Correlation of ASA Grades of Patients with the Length of Hospital Stay After Emergency Laparotomy

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ABSTRACT

Objective To find out the correlation of ASA grades of the patients with length of hospital stay (LOS) after laparotomy done in emergency.

Study design Cross-sectional observational study.

Place & Duration of study Department of Surgery, Dr. Ruth K.M. Pfau Civil Hospital Karachi, from April 2025 to September 2025.

Methods Patients aged >18 years age who underwent emergency laparotomy (EL) were included. Patients with history of malignancy, prior radiotherapy and previous laparotomy were excluded. Data on demographics, BMI, ASA grade, LOS, co-morbid conditions, duration of surgery, postoperative complications, postoperative mobility, oral intake status and ICU stay were recorded. Statistical analysis employed Chi-square / Fisher's exact tests for categorical variables, One-way ANOVA / Kruskal-Wallis for numerical variables, and binary logistic regression for confounders

Results A total of 80 patients were studied including fifty-three (66.3%) males. The mean age of the patients was 47.4±14.2 years. Majority (n=27 – 33.8%) were in ASA III category, and 8 (10%) ASA IV and V. Mean operative time was 103±23 minutes and hospital stay 9±3 days. Thirty-five (43.8%) patients required ICU admission and thirty-six (45%) developed complications. Higher ASA grade correlated with older age, lower BMI, more comorbid conditions, longer duration of surgery, greater ICU use, delayed oral intake / mobility, more complications, and longer stay ($p < 0.0001$). On multivariate analysis, only postoperative complications independently predicted prolonged hospital stay (>9 days - $p=0.022$).

Conclusion Higher ASA grade correlated with worse perioperative outcomes, but postoperative complications emerged as the only independent predictor of prolonged hospital stay after emergency laparotomy.

Key words Laparotomy, ASA classification, Hospital stay, Postoperative complications.

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INTRODUCTION:

Laparotomy performed in emergency is significantly associated with higher postoperative morbidity and mortality when compared with elective surgery.[1] It is challenging to stratify patients preoperatively as many factors have to be taken into consideration including pre-procedural optimization. However, it is essential to recognize the high-risk population. There are varied indications for EL and extent of surgery that has to be performed. It may be a simple adhesiolysis for small bowel obstruction to a complex, multi-stage procedure for acute mesenteric ischemia

secondary to mesenteric artery thrombus as an example.[2]

Enhanced recovery programs are nowadays practiced in various specialties including general surgery.[3,4] The length of hospital stay is thus shortened. This also decreases the incidence of nosocomial infections and reduce the cost of the treatment.[5,6] Various preoperative risk stratification tools exist to predict patient outcomes and LOS in emergency settings, including POSSUM, ASA Physical Status Classification System, and others.[7,8] Among these, the ASA classification system remains one of the most widely used standardized preoperative assessment tools globally due to its simplicity and universal applicability.[9,10] The ASA classification has undergone recent refinements, including the addition of the "E" as a suffix to denote emergency procedures like ASA 3E which further emphasizes the urgency and increased risk associated with conditions like those requiring EL.[11,12]

The relationship between ASA grades and postoperative outcomes, specifically the duration of hospitalization, remains under explored in patients undergoing EL. Understanding how ASA grades correlate with the length of hospital stay provide valuable insights into resource allocation, risk stratification, and postoperative care planning. Identifying high-risk patients based on their ASA grade could also help improve perioperative management, optimize discharge planning, and potentially reduce complications, readmissions, and healthcare costs. This study was conducted to provide evidence-based data about the correlation between ASA grade and LOS in patients undergoing EL from a tertiary care hospital.

METHODS:

Study design, place & duration: This was a cross-sectional observational study conducted in the Department of General Surgery, Dr. Ruth K.M. Pfau Civil Hospital Karachi, from April 2025 to September 2025.

