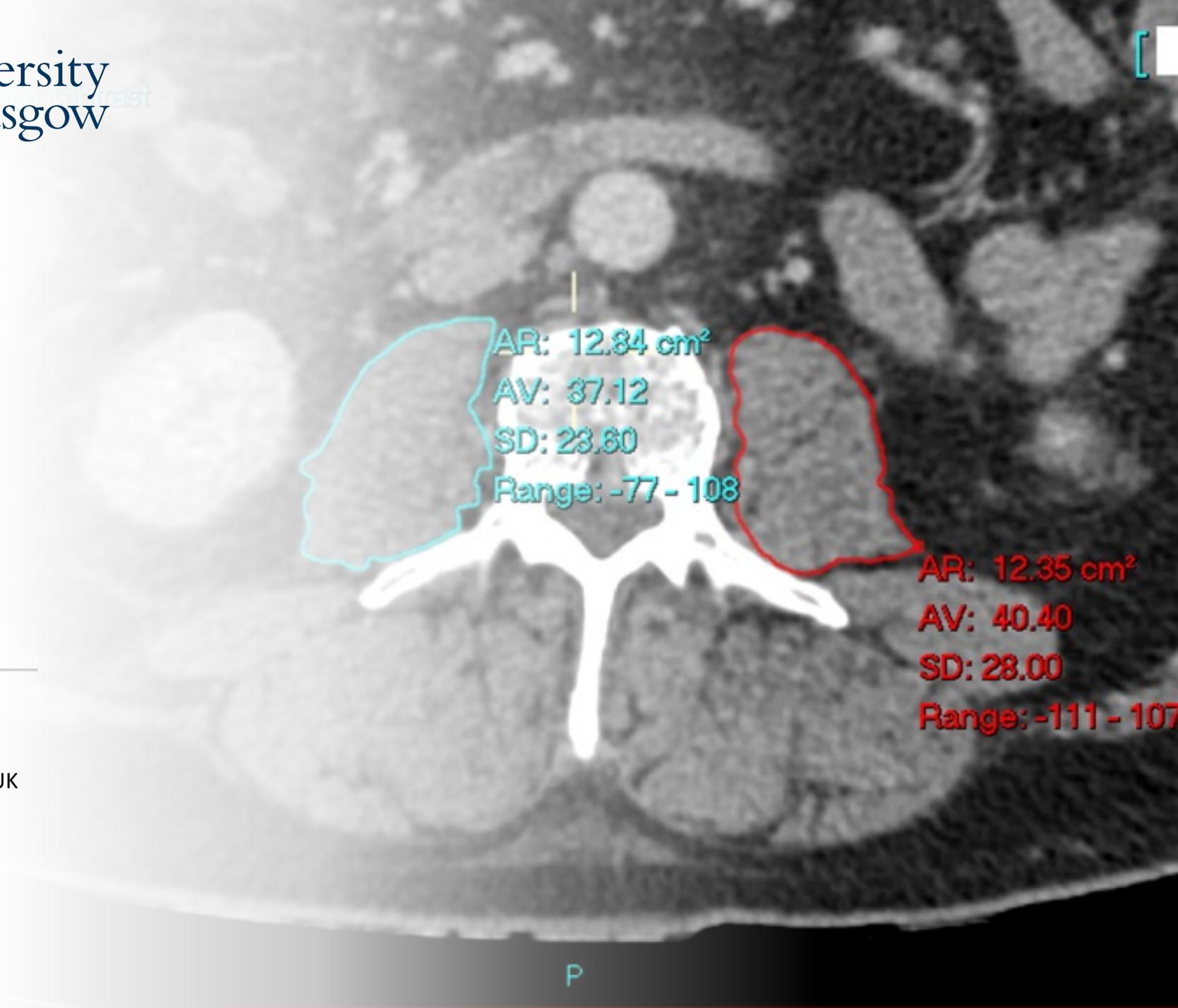


# Defining the influence of frailty, sarcopenia and multi-morbidity on emergency surgery outcomes

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## Background

**Frailty** has been shown to predict mortality in both younger and older adults undergoing emergency laparotomy.[1]

**Sarcopenia** (loss of muscle mass and function), measured on preoperative CT, is predictive of short and long-term outcomes in patients undergoing elective surgery for cancer. Frailty is a syndrome of which sarcopenia and **multi-morbidity** (presence of >2 long-term conditions) are components. Though there is a large overlap between frailty, sarcopenia and multimorbidity the exact interplay between these older adult conditions remains unexplored.

## Aims

- Primary aim is to define the prevalence of frailty, sarcopenia and multimorbidity in adults undergoing emergency laparotomy.
- Secondary aim is to explore the relationship between these factors in regards to 30-day mortality.

## Methods

- Study is an analysis of prospective data from two sites using Emergency Laparotomy and Laparoscopic Scottish Audit (ELLSA) database.
- Clinical frailty score (CFS) was used as a measure for frailty, and patients were grouped into “not frail” (CFS 1-3) or “frail” (CFS 4-7).
- Sarcopenia was assessed in each patient by manually measuring the total cross-sectional area of the psoas major muscle (Total Psoas Area, TPA) at the level of L3 lumbar spine on preoperative CT scan. TPA was adjusted for individual patient to obtain Total Psoas Index (TPI). Lowest sex specific TPI quartile was identified as “sarcopenic”.
- American Society of Anaesthesiologist physical status classification (ASA) was used to define multimorbidity, with ASA>3 indicating at least severe systemic disease.
- ICC was used to ensure reliability of the sarcopenia measuring technique.
- Binary logistic regression was used to assess association for 30-day mortality with frailty and sarcopenia.
- One-way ANOVA with Tukey’s post-hoc analysis was used to compare subgroups.

