Department of Surgery

Unraveling the Role of Cognitive Function in Frailty: Insights Across Multiple Frailty Screening Tools in the Ventral Hernia Population

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Objective

Explore the relationship between cognitive function and frailty by analyzing how 4 different frailty screening tools capture cognitive dysfunction in ventral hernia patients

Background

- Surgical patients are getting older and sicker
- More than 80% of US adults ≥ 65 years old have at least 1 comorbidity, 50% have multiple comorbidities, and 10-20% have frailty [1,2]
- Previous work has found that up to 27% of the ventral hernia population screens positive for frailty, higher than prior reports [3]
- Because ventral hernia repairs (VHRs) are typically elective operations, assessment of surgical candidacy requires substantial shared decision making, which is more complicated in patients with (1) reduced physiologic reserve to stressors (i.e., frailty) and (2) some (often unknown) level of cognitive impairment
- There is uncertainty in literature about the significance of cognitive impairment in the development of frailty
- There is no gold standard for frailty assessment in surgery patients
- Surgeons often conflate physical frailty with cognitive impairment during preoperative risk assessment, but it is unclear how closely these entities are associated and how this association may vary depending on which frailty screening tool is used

Methods: Frailty and Sarcopenia Screening

Patients ≥ 18 y.o. being evaluated for ventral hernia repair at a single institution clinic were enrolled from January 2023 to June 2023. Patients were screened for frailty via:

FRAIL Scale (FS)	Fried Frailty Index (FFI)	Modified Frailty Index-11 (mFI-11)	SARC-F
Fatigue	Weight loss		**S**trength
Resistance (climb stairs)	**E**xhaustion		**A**ssistance in walking
Ambulation	**S**edentary	Functional, DM, HTN, PVD, CHF, MI, COPD/PNA, CAD, H/o delirium, TIA, CVA	**R**ise from chair
Illness	Slow gait speed		**C**limb stairs
Loss of Weight	Weak grip		**F**alls
Frail if ≥ 3	Frail if ≥ 3	Frail if > 27%	Frail if ≥ 4

Methods: Cognitive Function Screening

Cognitive function was assessed via the NIH-developed patient questionnaire:

- **PROMIS-C:** Patient-Reported Outcomes Measurement Information System – Cognitive Function: Mean = 50, Standard deviation = 10, higher = better cognition

Results: Association of Cognition and Positive Frailty Screen

Frailty Screening Tools and PROMIS-C Score

Characteristic (mean, SD)	Patients (N = 62), n (%)	PROMIS-C Score, Mean (SD)	P Value
Fried Frailty Index (FFI)			0.041
Frail (≥ 3)	17 (27.4%)	44.6 (6.56)	
Pre-Frail or Robust (< 3)	45 (72.6%)	49.8 (8.38)	
mFI-11			0.026
Frail (≥ 0.27)	12 (19.4%)	45.1 (4.18)	
Robust (< 0.27)	50 (80.6%)	49.1 (8.76)	
FRAIL Scale			0.031
Frail (≥ 3)	15 (24.2%)	44.0 (7.03)	
Pre-Frail or Robust (< 3)	47 (75.8%)	49.7 (8.14)	
SARC-F			0.12
Positive (≥ 4)	16 (25.8%)	45.4 (8.75)	
Negative (< 4)	46 (74.2%)	49.4 (7.85)	

Table 1. Frail patients have lower cognitive function if screened by FS, FFI, or mFI-11, but SARC-F (sarcopenia) does not capture cognitive impairment as well as frailty tools

Table 2. Univariate Regression for Positive Frailty Screen

	Positive FRAIL Scale		Positive FFI		Positive mFI-11		Positive SARC-F	
	OR (95% CI)	P Value	OR (95% CI)	P Value	OR (95% CI)	P Value	OR (95% CI)	P Value
Age	1.10 (1.04 – 1.18)	0.003	1.08 (1.03 – 1.14)	0.0053	1.25 (1.12 – 1.49)	0.0020	1.05 (1.00 – 1.10)	0.046
Female	3.83 (0.956 – 15.4)	0.058	4.88 (1.37 – 23.3)	0.024	1.01 (0.28 – 3.84)	0.98	1.85 (0.57 – 6.65)	0.32
CCI	1.47 (1.10 – 1.96)	0.009	1.63 (1.23 – 2.32)	0.002	6.45 (2.69 – 27.6)	0.001	1.48 (1.14 – 2.03)	0.007
# Preop Meds	1.14 (1.04 – 1.28)	0.010	1.15 (1.05 – 1.29)	0.002	1.33 (1.15 -1.64)	0.001	1.18 (1.07 – 1.34)	0.004
PROMIS-C	0.90 (0.81 – 0.98)	0.028	0.91 (0.83 – 0.99)	0.035	0.935 (0.85 -1.02)	0.14	0.936 (0.86 – 1.01)	0.11
BMI	1.10 (1.02 – 1.21)	0.023	1.06 (0.98 – 1.15)	0.15	0.954 (0.86 – 1.04)	0.32	1.09 (1.01 – 1.19)	0.032
Grip Strength	0.85 (0.77 – 0.93)	0.0008	0.79 (0.69 – 0.88)	0.0001	0.84 (0.75 – 0.93)	0.002	0.86 (0.78 – 0.93)	0.001
TUG	1.71 (1.28– 2.66)	0.004	1.72 (1.29 – 2.61)	0.003	1.36 (1.15 – 1.75)	0.003	1.85 (1.34 – 3.01)	0.003

Table 2.
Cognitive impairment is associated with positive frailty screen for FS and FFI, but it is not an independent predictor in multivariate regression (not shown)

Results: Cognitive Impairment is Associated with Some Frailty Components

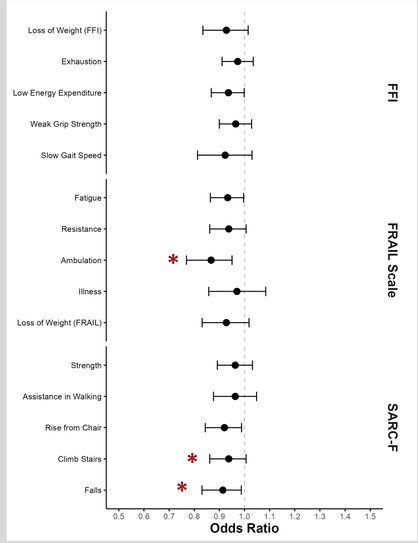


Fig. 1. Increased cognitive function is associated with decreased odds of having comorbid:

- **Decreased ambulation function** on FRAIL Scale
- **Decreased ability to rise from chair**
- **History of falls** on SARC-F

Conclusion

- VHR patients with frailty are more likely to have cognitive impairment
- However, frailty is not a surrogate marker for cognitive impairment
- The imperfect correlation of frailty and cognitive impairment is likely due to shared risk factors contributing to impairment in 2 distinct health domains, rather than reflecting dysfunction of a single process
- Both should be independently considered in preoperative risk assessment – frailty measures should not be used to infer cognitive capacity

References:
[1] Robinson et al. Frailty for Surgeons: Review of a National Institute on Aging Conference on Frailty for Specialists. J Am Coll Surg. 2015.
[2] Taylor et al. Comorbid Chronic Conditions Among Older Adults with Subjective Cognitive Decline. Innov Aging. 2020.
[3] Huggins et al. Classifying frailty in the ventral hernia population. Surg Endosc. 2024.