Ethical considerations: The study protocol was approved by Institutional review board of Dow University of Health and Sciences (IRB-4001/DUHS/Approval/2025/234). The synopsis of the study was also approved by the Research Evaluation Unit (REU) of College of Physicians & Surgeons Pakistan. Informed consent was taken from the participants or their family members where needed.

Inclusion and exclusion criteria: All patients, 18 years and above, who underwent EL were included. Patients with a history of malignancy, prior radiotherapy, and previous laparotomy were excluded.

Sample size estimation: The sample size was calculated as 50 patients by taking the mean length of hospital stay after EL as 12.03±7.12 days, as reported by previous study,[6] with a margin of error of 2% and confidence level of 95%, employing OpenEpi calculator. However, during the study period, 80 consecutive patients met the inclusion criteria and consented to participate, resulting in a larger final sample size.

Study protocol: Non-probability consecutive sampling technique was applied. Eligible patients falling on the aforementioned criteria were identified in the emergency department and inculcated in the study. The ASA status of the patient was noted preoperatively.[12] All patients were followed after surgery. Data collected included age, gender, BMI, comorbid conditions, duration of surgery, postoperative complications, postoperative mobility, oral intake status, duration of ICU stay, in addition to length of hospital stay, were noted in a structured form. The primary outcome was length of hospital stay, dichotomized into <9 days and =9 days after acquiring the said value following descriptive statistics.

Statistical analysis: Data were entered and analyzed in SPSS version 25. Quantitative variables like age, duration of surgery and length of hospital stay were reported as mean and standard deviation. Normality of the numerical variables were determined by Kolmogorov Smirnov test. The association between frequency and percentages were calculated for qualitative variables like gender, ASA grade. ASA grade status and categorical variables was analyzed using Chi square or Fisher Exact test. The association between ASA grade status and numerical variables was determined by One-way ANOVA and Kruskal Wallis test.

Data were stratified on the basis of age, gender, BMI, comorbid conditions, duration of surgery, postoperative complications, postoperative mobility, oral intake status and ICU stay to control effect modifiers or confounders that also eliminated the bias. The confounding factors were determined by univariate and multivariate analysis using binary logistics regression. A p-value of less than 0.05 was considered as statistically significant.

RESULTS:

A total of 80 patients were included with 53 (66.3%) males. The mean age of the patients was 47.4±14.2 years. The mean BMI was 25.1±3.2 kg/m², reflecting a slightly overweight cohort. Comorbid conditions were present in 53 (66.3%) patients, with 33.8% having multiple conditions, most frequently hypertension and diabetes mellitus. Most patients were classified as ASA grade III (n=27-33.8%), followed by grade I (n=26 - 32.5%). The mean duration of surgery was 102.8±22.6 minutes. Nearly half of the patients (n=35 - 43.7%) required ICU admission.

The leading indications for laparotomy were gastrointestinal perforation (n=29 - 36.2%) and benign obstruction (n=18 - 22.5%). Resection with stoma formation (n=18 - 22.5%) and resection with anastomosis (n=15 - 18.7%) were the most frequently performed procedures. The majority of the patients tolerated oral intake by postoperative day-3 (IQR: 3–4), and regained mobility by day-2 (IQR: 2–3). However, thirty-six (45%) experienced complications, most commonly ileus (n=18 - 22.5%) and surgical site infection (n=9 - 11.2%). The mean LOS was 9.0 ± 3.2 days.

Perioperative and postoperative outcomes across ASA grades are summarized in table I. Increasing ASA grade correlated with older age, lower BMI, higher comorbidity burden, and longer operative duration. Postoperative complications, delayed oral intake, impaired mobility, need ICU admission, and prolonged length of hospital stay.

The trend between ASA grade and length of hospital stay demonstrate a stepwise increase in median LOS with higher ASA grades on univariate analysis. Univariate and multivariate logistic regression analyses are shown in table II. Several perioperative factors were associated with a hospital stay > 9 days on univariate analysis, but only postoperative complications remained an independent predictor after adjustment.

