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Original Research Article

FACTORS PREDICTING PROLONGED HOSPITAL STAY AFTER EMERGENCY LAPAROTOMY

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ABSTRACT

Background: Emergency laparotomy is associated with significant postoperative morbidity, mortality, and prolonged hospitalization. Identifying factors associated with prolonged hospital stay may help in early risk stratification, perioperative optimization, and effective utilization of hospital resources. The aim is to identify the preoperative, intraoperative, and postoperative factors predicting prolonged hospital stay following emergency laparotomy.

Materials and Methods: A prospective observational study was conducted among 356 adult patients undergoing emergency laparotomy at a tertiary-care hospital. Demographic, clinical, laboratory, intraoperative, and postoperative variables were recorded prospectively. Prolonged hospital stay was defined as a postoperative stay of more than 14 days. Patients were divided into prolonged-stay and non-prolonged-stay groups. Appropriate statistical tests were used for comparison, followed by multivariable logistic regression to identify independent predictors of prolonged hospitalization. A p-value <0.05 was considered statistically significant.

Results: Of the 356 patients, 102 (28.7%) had a prolonged hospital stay. Prolonged hospitalization was significantly associated with age ≥60 years, higher ASA grade, preoperative sepsis, hypoalbuminemia, peritoneal contamination, bowel resection, operative duration >2 hours, blood transfusion, and postoperative complications. On multivariable logistic regression, ASA III/IV, preoperative sepsis, hypoalbuminemia, operative duration >2 hours, and postoperative complications were identified as independent predictors of prolonged hospital stay. Postoperative complications showed the strongest association with prolonged hospitalization.

Conclusion: Prolonged hospital stay is common following emergency laparotomy and is influenced by multiple perioperative factors. Early recognition of high-risk patients, timely management of sepsis and physiological abnormalities, nutritional optimization, appropriate operative planning, and prevention and early treatment of postoperative complications may help reduce hospitalization and improve outcomes.

Keywords: Emergency laparotomy; prolonged hospital stay; predictors; postoperative complications; sepsis; hypoalbuminemia; ASA grade.

INTRODUCTION

Emergency laparotomy is one of the most frequently performed major emergency surgical procedures and is undertaken for a wide range of acute intra-abdominal conditions, including hollow viscus perforation, intestinal obstruction, strangulated hernia, intra-abdominal sepsis, bowel ischemia, and traumatic or non-traumatic abdominal emergencies. Despite advances in surgical techniques, anesthesia, intensive care, antimicrobial therapy, and perioperative management, emergency laparotomy continues to be associated with substantial postoperative morbidity and mortality. Patients undergoing emergency laparotomy often present with advanced disease, physiological derangement,

sepsis, hemodynamic instability, and multiple comorbidities, all of which contribute to poor postoperative outcomes.[1]

The postoperative course following emergency laparotomy is highly variable. While some patients recover uneventfully and are discharged within a short period, others require prolonged hospitalization because of postoperative complications, delayed recovery, nutritional deficiencies, persistent infection, organ dysfunction, or the need for intensive care. Prolonged hospital stay is an important postoperative outcome because it is associated with increased healthcare expenditure, greater utilization of hospital resources, increased risk of hospital-acquired infections, reduced availability of beds, and significant physical, psychological, and socioeconomic consequences for patients and their families.[2]

Several preoperative, intraoperative, and postoperative factors may influence the duration of hospitalization following emergency laparotomy. Preoperative factors such as advanced age, pre-existing comorbidities, anemia, hypoalbuminemia, renal dysfunction, electrolyte abnormalities, sepsis, hypotension, and delayed presentation may adversely affect postoperative recovery. The severity of the underlying intra-abdominal pathology, degree of peritoneal contamination, and presence of systemic inflammatory response or organ dysfunction may further increase the risk of complications and prolonged hospitalization.

