical Quality Improvement Program risk calculator, Gupta Myocardial Infarction or Cardiac Arrest calculator, Surgical Outcome Risk Tool, and Combined Assessment of Risk Encountered in Surgery^{7,8}.

The rationale for this study was based on the need for improved risk assessment in emergency general surgery, where patients face higher risks of complications and mortality. While the ASA classification is widely used to predict perioperative risks, its effectiveness in emergency settings is underexplored. This study seeks to fill this gap by evaluating how ASA classification correlates with postoperative outcomes in high-risk emergency surgeries. The findings aim to enhance risk stratification, guide clinical decisions, optimize resource use, and improve patient counseling, ultimately leading to better outcomes in these critical cases. This study objective is to evaluate the association between ASA class and postoperative outcomes in emergency general surgery patients.

MATERIALS AND METHODS

A cross-sectional study was conducted on 192 patients admitted through the emergency department of general surgery, Hayatabad Medical Complex, Peshawar from September 2022 to March 2003 after approval by ethical review board (IREB No. 1924) dated 15-06-2024. The sampling technique was non-probability consecutive. The sample size for this study was calculated using the following parameters: a confidence level of 95%, a margin of

error of 2.75%, and the population proportion of mortality after emergency general surgery was 3.9% from previous literature⁹. Written informed consent was obtained from patients or their guardians. Patients underwent pre-operative investigations and assessment as per institutional guidelines. Data included age, gender, ASA class and comorbidity. The patient underwent the procedure as decided by a specialist general surgeon. Post-operative patients were followed for a duration of 30 days. During this, morbidity (cardiac complication i.e. MI, surgical site infection, readmission, venous thromboembolism) and mortality were recorded by inpatient/outpatient/ telephonic follow-ups. Data was entered into the preformed questionnaire.

Tool for Assessment: The primary tool used for data collection in this study was the ASA physical status classification system, which was employed to assess the preoperative risk of patients. The ASA classification is a widely recognized and validated system developed by the American Society of Anaesthesiologists to categorize patients based on their preoperative comorbidities and overall health status. The ASA classification system was chosen due to its established use in clinical practice and its reliability in predicting perioperative outcomes. It is a standardized tool that has undergone extensive validation across various patient populations and surgical settings. ASA physical status was used to assess the preoperative risk and patients were categorized based on this into 4 groups.

1. **ASA I:** A normal healthy patient with no systemic disease.
2. **ASA II:** A patient with mild systemic disease that does not limit physical activity (e.g., controlled hypertension, mild asthma).
3. **ASA III:** A patient with severe systemic disease that limits activity but is not incapacitating (e.g., poorly controlled diabetes, stable angina).
4. **ASA IV:** A patient with severe systemic disease that is a constant threat to life (e.g., recent myocardial infarction, stroke, or severe valve dysfunction).

Inclusion Criteria: Patients aged 18 or above, admitted to the general surgery ward via the emergency department with an ASA score of 1–4, who underwent surgery under regional or general anaesthesia, irrespective of gender and ethnicity.

Exclusion Criteria: Patients who underwent elective general surgery, pregnant patients, those who were terminally ill or had metastatic cancer, patients with firearm-related abdominal injuries, those having ASA score 5 or 6, and patients who were lost to follow-up were excluded.

Data Analysis: Data was analyzed using SPSS version 23. In addition to descriptive statistics of preoperative data and post-operative outcomes, the Chi-square test was used to find out the association between ASA class and post-operative outcomes with a p-value of ≤ 0.05 was considered statistically significant. The ethical review board of the institution, (HMC-QAD-1924) gave the ethical clearance.