DISCUSSION:

This study explored the correlation of ASA classification system with the length of hospital stay of patients undergoing emergency laparotomy and found that higher ASA grade was understandably linked with a longer length of hospital stay and other variables. Emergency laparotomy is associated with significant morbidity and mortality.[13] Unlike elective surgery, it becomes imperative to address acute intra-abdominal pathologies on emergent basis and optimal preoperative optimization is often not possible.[14] This aspect is always under consideration in this group of patients. This study provided data in relation to this approach.

The findings of our study are in congruence with previously reported research that demonstrated baseline physiological status of the patients depicted by ASA grade is directly proportional to postoperative morbidity and protracted period of recovery.[15,16] In our analysis, there was a progressive increase of LOS across ASA grades. A study that included patients who underwent spinal surgery also reported similar findings.[17] The mean length of stay reported in our cohort is also comparable with the study done in Ethiopia that showed LOS of 8 days.[18] In striking contrast, studies from Singapore and India documented LOS of 24.6 and 12.2 days respectively.[19,20] These differences may be due to inclusion of a larger subset of frail patients and variability in discharge policies.

In our study, ICU admission and prolonged ICU stay were associated with higher ASA grades as all ASA V required critical care. Similar findings were reported in a study where greatest frequency of ICU stay was reported in higher ASA grades.[21] However, in our study this variable of ICU admission as a predictor of prolonged LOS was not significant after multivariate analysis. Interestingly, the multivariate analysis did not report ASA grade to independently predict prolonged LOS despite being strongly associated with adverse outcomes on univariate testing. The postoperative complications were found to be the strongest independent predictor of LOS. It increased the odds of a prolonged LOS by ninety-fold. These findings align with the study done by Walêdziak et al that demonstrated a direct impact of postoperative complications on LOS.[22]

This finding of our study highlights the significance of postoperative morbidity in determining the course of in-hospital length of stay and, hence, resource utilization and allocation. The data showed that surgical site infection, ileus and sepsis were the most frequent complications, especially in the ASA III subset of patients. It reiterates the dynamic relationship between patient's baseline physiological reserves and the postoperative adverse events. Hence, from a regional standpoint, interventions should be targeted at reducing the postoperative morbidity by incorporating enhanced recovery protocols, early mobilization and infection control in order to reduce LOS and improve recovery in an emergency setting.

Table I: Association of ASA Grade with Demographic and Perioperative Variables

	ASA Grade Status					
	I	II	III	IV	V	p-values
Gender						
Male	19	10	19	04	01	0.634
Female	07	09	08	02	01	
Age (Years): (Mean ± SD)	30.73±5.08	49.74±5.94	56.81±8.98	64.83±9.79	62.5±6.36	<0.0001
Height (cm): Mean ± SD	173.42±7.53	166.11±6.63	167.15±5.67	164.17±6.08	164±5.66	<0.0001
Weight (Kg): Mean ± SD	71.69±5.65	71.53±10.01	73.3±10.94	66.5±8.67	57±4.24	<0.0001
BMI (Kg/m^2): Mean ± SD	23.86±1.76	25.94±3.43	26.24±3.64	24.7±3.14	21.2±0.14	<0.0001
Comorbid Conditions						
None	26	01	0	0	0	<0.0001
Hypertension	0	14	1	0	0	
Diabetes Mellitus	0	02	3	1	1	
Multiple	0	00	21	5	1	
Others	0	02	2	0	0	
Duration of Surgery (Minutes): Mean ± SD	89.81±16.46	100.79±19.74	105.93±15.44	139.17±30.24	140±14.14	<0.0001
ICU Admission						
Yes	05	02	20	06	02	<0.0001
No	21	17	07	00	00	
Duration of ICU stay (Days): Median (Ranges)	1 (1-1)	2 (2-2)	2 (1-2)	4 (2-5)	4 (3-6)	<0.0001
Postoperative Oral Intake (postoperative day – Median) (Ranges)	2.5 (1-4)	3 (2-4)	4 (2-5)	5.5 (4-7)	7 (6-8)	<0.0001
Postoperative Mobility (Postoperative day – Median) (Ranges)	1 (1-3)	2 (1-3)	3 (2-5)	5.5 (3-6)	5.5 (4-7)	
Complications						
None	24	13	07	00	00	<0.0001
Acute Kidney Injury	00	00	02	00	00	
Paralytic Ileus	02	06	09	01	00	
Surgical Site Infection	00	00	08	01	00	
Sepsis and Acute Kidney Injury	00	00	00	04	01	
Sepsis	00	00	01	00	01	
Indication for Emergency Laparotomy						
Benign Obstruction	03	08	06	01	00	0.001
Ischemia	01	03	03	02	00	
Jejunum, Trauma	00	00	00	00	00	
Malignant Obstruction	00	00	03	01	01	
Perforated Appendix	06	00	02	00	00	
Gut Perforation	06	08	13	01	01	
Trauma	08	00	00	00	00	
Others (Ruptured Liver abscess, Biliary peritonitis)	02	00	00	01	00	
Type of Procedure Performed						
Adhesiolysis	03	01	04	00	00	<0.0001
Appendectomy	06	00	02	00	00	
Graham's repair	01	05	04	00	00	
Malignancy resection and stoma	00	00	03	01	01	
Primary repair of perforation	02	01	01	00	00	
Resection and anastomosis	05	06	04	00	00	
Resection and stoma formation	00	03	09	05	01	
Trauma Surgery	08	00	00	00	00	