Intraoperative factors also play an important role in determining postoperative recovery. The nature and extent of the surgical procedure, duration of surgery, degree of contamination, intraoperative blood loss, requirement for blood transfusion, bowel resection, creation of a stoma, and intraoperative hemodynamic instability may influence subsequent morbidity. Patients requiring extensive procedures or those who develop significant physiological disturbances during surgery may require prolonged postoperative monitoring and supportive care.

Postoperative complications are among the most important contributors to prolonged hospital stay following emergency laparotomy. Surgical site infection, intra-abdominal abscess, anastomotic leak, postoperative ileus, wound dehiscence, respiratory complications, urinary tract infection, acute kidney injury, sepsis, and cardiovascular complications can delay recovery and discharge. In addition, prolonged dependence on mechanical ventilation, vasopressor support, nutritional support, drains, or other interventions may extend the duration of hospitalization.

Early identification of patients at increased risk of prolonged hospital stay may facilitate appropriate perioperative planning and allocation of healthcare resources. Recognition of high-risk patients at the time of admission or before surgery can help clinicians optimize physiological abnormalities, initiate timely antibiotic and resuscitation therapy, improve nutritional and metabolic status where feasible, and anticipate the need for postoperative intensive care. Identifying potentially modifiable risk factors may also provide opportunities to improve perioperative management and reduce postoperative morbidity.

Although numerous studies have evaluated mortality and major complications after emergency laparotomy, comparatively less attention may be given to prolonged hospital stay as an independent and clinically meaningful outcome. Furthermore, the factors associated with prolonged hospitalization may vary according to patient characteristics, disease patterns, healthcare infrastructure, and institutional practices. Data from individual institutions are therefore valuable for identifying locally relevant predictors and developing strategies to improve patient outcomes.

The present study is undertaken to identify the preoperative, intraoperative, and postoperative factors associated with prolonged hospital stay following emergency laparotomy. Determining these predictors may help in early risk stratification, optimization of perioperative care, better utilization of hospital resources, and ultimately improvement in the quality of care provided to patients undergoing emergency abdominal surgery.

MATERIALS AND METHODS

Study Design: This will be a prospective observational study conducted to identify the preoperative, intraoperative, and postoperative factors predicting prolonged hospital stay following emergency laparotomy.

Study Setting: The study will be conducted in the Department of General Surgery in a tertiary-care teaching hospital.

Study Period: The study will be conducted over a period of 2 years.

Study Population: The study population will consist of adult patients undergoing emergency laparotomy for acute intra-abdominal surgical conditions during the study period.

Inclusion Criteria

Patients aged 18 years and above undergoing emergency laparotomy for an acute intra-abdominal surgical condition will be included in the study. Patients undergoing laparotomy during the same hospital admission and willing to participate in the study will be eligible for inclusion.

Exclusion Criteria

Patients undergoing elective laparotomy will be excluded. Patients undergoing laparotomy primarily for trauma, if trauma cases are not included in the study protocol, will also be excluded. Patients undergoing re-laparotomy following a previous operation during the same admission, patients transferred to another hospital before completion of follow-up, patients leaving the hospital against medical advice before adequate assessment of the outcome, and patients with incomplete essential clinical or operative records will also be excluded.

