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Original Research Article

A three-year retrospective analysis of variables and their relationships as outcome indicators following emergency laparotomies in octogenarians: insights from a single institutional experience

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ABSTRACT

Background: This retrospective study aims to specifically assess the morbidity and mortality outcomes linked to emergency laparotomies in a subset of patients aged 80 years and above, referred to as octogenarians. The objective is to gain insights into the specific challenges and outcomes faced by this elderly population undergoing emergency laparotomies.
Methods: This retrospective analysis focused on emergency laparotomies in octogenarians between June 2020 and June 2023, involving 62 cases out of 370 total emergency laparotomies conducted across various age groups. Using a standardized proforma, data was collected, and statistical analysis was performed with statistical package for the social sciences (SPSS).
Results: In this study involving 62 elderly patients (mean age 84) undergoing emergency laparotomies, common diagnoses included adhesional small bowel obstruction (32.3%) and large bowel obstruction due to diverticular disease (21.0%). Approximately 22.6% of cases were malignant, emphasizing the diverse nature of the cohort. A significant portion (56.5%) underwent bowel resection, and 16.1% had a stoma. Notably, 100% of patients were not seen by geriatrics, indicating potential gaps in comprehensive assessment despite the absence of geriatrician involvement, the overall mortality rate was 21%, emphasizing the potential impact of geriatrician reviews.
Conclusions: In summary, emergency major abdominal surgery poses significant risks, particularly for frail and elderly individuals with multiple co-morbidities. Recognizing frailty as an independent risk factor is crucial and highlights areas of potential improvement in this area with early involvement of geriatricians.

Keywords: Octogenarians, Emergency laparotomy, National emergency laparotomy audit, Clinical frailty score

INTRODUCTION

Emergency laparotomy is a routinely conducted general surgical procedure, and recent data from the eighth year of the national emergency laparotomy audit (2020–2021) has reported an overall in-hospital mortality rate of 9.2% across all age groups, a slight increase from 9.1% in year 7 and 9.6% in year 6.[1]

This retrospective study aims to specifically assess the morbidity and mortality outcomes linked to emergency laparotomies in a subset of patients aged 80 years and above, referred to as octogenarians.

The objective is to gain insights into the specific challenges and outcomes faced by this elderly population undergoing emergency laparotomies.

METHODS

Place of study

The study was conducted at George Elliot NHS Hospital, England.

Study design

It was an institution-based retrospective study.

Period of study

The period of study was from June 2020 to June 2023.

Inclusion and exclusion criteria

All patients who underwent emergency exploratory laparotomy above 80 years of age were included in this study and rest were excluded.

Ethical considerations

The current study was conducted according to the ethical principles and guidelines laid down by the declaration of Helsinki for biomedical research involving human subjects.

This retrospective analysis focused on patients aged over 80 years (octogenarians) who underwent emergency laparotomy within the timeframe of June 2020 to June 2023. Among the total emergency laparotomies conducted during this period (370 cases), 62 cases involved individuals aged 80 and above. Data collection employed a standardized proforma encompassing various parameters: patient age, American society of anaesthesiologists (ASA) grade, sepsis status on admission, diagnosis (malignant or non-malignant), the necessity of bowel resection, requirement for a stoma, recording of frailty score on presentation along with its value, calculation of NELA mortality score, presence of comorbidities (cardiac, respiratory, endocrine), length of hospital stay, postoperative complications, and discharge status.

Statistical analysis was executed using statistical package for the social sciences (SPSS) software version 20. Categorical variables were represented in terms of frequency and percentage. The Chi-square test was applied for assessing associations among categorical variables, while continuous variables underwent analysis via an independent t-test. A significance level of 5% ($p<0.05$) was considered for all discussions, indicating statistical significance.

RESULTS

The research involved a cohort of 62 elderly individuals with an average age of 84 years, signifying a geriatric population.

