

Retrospective Analysis of Emergency Laparotomy and Laparoscopy Outcomes: A Single-center Experience Comparing Etiologies and Early Postoperative Results in Geriatric and Adult Patients

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ABSTRACT

Objective: Emergency gastrointestinal surgery carries high postoperative complication and mortality rates, particularly in geriatric patients. Unlike elective procedures, limited preoperative optimization and frequent intraoperative contamination contribute to poorer outcomes. With the global increase in the geriatric population, understanding age-related risks is essential. This study aimed to compare early postoperative outcomes and etiological factors between adult and geriatric patients undergoing emergency laparotomy or laparoscopy.

Materials and Methods: We retrospectively reviewed adult patients undergoing emergency general surgery between November 2021 and May 2025. Trauma cases, acute appendicitis, cholecystitis, and negative explorations were excluded. Demographics, comorbidities, preoperative laboratory values, surgical indications, techniques, ICU needs, complications, length of stay, and 30-day mortality were recorded. Patients were divided into adults (18–64 years) and geriatrics (≥65 years). Postoperative complications were evaluated using Clavien–Dindo and Comprehensive Complication Index (CCI) scores. Multivariate logistic regression was used to identify predictors of 30-day mortality.

Results: Sixty patients were included (39 geriatric). Geriatric patients had higher ASA scores, more comorbidities, and lower preoperative albumin levels. Surgical indications, techniques, complication rates, and length of stay were similar between groups. Thirty-day mortality occurred in nine geriatric patients (15%), with low albumin identified as the only independent predictor.

Conclusion: Advanced age alone did not independently influence postoperative outcomes, while low serum albumin significantly affected 30-day mortality. Emergency surgical care should focus on individualized management considering patient comorbidities, nutritional status, and etiology rather than age. Future multicenter studies are needed to refine risk stratification and optimize postoperative care.

Keywords: Emergency surgery, geriatrics, laparoscopy, laparotomy

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INTRODUCTION

In emergency surgical interventions for gastrointestinal pathologies, the primary concerns are the high postoperative complication rates and elevated mortality. Early complication rates can exceed 50%, while mortality rates have been reported between 15% and 21%.^[1,2] Unlike elective surgery, the inability to optimize metabolic, pulmonary, and cardiac

comorbidities preoperatively, frequent intraoperative contamination due to gastrointestinal flora, and recent nutritional deficiencies before admission contribute to higher complication and mortality rates.

The proportion of the geriatric population—defined as individuals aged 65 years and older, accounting for approximately 15% of the global population—is steadily increas-



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ing.^[3] Analyses show that 46–63% of emergency surgeries in major centers are performed in geriatric patients.^[2,4] With advancing age, the prevalence of comorbidities, malignancies, and prior surgeries increases, leading to higher risks of complications in both open and laparoscopic procedures. Careful postoperative monitoring, along with early detection and prevention of complications, is therefore essential.

Several risk stratification systems have been developed. The Portsmouth–Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity (P-POSSUM) was initially used for patients undergoing emergency laparotomy.^[5] Later, the United Kingdom's National Emergency Laparotomy Audit (NELA) calculator was developed to estimate preoperative mortality risk.^[6] Subsequently, other scoring systems were introduced, with the aim of improving postoperative outcomes after emergency laparotomy or laparoscopy.^[7–9]

This retrospective study aimed to compare outcomes between geriatric and adult patient groups by analyzing etiological factors and early postoperative results in patients who underwent open or laparoscopic emergency general surgical procedures.

MATERIALS and METHODS

Between November 20, 2021, and May 30, 2025, adult patients who presented to the emergency room (ER) and underwent emergency surgery performed by the general surgery team—either laparoscopic or open—were retrospectively reviewed. Patients requiring re-laparotomy or re-laparoscopy during the same hospitalization, trauma patients, and those undergoing emergency surgery for acute appendicitis or acute cholecystitis were excluded to maintain data homogeneity. Negative laparotomy/laparoscopy cases were also excluded. Patients newly diagnosed at emergency admission with perforation, hemorrhage, or intestinal obstruction were included.

Patient demographics (age, sex), American Society of Anesthesiologists (ASA) scores, comorbidities (diabetes mellitus [DM], chronic obstructive pulmonary disease [COPD], coronary artery disease [CAD], arrhythmia, cerebrovascular disease [CVD]), and acetylsalicylic acid use were recorded. Cancer diagnoses prior to admission, organ system involved, and previous surgery history were documented.

This study was approved by the Baškent University Institutional Review Board (Project no: KA25/282-24.07.2025). Informed consent was obtained from the patients or their first-degree relatives before surgery, after providing detailed information regarding the procedures and associated risks.