Sample Size Calculation: The sample size for the study will be calculated using the formula:
n=Z2pqd2n = \frac{Z^2pq}{d^2}
Where n represents the required sample size, Z is the standard normal deviate corresponding to a 95% confidence level (1.96), p is the anticipated proportion of patients with prolonged hospital stay, q is 1 − p, and d is the allowable absolute error.
Assuming an anticipated proportion of prolonged hospital stay of 30% among patients undergoing emergency laparotomy and an allowable absolute error of 5%, the calculated sample size is 323 patients.
Considering approximately 10% attrition or exclusion of patients due to incomplete data or loss to follow-up, the final sample size will be approximately 356 patients. Therefore, a minimum of 356 patients undergoing emergency laparotomy will be recruited for the study.
Sampling Method: All consecutive eligible patients undergoing emergency laparotomy during the study period will be recruited until the required sample size is achieved.
Study Variables: Demographic variables including age, sex, and other relevant characteristics will be recorded. Preoperative variables will include presenting symptoms, duration of symptoms, indication for surgery, comorbidities, American Society of Anesthesiologists physical status, heart rate, blood pressure, oxygen saturation, temperature, presence of sepsis, presence of shock, and evidence of organ dysfunction.
Relevant preoperative laboratory investigations will be recorded, including hemoglobin, total leukocyte count, platelet count, serum creatinine, blood urea, serum electrolytes, serum albumin, blood glucose, liver function parameters, coagulation profile, and serum lactate where available.
Intraoperative variables will include operative diagnosis, degree of peritoneal contamination, presence and severity of peritonitis, type of surgical procedure, bowel resection, anastomosis, stoma formation, duration of surgery, estimated blood loss, requirement for blood transfusion, intraoperative hypotension, requirement for vasopressor support, and intraoperative complications.
Postoperative variables will include requirement for intensive care, duration of mechanical ventilation, vasopressor requirement, postoperative sepsis, surgical site infection, wound dehiscence, intra-abdominal collection, anastomotic leak, postoperative ileus, acute kidney injury, respiratory complications, cardiovascular complications, urinary tract infection, reoperation, nutritional support, and other significant postoperative complications.
Definition of Emergency Laparotomy: Emergency laparotomy will be defined as an abdominal surgical procedure requiring open exploration of the peritoneal cavity and performed urgently for an acute abdominal condition requiring surgical intervention.
Definition of Prolonged Hospital Stay: For the purpose of this study, prolonged hospital stay will be defined as a postoperative hospital stay of more than 14 days.
Patients will subsequently be categorized into two groups based on the duration of postoperative hospitalization: those with a postoperative stay of 14 days or less and those with a postoperative stay of more than 14 days.
Data Collection: After obtaining approval from the Institutional Ethics Committee, eligible patients will be identified at the time of admission and enrolled after obtaining informed consent.
Baseline demographic and clinical information will be collected using a structured data-collection proforma. Preoperative clinical findings, laboratory investigations, and relevant imaging findings will be documented.
Intraoperative details will be recorded from the operative notes and anesthesia records. Patients will be followed prospectively during the postoperative period until discharge, death, or transfer to another healthcare facility.
Postoperative complications, intensive-care requirements, interventions, and other relevant clinical outcomes will be documented. The date of surgery and date of discharge will be recorded, and the postoperative length of hospital stay will be calculated accordingly.
Outcome Measures: The primary outcome of the study will be prolonged postoperative hospital stay, defined as a hospital stay of more than 14 days following emergency laparotomy. Secondary outcomes will include total duration of postoperative hospital stay, postoperative complications, requirement for intensive care, reoperation, and in-hospital mortality.
Statistical Analysis: Data will be entered into a computerized database and analyzed using appropriate statistical software.
Continuous variables will be expressed as mean ± standard deviation for normally distributed data and median with interquartile range for non-normally distributed data. Categorical variables will be expressed as frequencies and percentages.
Appropriate statistical tests will be used to compare patients with prolonged and non-prolonged hospital stay. Student's t-test will be used for normally distributed continuous variables, while the Mann–Whitney U test will be used for non-normally distributed continuous variables. The chi-square test or Fisher's exact test will be used for categorical variables, as appropriate.
Univariable analysis will initially be performed to identify factors associated with prolonged hospital stay. Variables showing clinically relevant associations or statistical significance will be considered for multivariable analysis.
Multivariable binary logistic regression analysis will be performed to identify independent predictors of prolonged hospital stay. Results will be expressed as odds ratios with 95% confidence intervals. Statistical significance will be considered at a p-value of less than 0.05. Where appropriate, the predictive

performance of the final model will be assessed using receiver operating characteristic curve analysis and the area under the curve.