Table 1 delves into the demographic characteristics, diagnoses, comorbidities, and outcomes of these elderly patients undergoing surgical procedures. The most prevalent diagnoses were adhesional small bowel obstruction (32.3%) and large bowel obstruction due to diverticular disease (21.0%). Approximately 22.6% of cases were malignant, emphasizing the diverse nature of the cohort. Sepsis was present in 24.2% of patients, underscoring the severity of certain cases. Comorbidities, particularly hypertension (46.8%) and chronic kidney disease (24.2%), were widespread. A significant portion (56.5%) underwent bowel resection, and 16.1% had a stoma.

Notably, 100% of patients were not seen by geriatrics, indicating potential gaps in comprehensive assessment. Postoperative complications included diverse issues, with wound infections (11.3%) being noteworthy. Despite these challenges, 79.0% of patients were discharged alive.

Table 2 explores associations between clinical factors and patient outcomes. Sepsis on presentation and the decision for bowel resection showed no significant impact on outcomes. However, a potential trend was observed between ASA score and patient outcome, with ASA score 2 having a lower proportion of deceased patients. The nature of the diagnosis (malignant or non-malignant) also showed a trend, with non-malignant cases having a higher survival proportion.

Figure 1 revealed that the predicted NELA mortality rate significantly differed between surviving and deceased patients, emphasizing its potential utility in assessing outcomes.

Table 3 succinctly presents comorbidities and complications based on discharge status. Certain complications and comorbidities, including AKI, atrial fibrillation, heart failure, CKD, and specific endocrine issues, may indicate an increased risk of mortality, emphasizing the need for targeted clinical attention.

Table 4 below displays diverse distributions of clinical frailty scores within each ASA category. While the Chi-square test suggests no significant association, further investigation with a larger sample size is recommended for robust conclusions.

Table 5 explores relationships between ASA score, clinical frailty score, predicted NELA mortality rate, and length of stay. A significant positive correlation exists between ASA score and predicted NELA mortality rate.

Additionally, predicted NELA mortality rate is positively correlated with length of stay, suggesting that higher predicted mortality rates are associated with longer hospital stays. Other correlations were not statistically significant in this dataset.

Table 1: Demography, diagnosis, comorbidities, complications and outcome (n=62).

Parameters		
Age (in years) (mean±SS)	84±3	
Diagnosis	**N**	**%**
Adhesional small bowel obstruction	20	32.3
DU perforation	5	8.1
Ischemic small bowel	12	19.4
Large bowel obstruction due to diverticular disease	13	21.0
Obstruction due to colon cancer	11	17.7
Obstruction related to parastomal hernia	1	1.6
Sepsis on presentation		
N/A	1	1.6
No	46	74.2
Yes	15	24.2
Bowel resection or no resection		
No	27	43.5
Yes	35	56.5
Stoma or no stoma		
No	52	83.9
Yes	10	16.1
Seen by geriatrics		
Not seen	62	100.0
Malignant or non-malignant		
No	48	77.4
Yes	14	22.6
30-day complication		
AKI	1	1.6
Anemia	1	1.6
Atrial fibrillation	1	1.6
Dead	4	6.5
Intra-abdominal collection	1	1.6
Leak	2	3.2
Nil	38	61.3
Respiratory	3	4.8
Sepsis	1	1.6
Syncope	1	1.6
UTI	2	3.2
Wound infection	7	11.3
Respiratory comorbidities		
No	53	85.5
Yes	9	14.5
Cardiac comorbidities		
Atrial fibrillation	2	3.2
Hypertension	29	46.8
Hypertension and aortic stenosis	1	1.6
Hypertension and atrial fibrillation	9	14.5
Hypertension and heart failure	1	1.6
Hypertension and IHD	1	1.6
Hypertension and TIA	1	1.6
Mitral regurgitation	1	1.6
Nil	15	24.2
Tricuspid regurgitation	2	3.2
Renal comorbidities		
CKD	15	24.2
Nil	47	75.8

Continued.