This study was conducted in accordance with the principles of the Declaration of Helsinki.

Preoperative laboratory values included white blood cell (WBC) count, neutrophil count, lymphocyte count, platelet count, serum albumin, C-reactive protein (CRP), and creatinine. The neutrophil-to-lymphocyte ratio (NLR) was calculated by dividing neutrophil count by lymphocyte count, and the CRP-to-albumin ratio (CAR) was calculated by dividing CRP by albumin.

Surgical indications, surgical techniques (open/laparoscopic), ICU admission and length of stay, and postoperative complications were recorded. Complications were assessed using the Clavien–Dindo classification and the Comprehensive Complication Index (CCI).^[10,11] Hospital length of stay (LOS) and 30-day mortality rates were compared. Patients were divided into adults (18–64 years) and geriatrics (≥65 years).

This study was approved by the Institutional Review Board (project no. KA25/282, July 24, 2025). Informed consent was obtained from patients or first-degree relatives before surgery. The study was conducted in accordance with the Declaration of Helsinki.

Statistical analysis was performed using SPSS software (Version 25.0, SPSS Inc., Chicago, IL, USA). Normally distributed continuous variables were described as mean ± standard deviation ($p > 0.05$ in Kolmogorov–Smirnov or Shapiro–Wilk tests, $n < 30$). Non-normally distributed continuous variables were described as median values. Continuous variables were compared using the Student t-test or Mann–Whitney U test, depending on distribution. Categorical variables were analyzed with chi-square or Fisher's exact test. Multivariate logistic regression was performed to control for confounders and identify independent predictors of 30-day mortality. Variables significant in univariate analysis ($p < 0.10$) were included in the multivariate model. Statistical significance was set at $p < 0.05$.

RESULTS

During the study period, a total of 60 patients who required emergency general surgical intervention following admission to the emergency department were included. Of these, 34 patients (56%) were female and 26 (44%) were male. Twenty-one patients (35%) aged 18–64 years were classified as Group 1, and 39 patients (65%) aged 65 years or older were classified as Group 2.

In Group 2 (≥65 years), the ASA score was significantly higher ($p = 0.009$). Analysis of comorbidities revealed that the prevalence of DM, CAD, and acetylsalicylic acid use was

Table 1. Preoperative data

Variable	Total (n=60)		Group 1 (<65, n=21)		Group 2 (≥65, n=39)		p
	n	%	n	%	n	%	
Sex							1
Female	34	56	12	57.1	22	56.4	
Male	26	43.3	9	42.9	17	43.6	
ASA score							0.001*
I-II	13	21.7	13	61.9	0	0	
III-IV	47	78.3	8	38.1	39	100	
Diabetes mellitus	49	81.7	14	66.7	35	89.7	0.039*
COPD	24	40	5	23.8	19	48.7	0.097
Coronary artery disease	46	76.7	10	47.6	36	92.3	0.001*
Disrythmia	25	41.7	6	28.6	19	48.7	0.174
Acetyl salicylic acid usage	45	75	11	52.4	34	87.2	0.005*
Cerebrovascular disease	3	5	2	9.5	1	2.6	0.278
Previous malingnancy							0.872
None	40	66.7	13	61.9	27	69.2	
Gastrointestinal tract	14	23.3	5	23.8	9	23.1	
Urinary tract	2	3.3	1	4.8	1	2.6	
Gynecologic	4	6.7	2	9.5	2	5.1	
Previous surgical intervention							0.688
None	31	51.7	12	57.1	19	48.7	
Gastrointestinal tract	15	25	3	14.3	12	30.8	
Urinary tract	3	5	1	4.8	2	5.1	
Gynecologic	7	11.7	3	14.3	4	10.3	
Hernia repair	4	6.7	2	9.5	2	5.1	
WBC counts (n/mm ³)	10350 (2260–35500)		10400 (5000–23200)		10300 (2260–35500)		0.940
Neutrophil counts (n/mm ³)	8255 (1450–33300)		7700 (2800–20600)		8400 (1450–33300)		0.871
Lymphocyte counts (n/mm ³)	1075 (300–4100)		1200 (600–3000)		900 (300–4100)		0.099
Neutrophil/lymphocyte ratio	6.8 (1.3–74)		5.9 (1.6–30.5)		8.9 (1.3–74)		0.227
CRP/albumin ratio	34.6 (0.4–198.8)		24.8 (0.4–95.9)		45.7 (0.6–198.8)		0.127
Hemoglobin (g/dL)	12.3 (±2.6)		12.5 (±2.5)		12.2 (±2.7)		0.556
Platelet (×1000/mm ³)	244 (68–544)		233 (155–544)		248 (68–483)		0.889
Creatinin (mg/dL)	1.1 (0.4–8.1)		0.9 (0.5–7)		1.1 (0.4–8.1)		0.136
CRP (mg/L)	110 (2–517)		82 (2–327)		128 (2–517)		0.288
Albumin (g/dL)	3.3 (±0.8)		3.7 (±0.7)		3.1 (±0.7)		0.002*

