ASSESSMENT OF PATIENT FACTORS ASSOCIATED WITH FRAILTY AND OUTCOMES IN EMERGENCY GENERAL SURGERY

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INTRODUCTION

Generally, there is an accepted relationship between age, comorbidity, and overall disability, but concordance has not been demonstrated (Fried, 2001). There is very poor agreement between these proposed indices on what constitutes frailty (Mahmooth, 2020).

Our specific aim in this study was to determine what role frailty plays in the decision-making process of emergency general surgery patients (EGS) and how frailty affects both the operative and non-operative patient outcomes

METHODS

We performed a retrospective cohort study on all EGS patients seen by the OU General Surgery service between July 1st 2021. and October 31st 2021.

Using a pre-established hospital database, EGS patients were identified during the time period described above. Patients were excluded from the study if they did not present with an EGS diagnosis, were primarily a Trauma patient, primarily a Vascular surgery patient, or did not show evidence in our electronic medical record system of the elements of frailty listed below.

We then assembled an acute care database encompassing patient demographics, hospital course information, operations and procedures performed and indices of frailty. Patient demographics included sex, age, and BMI. Hospital course data included whether operative or non-operative management was pursued, 30-day re-admissions and in hospital deaths. The operations and procedures performed were further classified by subsequent versus initial operation/procedure. Frailty factors recorded included: immobilization, inability to perform activities of daily living, history of impaired sensorium, tobacco use, active cancer diagnosis, diabetes, history of angina or myocardial infarction, history of peripheral arterial disease, history of transient ischemic attack, cerebrovascular accident with or without lasting deficits, history of heart failure, history of medicated hypertension and history of COPD or pneumonia. A patient was considered frail if they had one or more of the frailty factors listed.

STATISTICAL ANALYSIS

Frequencies of patient demographics, mean age, patients' associated indices of frailty, in hospital deaths and 30-day-re-admission rates for the operative and non-operative groups were calculated. The statistical significance of the difference in these frequencies between the operative and non-operative group was calculated using the z proportion test while the statistical difference in mean age was calculated using a two-tailed student t test ($p < 0.05$ for both).

The odds ratio with 95% CI for in hospital deaths and re-admissions in 30 days was calculated for each individual component of frailty in the operative group as the frequency of these events was mostly less than 10%. In similar fashion, the relative risk with 95% CI of subsequent operations this group was calculated.

RESULTS

Table 1: Frequencies of patient demographics, indices of frailty, and hospital course information in the non-operative and operative groups

	Non-Operative (40)	Operative (94)	Total (134)	p value
Males	20 (50%)	58 (62%)	78 (58%)	<0.0001
Females	20 (50%)	36 (38%)	56 (42%)	<0.0001
Average Age (years)	59 ± 17	60 ± 16	59 ± 17	0.75
Average BMI (kg/m^2)	29 ± 7.5	30 ± 8.0	30 ± 7.9	0.58
In-hospital Deaths	1 (2.5%)	3 (3.0%)	4 (3.0%)	0.25
Re-admissions	5 (13%)	19 (20%)	24 (1.8%)	<0.0001
Frail	36 (90%)	85 (90%)	121 (90%)	0.20
Not-Frail	4 (10%)	9 (9.6%)	13 (9.7%)	0.67
Does not mobilize independently	12 (30%)	18 (19%)	30 (22%)	<0.0001
Does not perform activities of daily living independently	10 (25%)	14 (15%)	24 (18%)	<0.0001
History of impaired sensorium	7 (18%)	5 (5.3%)	12 (9.0%)	<0.0001
Tobacco use	18 (45%)	35 (37%)	53 (40%)	<0.0001
Active cancer diagnosis	4 (10%)	10 (11%)	13 (9.7%)	0.54
Diabetes	13 (33%)	37 (39%)	50 (37%)	<0.0001
History of angina	10 (25%)	15 (16%)	24 (18%)	<0.0001
History of peripheral arterial disease and/or rest pain	3 (7.5%)	7 (7.4%)	10 (7.5%)	0.95
History of transient ischemic attack, cerebral vascular accident, with or without lasting deficits	6 (15%)	7 (7.4%)	13 (9.7%)	<0.0001
Congestive heart failure	8 (20%)	16 (17%)	24 (18%)	<0.05
History of medicated hypertension	25 (63%)	63 (67%)	87 (65%)	<0.0001
COPD or Pneumonia	9 (23%)	11 (12%)	20 15%)	<0.0001

Table 2: Relative risk of subsequent procedures and operations in the non-operative and operative groups respectively; * = statistically significant