Parameters		
Endocrine comorbidities	**N**	**%**
CKD	1	1.6
DM	11	17.7
DM, hyperthyroidism	1	1.6
Dyslipidemia	1	1.6
Hypothyroidism	2	3.2
Hypothyroidism	1	1.6
Nil	45	72.6
Status on discharge		
Alive	49	79.0
Dead	13	21.0

Table 2: Association of different variables with outcome.

Parameters	Status on discharge				P value
	Alive (n=49)		Dead (n=13)		
	N	%	N	%	
Sepsis on presentation					
N/A	1	2.0	0	0.0	0.865
No	36	73.5	10	76.9	
Yes	12	24.5	3	23.1	
Bowel resection or no resection					
No	21	42.9	6	46.2	0.831
Yes	28	57.1	7	53.8	
ASA score					
2	6	12.2	2	15.4	0.053
3	35	71.4	5	38.5	
4	8	16.3	6	46.2	
Stoma or no stoma					
No	42	85.7	10	76.9	0.444
Yes	7	14.3	3	23.1	
Malignant or non-malignant					
No	40	81.6	8	61.5	0.123
Yes	9	18.4	5	38.5	

Table 3: Comorbidities and complications based on discharge status.

Parameters	Status on discharge			
	Alive (n=49)		Dead (n=13)	
	N	%	N	%
30-day complication				
AKI	0	0.0	1	7.7
Anemia	1	2.0	0	0.0
Atrial fibrillation	1	2.0	0	0.0
Dead	1	2.0	3	23.1
Intra-abdominal collection	1	2.0	0	0.0
Leak	1	2.0	1	7.7
Nil	35	71.4	3	23.1
Respiratory	3	6.1	0	0.0
Sepsis	0	0.0	1	7.7
Syncope	1	2.0	0	0.0
UTI	1	2.0	1	7.7
Wound infection	4	8.2	3	23.1
Respiratory comorbidities				
No	43	87.8	10	76.9
Yes	6	12.2	3	23.1

Continued.

Parameters	Status on discharge			
	Alive (n=49)		Dead (n=13)	
	N	%	N	%
Cardiac comorbidities				
Atrial fibrillation	2	4.1	0	0.0
Hypertension	20	40.8	9	69.2
Hypertension and aortic stenosis	1	2.0	0	0.0
Hypertension and atrial fibrillation	8	16.3	1	7.7
Hypertension and heart failure	0	0.0	1	7.7
Hypertension and IHD	1	2.0	0	0.0
Hypertension and TIA	1	2.0	0	0.0
Mitral regurgitation	1	2.0	0	0.0
Nil	13	26.5	2	15.4
Tricuspid regurgitation	2	4.1	0	0.0
Renal comorbidities				
CKD	10	20.4	5	38.5
Nil	39	79.6	8	61.5
Endocrine comorbidities				
CKD	1	2.0	0	0.0
DM	7	14.3	4	30.8
DM, hyperthyroidism	1	2.0	0	0.0
Dyslipidemia	1	2.0	0	0.0
hypothyroidism	1	2.0	1	7.7
Hypothyroidism	1	2.0	0	0.0
Nil	37	75.5	8	61.5

Table 4: Association between ASA score and clinical frailty score.

ASA score	N (%)	Clinical frailty score					Total
		3	4	5	6	7	
2	N	1	2	0	0	0	3
	% within ASA score	33.30	66.70	0.00	0.00	0.00	100.00
	% within clinical frailty score	12.50	25.00	0.00	0.00	0.00	9.40
3	N	7	5	5	4	1	22
	% within ASA score	31.80	22.70	22.70	18.20	4.50	100.00
	% within clinical frailty score	87.50	62.50	71.40	50.00	100.00	68.80
4	N	0	1	2	4	0	7
	% within ASA score	0.00	14.30	28.60	57.10	0.00	100.00
	% within clinical frailty score	0.00	12.50	28.60	50.00	0.00	21.90
Total	N	8	8	7	8	1	32
	% within ASA score	25.00	25.00	21.90	25.00	3.10	100.00
	% within clinical frailty score	100.00	100.00	100.00	100.00	100.00	100.00

Chi-square=10.006, p value=0.265

Table 5: Correlation coefficients between different variables.