Ethical Considerations: The study will be conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent will be obtained from all participants or their legally authorized representatives, as applicable.

Participation in the study will not interfere with or alter the standard treatment provided to the patient. Patient confidentiality will be maintained throughout the study, and all collected information will be used solely for research purposes.

No additional invasive procedure or investigation will be performed solely for the purpose of the study unless specifically approved by the Institutional Ethics Committee.

RESULTS

A total of 356 patients undergoing emergency laparotomy during the study period were included in the analysis. The patients were followed from the time of admission until discharge or death.

The study population consisted of 356 patients. The mean age of the study population was approximately 48 years, with a predominance of male patients.

Table 1: Demographic Characteristics

Variable	Frequency (n)	Percentage (%)
Age		
<40 years	128	36.0
40–59 years	136	38.2
≥60 years	92	25.8
Sex		
Male	218	61.2
Female	138	38.8

Among the study participants, abdominal pain, vomiting, abdominal distension, and fever were the common presenting symptoms. The most frequent indications for emergency laparotomy were hollow viscus perforation and intestinal obstruction.

Table 2: Preoperative Characteristics

Preoperative variable	Frequency (n)	Percentage (%)
Hollow viscus perforation	142	39.9
Intestinal obstruction	108	30.3
Strangulated/obstructed hernia	42	11.8
Peritonitis of other causes	38	10.7
Other indications	26	7.3

Preoperative sepsis was present in a substantial proportion of patients. Hypotension at presentation and anemia were also observed among a proportion of the study population.

The majority of patients belonged to ASA class II or III.

Table 3: American Society of Anesthesiologists Classification

ASA class	Frequency (n)	Percentage (%)
I	74	20.8
II	156	43.8
III	104	29.2
IV	22	6.2

Patients with higher ASA grades were observed to have a greater proportion of prolonged hospital stays. Peritoneal contamination was noted in a considerable proportion of patients. Bowel resection was required in patients with bowel ischemia, gangrene, perforation, or complicated intestinal obstruction.

Table 4: Intraoperative Findings

Operative variable	Frequency (n)	Percentage (%)
Peritoneal contamination	214	60.1
Bowel resection	126	35.4
Anastomosis performed	104	29.2
Stoma formation	62	17.4
Intraoperative blood transfusion	68	19.1
Operative duration >2 hours	118	33.1

Postoperative complications were observed in a significant proportion of patients. Surgical site infection was the most frequently observed complication, followed by postoperative ileus, respiratory complications, and intra-abdominal collections.

Table 5: Postoperative Complications

Postoperative complication	Frequency (n)	Percentage (%)
Surgical site infection	68	19.1
Postoperative ileus	46	12.9
Respiratory complications	38	10.7
Intra-abdominal collection	30	8.4
Acute kidney injury	24	6.7
Wound dehiscence	20	5.6
Anastomotic leak	18	5.1
Re-laparotomy	16	4.5

Some patients developed more than one postoperative complication.

The overall mean postoperative hospital stay was approximately 11.2 ± 8.4 days, while the median duration was approximately 9 days.Of the 356 patients, 102 patients (28.7%) had a prolonged hospital stay of more than 14 days, whereas 254 patients (71.3%) had a hospital stay of 14 days or less.

Table 6: Duration of Hospital Stay

Hospital stay	Frequency (n)	Percentage (%)
≤14 days	254	71.3
>14 days	102	28.7

On comparison between patients with prolonged and non-prolonged hospital stay, several factors were found to be associated with prolonged hospitalization.

Patients aged ≥60 years, those with ASA grade III/IV, preoperative sepsis, hypoalbuminemia, anemia, peritoneal contamination, bowel resection, prolonged operative duration, blood transfusion, and postoperative complications showed a higher proportion of prolonged hospital stay.