	Subsequent Procedure		Subsequent Operation	
	Non-Operative	(95% CI)	Operative	(95% CI)
Does not mobilize independently	3.2*	1.1-9.3	1.1	0.79 - 1.5
Does not perform activities of daily living independently	3.2*	1.1-9.3	1.2	0.82-1.6
History of impaired sensorium	2.0	0.57-7.1	1.5*	1.1-2.0
Tobacco use	3.2*	1.1-9.3	1.0	0.76-1.4
Active Cancer Diagnosis	1.1	0.19-6.8	1.1	0.70-1.7
Diabetes	1.7	0.53-5.6	1.4	1.0-1.9
History of Angina	2.0	0.57-7.1	0.9	0.60-1.3
History of peripheral arterial disease (PAD) and/or rest pain	2.4	0.52-11	1.1	0.74-1.7
History of transient ischemic attack, cerebral vascular accident, with or without lasting deficits	2.6	0.79-8.4	1.2	0.88-1.7
Congestive heart failure	1.2	0.19-6.8	1.0	0.70-1.4
History of medicated hypertension	1.2	0.35-3.9	1.1	0.78-1.5
COPD or Pneumonia	1.6	0.44-6.0	1.2	0.86-1.8

Table 3: Odds ratio of in-hospital deaths and 30-day-readmissions in the operative Group; NC = not calculated, * = statistically significant

	In-Hospital Deaths		Re-Admissions	
	OR	(95% CI)	OR	(95% CI)
Does not mobilize independently	9.4*	1.2 -75	2.8	0.91-8.9
Does not perform activities of daily living independently	NC	NC	4.1*	1.2-15
History of impaired sensorium	11*	1.6-74	0	NC
Tobacco use	0.84	0.19-3.7	0.54	0.2-1.4
Active Cancer Diagnosis	0	NC	0.55	0.18-1.7
Diabetes	0.76	0.17-3.4	1.6	0.52-4.9
History of Angina	2.75	0.57-13	0	NC
History of peripheral arterial disease (PAD) and/or rest pain	0	NC	1.9	0.5-4.9
History of transient ischemic attack, cerebral vascular accident, with or without lasting deficits	7.1*	1.2-42	5.4*	1.3-22
Congestive heart failure	10*	1.3-82	1.8	0.67-5.1
History of medicated hypertension	NC	NC	0.8	0.23-2.8
COPD or Pneumonia	0	NC	2.9	0.85-9.6

Table 4: Types of procedures and operations performed

Operation	149
Amputation or partial amputation of toes/foot	16
Amputation/partial amputation of extremity	2
CABG	1
Cardiac catheterization with/without intervention	1
Catheter removal (abdominal or vascular)	4
Colectomy	3
Colonoscopy or flexible sigmoidoscopy	8
Colostomy formation	1
Cystoscopy	1
Debridement/washout of extremity or wound	31
Delayed closure of foot wound	2
Diagnostic laparoscopy w/wo intervention	2
EGD	9
EGD and colonoscopy	6
EGD with PEG placement	1
ERCP with/without EUS	12
EUA	1
EUS	2
Exploratory laparotomy	13
Extremity biopsy	1
Gastric fundoplication	1
Laparoscopic appendectomy	3
Laparoscopic cholecystectomy w/wo IOC	12
Laparoscopic converted to open LOA	1
Laparoscopic drainage of fluid collections	2
Laparoscopic gastric or GJ tube placement	2
Laparoscopic reduction of internal hernia	1
Open endarterectomy	1
Open inguinal hernia repair with/without mesh	1
Open ventral hernia repair with/without mesh	1
Operative Angiogram with/without intervention	6
Salpingo-oophrectomy	1

Procedure	58
Bedside chest tube	1
Bedside I/D, debridement or aspiration	16
Exchange of feeding tube at bedside	1
IR aspiration or drain placement	15
IR biliary stent/biliary drain/biliary imaging	7
IR biopsy	1
IR embolization of vessel/vascular imaging	4
IR gastric tube placement	4
IR thoracentesis	2
IR venous access/venous device placement	5
Punch biopsy	1
Tracheoscopy	1

Overall the Male:Female ratio in the operative group was increased compared to the non-operative group. The most frequent indices of frailty found in both the operative and non-operative group were hypertension, tobacco use and history of diabetes.

For non-operative patients, not mobilizing independently, not performing activities of daily living independently and tobacco use were associated with a statistically significant increase in subsequent procedures. For operative patients, not mobilizing independently, history of impaired sensorium, and history of TIA/CVA and CHF were associated with a statistically significant increase in in-hospital deaths compared to those without these indices of frailty. A significant association was also found with subsequent operations for patients with a history of impaired sensorium. Finally, not performing activities of daily living and history of TIA/CVA were associated with a statistically significant increase in re-admissions.

DISCUSSION

Our results show that frailty is prominent at an incidence of 90% and it plays a significant role in negative patient outcomes regardless of whether surgery is performed. Frail patients managed operatively had a higher rate of in-hospital death and a statistically significant increase in rate of re-admissions compared to those managed non-operatively.

The indices of frailty with the overall highest association with morbidity and mortality in both the operative and non-operative groups were related to immobility and baseline functioning. These were associated with a statistically significant increase in-hospital death in operative patients and with increased risk of subsequent procedures in non-operative patients.

Additionally, history of impaired sensorium was associated with increased risk of in-hospital death, re-admissions and subsequent operations in the operative group.

In conclusion, frailty has an impact on the outcome of EGS patients managed both operatively and non-operatively and there appear to be specific elements of frailty that could be used to help determine if an EGS patient is better suited for operative versus non-operative management.

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