Correlations	ASA score	Clinical frailty score	Predicted NELA mortality rate in percentage	Length of stay in hospital
ASA score				
Pearson correlation	1	0.419*	0.648**	0.165
Sig. (2-tailed)		0.017	0.000	0.211
Clinical frailty score				
Pearson correlation	0.419*	1	0.294	0.027
Sig. (2-tailed)	0.017		0.102	0.885
Predicted NELA mortality rate in percentage				
Pearson correlation	0.648**	0.294	1	0.293*
Sig. (2-tailed)	0.000	0.102		0.024

Continued.

Correlations	ASA score	Clinical frailty score	Predicted NELA mortality rate in percentage	Length of stay in hospital
Length of stay in hospital				
Pearson correlation	0.165	0.027	0.293*	1
Sig. (2-tailed)	0.211	0.885	0.024	

*Correlation is significant at the 0.05 level (2-tailed), **correlation is significant at the 0.01 level (2-tailed)

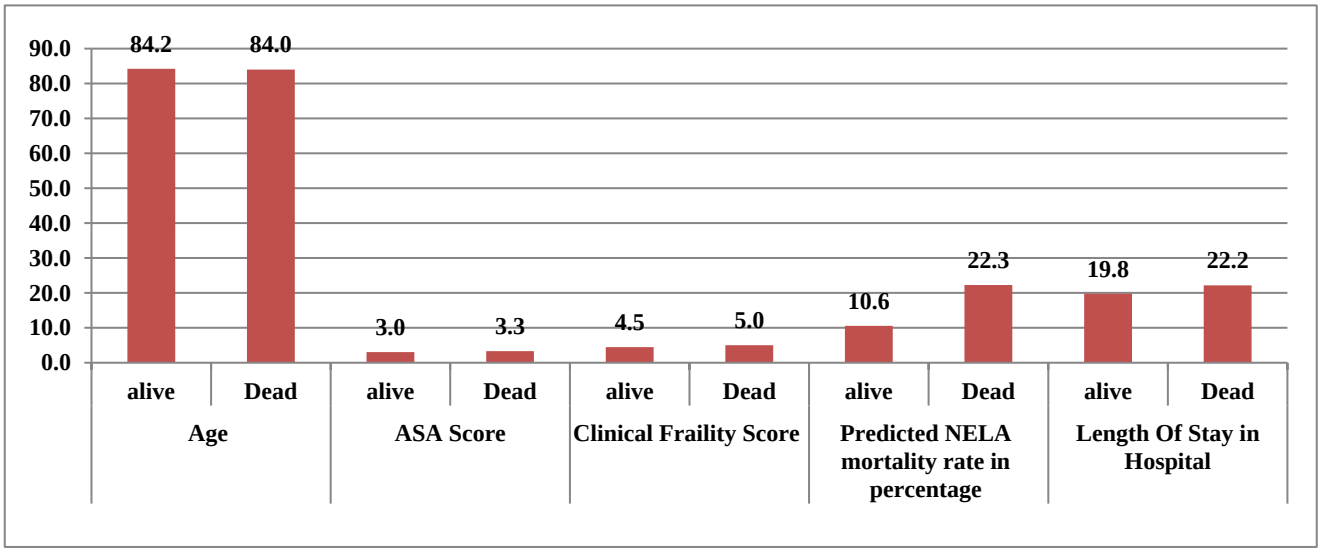

Figure 1: Descriptive statistics with respect to outcome.