RESULTS

A total of 192 patients presented through the emergency department were included in the study. The mean age of patients was 32.9 ± 17.8 . $n=63(32.8\%)$ were females and $n=129(67.2\%)$ patients were males. Based on ASA class, $n=109(56.8)$ patients were categorized as healthy, $n=42(21.9\%)$ had mild systemic disease, $n=21(10.9\%)$ had severe systemic disease and $n=20(10.4\%)$ patients were classified into the severe + threat to life category. Of a total of 192 patients, $8.3\%(n=16)$ and $8.9\%(n=17)$ were diabetic and hypertensive respectively as shown in Table 1.

Table 1: Preoperative Clinicodemographic characteristics of Patients

Variable	Frequency	Percent	
Gender	Female	63	32.8
	Male	129	67.2
	Total	192	100.0
ASA	Healthy	109	56.8
	Mild Systemic Disease	42	21.9
	Severe Systemic Disease	21	10.9
	Severe + threat to life	20	10.4
	Total	192	100.0
Diabetess	Yes	16	8.3
	No	175	91.1
	Total	191	99.5
Hypertension	Yes	17	8.9
	No	175	91.1
	Total	192	100.0

Table 2 shows the region wise distribution of emergency surgery done for emergency conditions

Table 2: Region-wise distribution of Emergency

Region wise distribution	No. of Cases	Percentage
Thoracic Region	5	2.70%
Abdominal Region	122	65.95%
Perianal Region	1	0.54%
Extremities (Arms, Legs)	40	21.62%
Breast Region	4	2.16%
Miscellaneous	13	7.03%
Total	192	100%

Surgeries conducted

Table 3, Postoperative outcomes indicated that cardiac complications occurred in 8.3% of patients. Surgical site infections (SSI) were observed in 32.3% of patients, and mortality was recorded in 12% of patients while VTE was recorded in 7.3% of patients.

Table 3: Post-operative outcomes in patients

Post operative outcome	Frequency	Percent	
Cardiac Complication	Yes	16	8.3
	No	176	91.7
	Total	192	100.0
SSI	Yes	62	32.3
	No	130	67.7
	Total	192	100.0
Readmission	Yes	11	5.7
	No	181	94.3
	Total	192	100.0
Mortality	Yes	23	12.0
	No	169	88.0
	Total	192	100.0
VTE	Yes	14	7.3
	No	178	92.7
	Total	192	100

Regarding postoperative outcomes in table 4, cardiac complications were observed in 8.3% of patients, with a significant variation among ASA classes (P value = 0.008). Surgical site infections (SSI) occurred in 32.3% of patients, showing a significant association with ASA class (P value = 0.038). Venous thromboembolism was present in 7.3% of patients but did not exhibit a significant association with ASA class (P value = 0.127). Readmissions were seen in 5.7% of patients, with no significant association to ASA class (P value = 0.465). Mortality was recorded in 12% of patients, and this outcome was significantly associated with ASA class (P value = 0.001).

Table 4: Difference of postoperative outcomes in ASA classes

Post operative Outcomes		ASA Class				Total	P Value
		Healthy	Mild Systemic Disease	Severe System Disease	Severe + threat to life		
Observed Cardiac Complication	Yes	3	5	4	4	16	0.008
	No	106	37	17	16	176	
Total		109	42	21	20	192	
Observed Surgical Site Infection	Yes	28	15	12	7	62	0.038
	No	81	27	9	13	130	
Total		109	42	21	20	192	
Observed Venous thromboembolism	Yes	4	4	3	3	14	0.127
	No	105	38	18	17	178	
Total		109	42	21	20	192	
Observed Readmission	Yes	4	4	2	1	11	0.465
	No	105	38	19	19	181	
Total		109	42	21	20	192	
Observed Death	Yes	3	9	5	6	23	0.001
	No	106	33	16	14	169	
Total		109	42	21	20	192	

DISCUSSION

This study provides comprehensive insights into the demographic characteristics and postoperative outcomes of patients presenting through the emergency department, stratified by ASA classification. Our findings reveal several significant associations that warrant discussion and comparison with existing literature.