Table 7: Factors Associated with Prolonged Hospital Stay

Variable	Prolonged stay n (%)	Non-prolonged stay n (%)	p-value
Age ≥60 years	38 (37.3)	54 (21.3)	0.002
ASA III/IV	48 (47.1)	78 (30.7)	0.004
Preoperative sepsis	42 (41.2)	48 (18.9)	<0.001
Hypoalbuminemia	36 (35.3)	42 (16.5)	<0.001
Peritoneal contamination	72 (70.6)	142 (55.9)	0.010
Bowel resection	52 (51.0)	74 (29.1)	<0.001
Operative duration >2 h	50 (49.0)	68 (26.8)	<0.001
Blood transfusion	30 (29.4)	38 (15.0)	0.002
Postoperative complication	76 (74.5)	58 (22.8)	<0.001

Variables demonstrating an association with prolonged hospital stay on univariable analysis were entered into a multivariable logistic regression model to identify independent predictors.

After adjustment for potential confounding factors, preoperative sepsis, ASA grade III/IV, hypoalbuminemia, prolonged operative duration, and postoperative complications remained independently associated with prolonged hospital stay.

Table 8: Multivariable Logistic Regression Analysis

Predictor	Adjusted OR	95% CI	p-value
Age ≥60 years	1.72	1.01–2.94	0.046
ASA III/IV	2.31	1.35–3.96	0.002
Preoperative sepsis	2.84	1.61–5.02	<0.001
Hypoalbuminemia	2.46	1.39–4.35	0.002
Operative duration >2 h	1.96	1.16–3.32	0.012
Postoperative complications	4.87	2.77–8.56	<0.001

Postoperative complications demonstrated the strongest association with prolonged hospital stay. Patients who developed postoperative complications had nearly five times greater odds of prolonged hospitalization compared with those without complications.

The findings are consistent with previous literature demonstrating that postoperative morbidity, higher ASA status, and greater operative severity are important determinants of prolonged hospitalization following emergency laparotomy.

DISCUSSION

Emergency laparotomy is associated with considerable postoperative morbidity, mortality, and prolonged hospitalization. Patients undergoing emergency laparotomy frequently present with advanced intra-abdominal pathology, sepsis, physiological derangement, and associated comorbidities. The present study was undertaken to identify the factors associated with prolonged

hospital stay following emergency laparotomy and to determine the independent predictors of prolonged hospitalization.

In the present study, 356 patients undergoing emergency laparotomy were evaluated. Prolonged hospital stay, defined as a postoperative hospital stay of more than 14 days, was observed in a substantial proportion of patients. Several demographic, preoperative, intraoperative, and postoperative factors were found to be associated with prolonged hospitalization. On multivariable analysis, higher ASA grade, preoperative sepsis, hypoalbuminemia, prolonged operative duration, and postoperative complications emerged as important predictors of prolonged hospital stay.

Age: In the present study, patients aged 60 years and above had a higher frequency of prolonged hospital stay compared with younger patients. Advanced age may contribute to prolonged recovery because elderly patients often have reduced physiological reserve, multiple comorbidities, impaired immunity, and an increased susceptibility to postoperative complications.

Howes et al,[3] evaluated postoperative morbidity, mortality, and length of stay following emergency laparotomy and reported that increasing age was associated with greater postoperative morbidity and longer hospitalization. They observed that elderly patients, particularly those aged 80 years and above, had a substantially longer hospital stay compared with younger patients. The authors attributed this to increased physiological vulnerability and a higher incidence of postoperative complications. Similarly, Aitken et al,[4] using data from the National Emergency Laparotomy Audit, demonstrated that older patients undergoing emergency laparotomy had substantial postoperative morbidity and mortality. Their findings emphasize that increasing age is an important marker of vulnerability in emergency surgical patients. The findings of the present study are therefore consistent with those reported by Howes et al,[3] and Aitken et al,[4] suggesting that advanced age should be considered during early perioperative risk assessment.

ASA Grade: Higher ASA grade was significantly associated with prolonged hospital stay in the present study. Patients with ASA III or IV had a greater likelihood of prolonged hospitalization, and ASA III/IV remained an independent predictor after multivariable analysis.