## Results

Median age of 215 eligible patients in the total cohort was 64 years, and 49.8% were older adults ( $\geq 65$  years). 30-day mortality for all patients was 4.2% (9/215).

- 54 (25.1%) patients were sarcopenic
- 37 (17.2%) patients were frail
- 107 (49.8%) patients had an ASA score  $\geq 3$

Characteristic	n (%)
Female	123 (57.2%)
Median age	64 (IQR 50 – 73)
Age $\geq 65$ years	107 (49.8%)
ASA $\geq 3$	107 (49.8%)
Frail (CFS 4 – 7)	37 (17.2%)
Sarcopenic	54 (25.1%)
Overall 30-day mortality	9 deceased (4.2%)

→ There was a **6.8 times increase** in risk of 30-day mortality in frail patients compared to non-frail counterparts (**p=0.006**). Results do not return significant after adjusting odd ratios for age and sex.

→ There was no statistically significant difference in 30-day mortality between sarcopenic and non-sarcopenic patients (OR 1.82, p=0.422)

Patient group	Crude odds ratio (95% CI)	P-value	Adjusted odds ratio – age (95% CI)	P-value	Adjusted odds ratio – sex & age (95% CI)	P-value
Frail vs Non-frail	6.80 (1.73 – 26.69)	<b>0.006</b>	3.99 (0.89 – 17.91)	0.071	4.32 (0.94 – 19.83)	0.060
Sarcopenic vs Non-sarcopenic	1.82 (0.42 – 7.90)	0.422	1.59 (0.36 – 7.01)	0.542	1.58 (0.36 – 6.99)	0.550

Patient characteristics were explored between the 4 different subgroups. Compared to baseline (no frailty or sarcopenia), patients with only frailty, and patients both frailty and sarcopenia are significantly older in age and are more likely to be multimorbid with higher ASA scores.

	No Sarcopenia or Frailty (n = 135   62.8%)	Both Sarcopenic and Frail (n = 11   5.1%)	Only Frail (n = 26   12.1%)	Only Sarcopenic (n = 43   20.0%)	p-value
<b>Characteristic</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	
Median age, years (IQR)	60 (46 – 70)	73 (64 – 82)	76 (70.5 – 82)	66.5 (54.5 – 74)	<b>&lt;0.001</b>
Compare to baseline (p-value)		<b>0.014</b>	<b>&lt;0.001</b>	0.157	
Age >65 years	53 (39.3%)	8 (72.7%)	24 (92.3%)	22 (51.2%)	<b>&lt;0.001</b>
Median ASA (IQR)	2 (2 – 3)	4 (3 – 4)	3 (3 – 4)	2 (2 – 3)	<b>&lt;0.001</b>
Compare to baseline (p-value)		<b>&lt;0.001</b>	<b>&lt;0.001</b>	1.000	

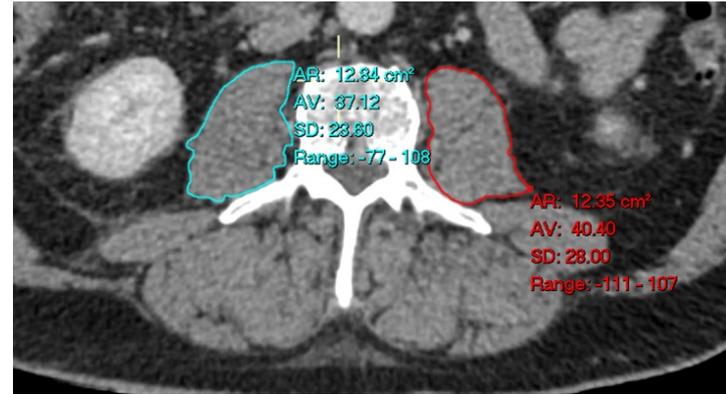
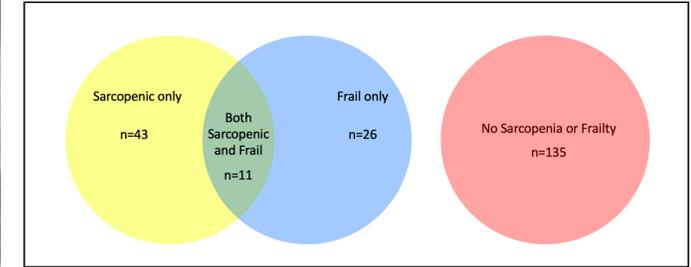


Figure 1: CT Abdomen & Pelvis, at the level of L3 vertebra, demonstrating the method of measuring total psoas area (TPA). Outlines of left (red) and right (cyan) psoas major muscle were manually traced and outlined on PACS.



Total cohort n=215

Figure 2: Venn-Diagram showing distribution of patients in four subgroups. This shows patients do not necessarily need to be sarcopenic to be frail, and vice-versa.

## Conclusions

- Frailty, sarcopenia and multimorbidity are prevalent in patients undergoing emergency laparotomy.
- While there is an overlap between frailty and sarcopenia, patients do not necessarily need to be frail to be sarcopenic.
- Frailty was significantly associated with 30-day mortality while sarcopenia is not. This is likely due to incompleteness of data and low reported mortality in patient cohort.

## References

- [1] NELA Seventh Patient Report [Internet]. National Emergency Laparotomy Audit (NELA). 2021 [cited 2022 Apr 18]. Available from: <https://www.nela.org.uk/Seventh-Patient-Report>
- [2] Dolan DR, Knight KA, Maguire S, Moug SJ. The relationship between sarcopenia and survival at 1 year in patients having elective colorectal cancer surgery. Tech Coloproctol [Internet]. 2019;23(9):877–85. Available from: <http://dx.doi.org/10.1007/s10151-019-02072-0>

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