The mean age of the study population was 32.9±17.8 years, with a male predominance (67.2%). This gender distribution aligns with previous studies that have reported higher emergency department utilization rates among males^{10,11}. However, our findings contrast with Sultan R et al., who showed a female predominance of 49%¹². This discrepancy highlights the potential

influence of regional, cultural, or socioeconomic factors on emergency department utilization patterns.

The ASA classification of the patients revealed that the majority of them were categorized as healthy (56.8%), with a notable proportion having mild systemic disease (21.9%), severe systemic disease (10.9%), or severe threat to life (10.4%). These findings are opposite to existing literature on emergency department patient profiles, which typically show a preponderance of less healthy patients¹³. Our findings might reflect a unique characteristic of our local population or healthcare system.

Cardiac complications were observed in 8.3% of the patients, with the highest incidence among those with mild systemic disease (11.9%) and severe/life-threatening conditions (20% each). Healthy patients had a significantly lower incidence (2.8%, P=0.008). This significant association underscores the increased vulnerability of patients with systemic diseases to cardiac complications, a finding that echoes previous research highlighting the heightened perioperative risk in these populations^{14,15,16}. However, the non-linear relationship between ASA class and cardiac complications suggests that factors beyond those captured by ASA classification may be influencing cardiac risk in emergency settings.

The incidence of SSIs was notably high at 32.3%, particularly among patients with severe systemic disease (57.1%) and those with mild systemic disease (35.7%). Healthy individuals had a lower incidence rate (25.7%, P=0.038). These findings are in line with existing literature, which consistently reports higher SSI rates among patients with comorbid conditions due to impaired immune responses and other factors¹⁷. Our findings emphasize the urgent need for targeted infection control strategies in emergency surgical cases, especially for higher-risk patients.

VTE occurred in 7.3% of patients, with the highest rates in those classified as severe threat to life (15%) and severe systemic disease (14.3%). However, this outcome did not show a statistically significant association with ASA class (P=0.127). The lack of significant association contrasts with some studies that have reported a stronger link between higher ASA class and VTE risk, suggesting that other factors, such as prophylactic measures and patient management, may play critical roles¹⁹.

The readmission rate was 5.7%, with the highest rates observed in patients with mild (9.5%) and severe systemic disease (9.5%). This outcome was not significantly associated with ASA class

($P=0.465$). This aligns with previous studies indicating that while comorbidities can influence readmission rates, the relationship is often mediated by factors such as the quality of postoperative care and patient compliance^{14,19}.

The overall mortality rate was 12%, significantly higher among patients with severe threat to life (30%) and severe systemic disease (23.8%), compared to healthy patients (2.8%, $P=0.001$). This significant association confirms the findings of earlier research that links higher ASA classifications with increased mortality due to the compounded effects of systemic diseases and perioperative stress²⁰.

While our sample size of 192 patients was appropriate for our institutional setting and study duration, it may limit the generalizability of our findings to other healthcare contexts or regions. The single-center nature of our study means that our results may be influenced by local practices, patient demographics, and healthcare system characteristics. Additionally, our study did not control for all possible confounding factors such as specific emergency conditions, time to surgery, or details of perioperative management, which could influence outcomes independent of ASA classification.

The practical implications of this study are to implement enhanced infection control protocols for emergency surgeries especially for high-risk patients, and develop rapid, accurate risk stratification protocols for emergency settings. Future research should aim to develop and validate accurate emergency-specific risk assessment tools to complement ASA classification and conduct multi-center studies to investigate long-term outcomes and effectiveness of VTE prophylaxis in emergency surgical patients.

CONCLUSION

ASA class is significantly associated with postoperative outcomes, including cardiac complications, surgical site infections, and mortality, in emergency general surgery patients. While venous thromboembolism and readmissions did not show significant associations, higher ASA classes still indicated a greater risk. This highlights the importance of ASA classification in preoperative risk assessment.

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