DISCUSSION

The increasing prevalence of an aging population presents a complex challenge for surgeons, particularly when it comes to performing laparotomies on elderly patients. The eighth year of the national emergency laparotomy audit conducted in 2020–2021 revealed that a substantial 17.7% of patients undergoing this procedure were above 80 years old.[1] Traditionally, age has been a significant factor in assessing surgical risks, with the assumption that older patients face elevated mortality and morbidity rates, often discouraging surgery. However, this perspective is evolving as it becomes clear that chronological age alone does not capture the full picture of a patient's health.

Contrary to conventional wisdom, the age of a patient does not solely determine their fitness for surgery. A spry and active 90-year-old individual might exhibit better overall health and resilience than a sedentary 65-year-old burdened by comorbidities. Consequently, decisions regarding operative interventions in the elderly demand meticulous consideration of the patient's physiological reserves, potential benefits, and their projected quality of life. Importantly, understanding the health beliefs of both the patients and their relatives is integral to making informed decisions.

Advanced age is often accompanied by multi-morbidity, a state of having multiple chronic conditions, and polypharmacy, the use of multiple medications. These factors contribute to a reduced physiological capacity to withstand the stress induced by surgery, thereby elevating the risks of mortality and morbidity. The management of elderly patients has historically leaned towards conservative or palliative approaches. However, evolving surgical techniques and rising patient expectations are reshaping these practices, leading to an increased inclination towards operative interventions.[2]

Laparotomy, as a major surgical procedure, is not without significant risks, particularly in emergency settings. Current literature highlights mortality rates ranging from 10% to 55%, emphasizing the seriousness of the procedure.[3-5] The challenges are amplified in elderly patients due to their tendency towards multi-morbidity, polypharmacy, and diminished physiological reserves. A five-year study focusing on emergency laparotomy patients aged 80 and above revealed a staggering 45% in-hospital mortality rate, with sepsis identified as the primary cause of death.[2] Overall, the challenges of operating on older individuals require a nuanced approach that considers various factors for a balanced decision-making process.

Our study focussed on cohort of 62 elderly patients with a mean age of 84 years who underwent emergency laparotomies, the most common diagnoses were adhesional small bowel obstruction (32.3%) and large bowel obstruction due to diverticular disease (21.0%). Notably, 22.6% of cases were malignant, and 24.2% presented with sepsis, highlighting the severity of some cases. The cohort exhibited a high prevalence of comorbidities, including hypertension (46.8%), chronic kidney disease (24.2%), and diabetes mellitus (17.7%).

A majority of patients underwent bowel resection (56.5%), and 16.1% had a stoma. Notably, none of the patients were seen by geriatric, indicating potential gaps in comprehensive geriatric assessment. The study identified diverse 30-day complications, with wound infections (11.3%), acute kidney injury (AKI), atrial fibrillation, intra-abdominal collection, and respiratory issues. While most patients were discharged alive (79.0%), 21.0% did not survive to discharge, underscoring the gravity of the patient population.

The eighth year of the national emergency laparotomy audit (2020–2021) revealed significant differences in in-hospital mortality among patients aged ≥80 years based on geriatrician involvement. For non-frail patients in this age group, the mortality rate was 8.2% when reviewed by geriatricians, compared to 14.6% when not reviewed. In frail patients aged ≥80, the mortality rate was 14.2% when reviewed by geriatricians and rose to 23.1% when not seen by geriatricians.[1]

Contrastingly, in our study, where none of the patients were reviewed by geriatricians, the overall mortality rate was 21%, and 79% of patients were discharged alive. The absence of geriatrician involvement in our study is notable given the observed impact on mortality rates in the national emergency laparotomy audit. This raises considerations about the potential benefits of incorporating geriatrician assessments into the care of elderly patients undergoing laparotomies, especially in light of the demonstrated lower mortality rates in the presence of geriatrician reviews in the national audit.