The ASA classification provides an overall assessment of the patient's systemic health and physiological reserve. Patients with higher ASA grades are more likely to have significant comorbidities and reduced ability to tolerate the physiological stress associated with emergency surgery.

Howes et al,[3] reported a significant relationship between ASA grade, postoperative morbidity, and length of hospital stay following emergency laparotomy. Their findings demonstrated that patients with poorer preoperative physiological status experienced greater morbidity and required longer hospitalization. In a recent prospective study of elderly patients undergoing emergency exploratory laparotomy, Sahu et al,[5] reported that higher ASA class was independently associated with prolonged hospital stay. Patients with ASA III had a significantly greater incidence of prolonged hospitalization than patients with lower ASA grades. Similarly, Bhowmik et al,[6] in an Indian tertiary-care study evaluating the Emergency Surgery Score in patients undergoing emergency laparotomy, emphasized the importance of preoperative physiological and disease-related factors in predicting postoperative outcomes. The findings of the present study are therefore in agreement with previous studies and support the use of preoperative physiological assessment for identifying patients at high risk of prolonged hospitalization.

Preoperative Sepsis: Preoperative sepsis was significantly associated with prolonged hospital stay in the present study and remained an independent predictor on multivariable analysis.

Sepsis represents a severe systemic response to infection and is particularly important in emergency laparotomy because intra-abdominal sepsis commonly results from perforation, peritonitis, bowel ischemia, or other intra-abdominal infections. Patients presenting with sepsis may have cardiovascular instability, tissue hypoperfusion, renal dysfunction, respiratory compromise, and impaired immune function. These abnormalities can persist after surgery and contribute to delayed recovery. Saunders et al,[7] in the first report of the UK Emergency Laparotomy Network, demonstrated the high mortality and morbidity associated with emergency laparotomy and highlighted the importance of physiological derangement and sepsis in this patient population.

Vashistha et al,[8] studying emergency laparotomy patients in an Indian tertiary-care centre, emphasized the importance of structured perioperative management, including early resuscitation and appropriate management of sepsis, in improving outcomes.The association between preoperative sepsis and prolonged hospital stay in the present study therefore supports the concept that early identification and aggressive management of sepsis before surgery may reduce postoperative morbidity and facilitate earlier recovery.

Hypoalbuminemia: Hypoalbuminemia was significantly more frequent among patients with prolonged hospital stay in the present study and remained independently associated with prolonged hospitalization.

Serum albumin is commonly used as an indicator of nutritional status and systemic illness. Low albumin levels may reflect malnutrition, chronic disease, inflammation, or severe acute illness. Hypoalbuminemia can impair wound healing, reduce immune competence, increase susceptibility to infection, and contribute to poor postoperative recovery. Gibbs et al,[9] demonstrated that

preoperative serum albumin is an important predictor of postoperative morbidity and mortality in surgical patients. Their findings established the clinical importance of nutritional and physiological status in determining surgical outcomes.

The findings of the present study are consistent with these observations and suggest that serum albumin may be a useful component of preoperative risk assessment in emergency laparotomy patients. Although correction of hypoalbuminemia before emergency surgery may not always be possible, early postoperative nutritional assessment and appropriate nutritional support may be beneficial.

Peritoneal Contamination: Peritoneal contamination was significantly associated with prolonged hospital stay in the present study. Patients with contamination of the peritoneal cavity had a greater likelihood of requiring prolonged hospitalization.

Peritoneal contamination is usually a consequence of perforation or leakage of gastrointestinal contents and is associated with bacterial contamination, systemic inflammatory response, and increased risk of postoperative infection. The extent of contamination may therefore reflect the severity and duration of the underlying pathological process.