Table I: (continued) Association of ASA Grade with Demographic and Perioperative Variables

	ASA Grade Status					
	I	II	III	IV	V	p-values
Others (Evacuation of abscess, peritoneal lavage, Omentectomy, Henria repair)	01	03	00	00	00	<0.0001
Length of Hospital Stay (days): Mean ± SD	6.46±1.63	8.05±1.39	10.33±1.84	15.17±2.93	16.5±3.54	<0.0001

Table II: Logistic Regression Analysis of Factors Associated with Prolonged Length of Stay (= 9 Days vs. < 9 Days)

	Univariate Analysis			Multivariate Analysis		
	Odds Ratio	Confidence Interval	p-values	Odds Ratio	Confidence Interval	p-values
Age	1.12	1.07-1.18	<0.0001	1.1	0.92-1.32	0.257
Gender						
Male	1.51	0.59-3.83	0.386	-	-	-
Female				-	-	-
BMI (Kg/m2)	1.03	0.89-1.18	0.675	-	-	-
Comorbid Conditions						
Yes	13.29	3.95-44.72	<0.0001	5.01	0.011-2160	0.602
Indication						
Perforation	4.59	1.56-13.52	1.56-13.52	0.00939	7.5E-05-1.16	0.057
Benign Obstruction	1.4	0.435-4.50	0.435-4.50	0.00069	8.2E-07-0.59	0.034
ASA Grade	5.42	2.69-10.92	<0.0001	0.92	0.035-24.09	0.963
Resection and anastomosis/ Resection and Stoma formation	2.94	1.164-7.46	0.023	57.4	0.184-17903	0.166
Duration of Surgery	1.04	1.01-1.07	0.001	1.143	0.97-1.33	0.094
ICU Admission						
Yes	18.54	5.78-59.48	<0.0001	0.05	0.0011-2.74	0.146
Complication						
Yes	89.85	17.44-462.765	<0.0001	0.00011	4.9E-08-0.278	0.022

Limitations of the study: The study cohort was relatively small and confined to a single center that resulted in wide confidence intervals during statistical analysis for which larger sample size is required. The confounders were included in the study and their effect was adjusted on the outcome, but these cannot be excluded in entirety.

CONCLUSION:

The ASA physical status classification remained a fundamental perioperative tool. ASA alone was not an independent predictor of a prolonged length of hospital stay. However, postoperative complications were found to be the independent and significant predictor in patients after emergency laparotomy.

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