*: Statistically significant. ASA: American society of anesthesiologists; COPD: Chronic obstructive pulmonary disease; WBC: White blood cell; CRP: C-reactive protein

significantly higher in this group. The mean creatinine level was higher in Group 2; however, this difference was not statistically significant ($p>0.05$). A notable finding in the preop-

erative laboratory evaluation was that the albumin level was significantly lower in Group 2. Other laboratory parameters were statistically similar between the groups (Table 1).

Table 2. Operative data and outcomes

Variable	Total (n=60)		Group 1 (<65, n=21)		Group 2 (≥65, n=39)		p
	n	%	n	%	n	%	
Surgical indications							1
Intestinal obstructions	51	85	18	85.7	33	84.6	
Perforation	9	15	3	14.3	6	15.4	
Etiology							0.432
Brid	12	20	3	14.3	9	23.1	
Inflammatory	8	13.3	4	19	4	10.3	
Hernia	17	28.3	4	19	13	33.3	
Iatrogenic injury	6	10	3	14.3	3	7.7	
Malignancies	15	25	7	33.3	8	20.5	
Others	2	3.3	0	0	2	5.1	
Surgical technique							1
Open	43	71.7	15	71.4	28	71.8	
Laparoscopic	17	28.3	6	28.6	11	28.2	
Conversion to open	6	10	1	4.8	5	12.8	
ICU requirement	36	60	7	33.3	29	74.4	0.003*
ICU duration (day)	1 (0–15)		0 (0–7)		2 (0–15)		0.007*
Postoperative complication	33	55	12	57.1	21	53.8	1
CCI (%)	20.9 (0–100)		0 (0–51.7)		20.9 (0–100)		0.212
LOS (day)	6 (0–28)		7 (2–22)		6 (0–28)		0.679
30-day mortality	9	15	0	0	9	23.1	0.021*

ICU: Intensive care unit; CCI: Comprehensive complication index; LOS: Length of stay

No statistically significant differences were observed between the groups in terms of surgical indications, etiological causes, or surgical techniques. Thirty-six patients (60%) required postoperative intensive care unit (ICU) monitoring. The median ICU length of stay was 1 day (range, 0–15 days). Twenty-four patients were admitted to the surgical ward postoperatively, and none required subsequent ICU admission. Both ICU requirements and ICU duration were significantly higher in Group 2 (Table 2).

Postoperative complications (POCs) occurred in 35 patients (55%). The cumulative assessment of POCs using the Comprehensive Complication Index (CCI) yielded a mean score of 20.9 (range, 0–100). The mean length of hospital stay (LOS) was 6 days (range, 0–28 days). No statistically significant differences were observed between the groups in terms of postoperative complications, CCI scores, or LOS (Table 2).

Postoperative 30-day mortality occurred in nine patients (15%), all of whom were in Group 2, and this difference was statistically significant ($p=0.021$). Two patients, aged 66 and 87 years, died on postoperative days 2 and 4, respectively,

due to myocardial infarction. The remaining patients died as a result of abdominal septic shock.

In multivariate regression analysis, age group was not found to have a statistically significant impact on 30-day mortality. In contrast, serum albumin level was identified as the only factor significantly associated with mortality. The mean albumin level in the nine patients who died was 2.6 ± 0.8 g/dL, compared with 3.4 ± 0.7 g/dL in surviving patients ($p=0.005$). Multivariate analysis revealed that low albumin was the only independent risk factor for 30-day mortality (OR: 4.5; 95% CI: 1.4–14.4; $p=0.011$) (Table 3). The post-hoc power calculated based on serum albumin level results was found to be 72.4%.

DISCUSSION

The results of this single-center, retrospective analysis indicate that advanced age is not an independent factor affecting outcomes in patients requiring emergency general surgical interventions, whereas low preoperative serum albumin levels may influence early postoperative mortality.