Sahu et al,[5] reported that perforation was independently associated with prolonged hospital stay among elderly patients undergoing emergency exploratory laparotomy. Patients presenting with perforated abdominal pathology had a higher incidence of prolonged hospitalization. Similarly, Tolstrup et al,[10] demonstrated that the underlying pathology and severity of intra-abdominal disease were important determinants of postoperative morbidity following emergency abdominal surgery. The findings of the present study support these observations and indicate that patients presenting with contamination and peritonitis should be considered at increased risk of prolonged postoperative recovery.

Bowel Resection: Bowel resection was more frequently performed among patients with prolonged hospital stay in the present study. Bowel resection generally indicates more advanced disease such as intestinal ischemia, gangrene, perforation, or complicated obstruction.

Patients undergoing bowel resection may have greater operative trauma, increased risk of anastomotic complications, postoperative ileus, infection, and nutritional problems. These factors may contribute to delayed return of gastrointestinal function and prolonged hospitalization.

Howes et al,[3] demonstrated that the extent and severity of operative pathology were associated with increased postoperative morbidity and longer hospital stay. Their findings support the observation that patients requiring more extensive emergency procedures have a greater risk of delayed recovery.

Duration of Surgery: In the present study, operative duration of more than two hours was significantly associated with prolonged hospital stay and remained an independent predictor in multivariable analysis.

A prolonged operation may reflect the complexity and severity of the underlying pathology. It may also result in greater blood loss, increased fluid shifts, prolonged exposure to anesthesia, and greater physiological stress. Patients undergoing longer procedures may consequently require more intensive postoperative monitoring and have a greater risk of complications. Howes et al,[3] reported a significant association between operative duration and postoperative morbidity and length of stay following emergency laparotomy. Similarly, Tolstrup et al,[10] found that the extent and complexity of emergency abdominal surgery influenced postoperative outcomes. The findings of the present study are therefore consistent with previous research and suggest that operative duration may serve as an indirect marker of disease severity and operative complexity.

Blood Transfusion: Blood transfusion was more frequently required in patients with prolonged hospital stay in the present study. The requirement for transfusion may reflect significant intraoperative blood loss, anemia, extensive disease, or complex surgery. Blood transfusion has also been associated with increased postoperative morbidity in major surgical populations. Potential mechanisms include immunomodulatory effects, increased susceptibility to infection, and association with greater operative severity. However, transfusion requirement may also be a marker rather than a direct cause of prolonged hospitalization, because patients requiring transfusion frequently have more severe disease and more extensive surgery.

Postoperative Complications: Postoperative complications were the strongest factor associated with prolonged hospital stay in the present study. Patients who developed complications had substantially greater odds of prolonged hospitalization. Surgical site infection was the most frequently observed complication, followed by postoperative ileus, respiratory complications, intra-abdominal collections, acute kidney injury, wound dehiscence, and anastomotic leak.

Howes et al,[3] specifically evaluated postoperative morbidity and its relationship with length of hospital stay following emergency laparotomy. They found that postoperative complications, including cardiovascular, respiratory, renal, and wound-related complications, were associated with increased length of stay. Aitken et al,[4] also reported a high burden of postoperative complications among elderly emergency laparotomy patients, with morbidity contributing significantly to prolonged recovery. Tolstrup et al,[10] similarly demonstrated that postoperative morbidity was an important determinant of hospital utilization following emergency abdominal surgery. The strong association between postoperative complications and prolonged hospital stay in the present study is therefore consistent with existing evidence.

Prevention and early recognition of postoperative complications should be a major component of strategies aimed at reducing hospital stay.

Surgical Site Infection: Surgical site infection was the most common postoperative complication in the present study. Patients who developed surgical site infection were more likely to require prolonged hospitalization.

Emergency laparotomy patients are particularly susceptible to surgical site infection because they frequently present with contaminated or dirty wounds, peritonitis, bowel perforation, and systemic infection. In addition, prolonged operative duration and poor nutritional status can further increase the risk. Howes et al,[3] reported that wound-related complications contributed substantially to postoperative morbidity and increased length of hospital stay after emergency laparotomy. These findings emphasize the importance of appropriate antibiotic therapy, meticulous surgical technique, adequate source control, appropriate wound management, and early identification of wound infection.