The study found that sepsis on presentation and the decision for bowel resection did not significantly impact patient outcomes. However, there was a potential association between ASA score and patient outcomes, with ASA score 2 associated with a lower proportion of deceased patients compared to ASA scores 3 and 4. Additionally, a trend suggested a potential association between the nature of the diagnosis (malignant or non-malignant) and patient outcomes. Emergency procedures and an increasing American Society of Anaesthesiologists' (ASA) score have been identified as poor prognostic indicators for patients with colorectal cancer.[6]

The predicted mortality rate significantly differed between surviving and deceased patients, indicating its potential utility as a predictor for assessing patient outcomes. Certain complications and comorbidities, such as AKI, atrial fibrillation, heart failure, CKD, and specific endocrine issues, were associated with an increased risk of mortality, emphasizing the need for comprehensive management strategies, preferably by geriatricians.

The chi-square test suggested that diverse distributions of clinical frailty scores within each ASA category may not be significantly associated, warranting further investigation with a larger sample size for more robust conclusions. Correlation analysis revealed a significant positive correlation between ASA score and predicted NELA mortality rate, indicating that as ASA score increases, the predicted mortality rate also tends to increase. Moreover, there was a significant positive correlation between predicted NELA mortality rate and length of stay in hospital, suggesting that higher predicted mortality rates are associated with longer hospital stays. Other correlations, including ASA score with clinical frailty score and clinical frailty score with length of stay, were not statistically significant in this dataset. Prior research in emergency surgical settings has identified frailty as a factor linked to increased mortality risk and extended hospital stays.[6] However, making direct comparisons to the current study proves challenging due to the limitations of the previous work, which involved retrospective analysis, single-centre focus, inclusion of non-operatively managed older adult patients, and/or small patient sample sizes. These limitations underscore the need for cautious interpretation and highlight the potential differences in study design and patient cohorts that may impact the generalizability of findings between the two studies.

Emergency laparotomy poses a significantly elevated risk of mortality, nearly 10 times greater than that associated with major elective gastrointestinal surgery.[7,8] Beyond operation-related factors, patient-related variables play a crucial role in determining outcomes for emergency laparotomies. These factors encompass age, comorbidities, performance status, frailty, sarcopenia, and the existence of peritoneal contamination.[9,10] A thorough preoperative assessment of these factors is essential to gauge the potential for survival following emergency laparotomy. To enhance objectivity of decision-making, various scoring systems have been developed with the aim of predicting surgical outcomes in these critical situations.[11-13]

The decision to perform surgery in octogenarian patients is challenging and necessitates thoughtful consideration of the patient's pre-existing health conditions. Effective counselling of both patients and their relatives is crucial, emphasizing the significance of meticulous patient selection.[14] Research indicates that the experience and seniority of both the anaesthetist and the operating surgeon play a role in influencing mortality rates. Consequently, it is recommended that elderly patients receive care led by consultants in both anaesthesia and surgery. Furthermore, it is advised that this care should be provided on an emergency list at a reasonable time of day to optimize patient outcomes.[15] The national confidential enquiry into patient outcome and death report emphasizes the crucial role of identifying frailty in case selection, recognizing frailty as an independent risk factor for poor surgical outcomes.[16]

Limitations

As this is a retrospective study, a number of limitations were encountered which included- small sample size and single institutional data.

CONCLUSION

In conclusion, emergency major abdominal surgery entails a considerable risk of morbidity, particularly in frail and elderly individuals with multiple co-morbidities and diminished physiological reserves associated with aging. Identifying patients who would benefit from surgery becomes challenging in these demographics. However, assessing frailty itself is a complex task. It is imperative to engage in open and honest discussions with elderly patients and their families, providing clear information about the substantial risks associated with surgery. Establishing realistic expectations becomes crucial in ensuring informed decision-making and patient-centred care.

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