Table 3. Analysis of the factors affecting 30-day mortality

Univariate analysis		Multivariate analysis		
Variable	p	OR	95% CI	p
Albumin	0.005	4.5	(1.4–14.4)	0.011

OR: Odds ratio; CI: Confidence interval

Among the patients included in our study, 52% had no history of previous abdominal surgery. Fifteen patients (25%) had a history of gastrointestinal surgery, seven patients (12%) had undergone gynecologic surgery, four patients (7%) had abdominal wall hernia repair, and three patients (5%) had a history of urologic surgery. No statistically significant differences were observed between the groups. In the study by Cihoric et al.,^[8] the rate of previous abdominal surgery was 20%, whereas Tengberg et al.^[12] reported 57%. Although considerable variation exists across centers, Jeppessen et al.^[13] reported one of the highest rates, with 64% of patients having a history of prior surgery. This heterogeneous distribution may impact intraoperative and postoperative outcomes.

A diagnosis of malignancy was present preoperatively in 20 patients (34%). Fourteen patients (23%) had gastrointestinal, four (7%) had gynecologic, and two (3%) had urologic malignancies. The groups were statistically similar in this regard. Considering the metabolic burden and adjuvant treatments, malignancy may negatively influence postoperative outcomes and is also an important factor in determining surgical strategy in emergency settings. Differentiating between palliative and definitive surgical approaches can influence both intraoperative and postoperative outcomes.^[14] In a 2023 study, Tolstrup et al.^[15] recommended intraoperatively developed, multidisciplinary strategies as the standard of care for emergency surgical interventions. They emphasized that within 30 minutes of surgery, decisions should be made to proceed with definitive, palliative, or damage control surgery, based on the patient's physiological status, to optimize outcomes.

The Clavien–Dindo (CD) classification is commonly used to grade postoperative complications (POCs).^[10] Complications are graded from I to V, with grade V representing patient death. Classification is based on the highest-grade complication. The Comprehensive Complication Index (CCI), in contrast, incorporates all complications into a single score ranging from 0 to 100, providing a more comprehensive assessment of the postoperative course.^[11] In our study, the overall incidence of complications was similar between groups (57% vs. 55%, $p=1$). Although not statistically signif-

icant, higher CCI values in the geriatric group may suggest more severe complications (0% vs. 20.9%, $p=0.212$).

In our study population, nine patients (15%) died within 30 days postoperatively. This rate aligns with literature reporting outcomes of major abdominal surgeries. Studies including less complex procedures (e.g., appendectomy, cholecystectomy) report much lower rates,^[16] whereas case series focusing on major procedures report mortality rates of 15–21%.^[17]

Low albumin levels have been repeatedly linked to adverse postoperative outcomes across general surgery. Several studies highlight the prognostic importance of albumin in emergency surgery. Hacim et al.^[17] reported significantly lower albumin in patients who died after emergency laparotomy compared with survivors (2.35 vs. 4.15 g/dL, $p<0.001$). Similarly, in a multicenter study by Cihoric et al.,^[8] analyzing 1,084 patients, low preoperative albumin was an independent risk factor for mortality. By contrast, Chua et al.,^[3] in 170 emergency laparotomy cases, found that although albumin was lower in elderly patients, it did not significantly influence survival. Variability in indications, patient populations, and functional capacity may explain these differences.

Risk stratification systems aim to predict survival following emergency laparotomy/laparoscopy. More than 20 models exist, with long-term evidence showing reductions in mortality when applied.^[8,18] Properly designed stratification contributes to standardized care, timely complication management, and improved outcomes.^[19]

Another factor reported in emergency GI surgery is subspecialist expertise. In 2019, Brown et al.^[20] demonstrated that upper and lower GI surgeons had lower complication and mortality rates than non-specialists in emergency cases. They also reported higher use of laparoscopic techniques among GI subspecialists.

Being a tertiary university hospital affiliated with the Ministry of Health provides advantages for our center. Emergency surgeries are routinely performed by two senior academic surgeons, helping standardize procedures. Additionally, extensive experience in colorectal surgery and solid-organ transplantation (liver, kidney, heart) contributes to expertise in intensive care management.

This study has limitations. As a retrospective, single-center analysis with a small sample size, its evidence level is limited and generalizability is low. Prospective studies incorporating preoperative risk stratification are expected to yield more objective findings. Larger multicenter studies, including functional assessments, are necessary for more reliable conclusions.

CONCLUSION

In conclusion, in emergency intra-abdominal general surgery, advanced age was not identified as an independent risk factor for 30-day mortality. Outcomes cannot be stratified by age alone; individualized management should consider comorbidities, nutritional status, and etiology. Low serum albumin levels may be an important determinant of outcomes. Multicenter and randomized studies are crucial for improving care and complication management.

Disclosures

Ethics Committee Approval: The study was approved by the Başkent University Medical and Health Sciences Research Board Ethics Committee (No: KA25/282, Date: 24/07/2025).

Informed Consent: Informed consent was obtained from the patients or their first-degree relatives before surgery, after providing detailed information regarding the procedures and associated risks.

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