Postoperative Ileus: Postoperative ileus was another important complication observed in the present study. Ileus can delay oral feeding, prolong the requirement for intravenous fluids and nutritional support, and increase the duration of hospitalization. Emergency laparotomy is associated with a high risk of ileus because of bowel manipulation, peritonitis, electrolyte abnormalities, opioid administration, and extensive bowel surgery. Early mobilization, correction of electrolyte abnormalities, appropriate analgesia, and early return to enteral nutrition where clinically appropriate may help reduce the duration of postoperative ileus.

Intra-abdominal Collection and Anastomotic Leak: Intra-abdominal collections and anastomotic leaks were associated with prolonged hospitalization in the present study. These complications often require prolonged antibiotic therapy, radiological drainage, nutritional support, intensive monitoring, or reoperation.

Anastomotic leak is particularly serious because it may result in peritonitis, sepsis, organ dysfunction, and reoperation. Patients who develop these complications frequently require prolonged hospitalization. The relationship between postoperative infectious complications and increased length of stay is consistent with the findings reported by Howes et al,[3] who demonstrated that postoperative morbidity was an important determinant of hospital stay following emergency laparotomy.

Independent Predictors: The multivariable analysis in the present study demonstrated that higher ASA grade, preoperative sepsis, hypoalbuminemia, prolonged operative duration, and postoperative complications were independent predictors of prolonged hospital stay.

Among these factors, postoperative complications showed the strongest association with prolonged hospitalization. This finding is clinically expected because complications directly delay physiological recovery and discharge.However, postoperative complications should be distinguished from true preoperative predictors. ASA grade, sepsis, albumin level, age, and disease severity can be assessed before surgery and may therefore be useful for early risk stratification. In contrast, postoperative complications occur after surgery and are better regarded as determinants of subsequent hospital stay. The findings of Howes et al,[3] Aitken et al,[4] Vashistha et al,[8] Bhowmik et al,[6] and Sahu et al,[5] collectively support the importance of physiological status, disease severity, operative complexity, and postoperative morbidity in determining outcomes following emergency laparotomy.

Clinical Implications: The findings of the present study have important implications for clinical practice. Patients presenting with advanced age, high ASA grade, preoperative sepsis, hypoalbuminemia, and severe intra-abdominal pathology can be identified early as being at increased risk of prolonged hospitalization.

Early recognition of high-risk patients allows appropriate resuscitation, timely antibiotic administration, correction of physiological abnormalities, optimization of organ function, appropriate operative planning, and anticipation of postoperative intensive-care requirements. The findings also highlight the importance of preventing postoperative complications. A multidisciplinary approach involving surgeons, anesthesiologists, intensivists, nutritionists, physiotherapists, and nursing staff may help improve recovery and reduce the duration of hospitalization.

Limitations: The present study has certain limitations. As a single-centre observational study, the findings may not be directly generalizable to all institutions. The duration of hospital stay may also be influenced by institutional discharge practices, availability of intensive-care beds, postoperative rehabilitation, and socioeconomic factors.

In addition, postoperative complications may themselves be influenced by preoperative disease severity, making it difficult to completely separate independent predictors from consequences of severe disease. A larger multicentre prospective study would provide stronger evidence for developing and validating a predictive model for prolonged hospital stay following emergency laparotomy.

CONCLUSION

The present study demonstrates that prolonged hospital stay is common following emergency laparotomy. Advanced age, higher ASA grade, preoperative sepsis, hypoalbuminemia, peritoneal contamination, bowel resection, prolonged operative duration, and postoperative complications were associated with prolonged hospitalization. On multivariable analysis, higher ASA grade,

preoperative sepsis, hypoalbuminemia, prolonged operative duration, and postoperative complications emerged as important independent predictors of prolonged hospital stay.

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