Frailty in older adults

GRECC CBOC Connection Case Conference Series
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Objectives

- Understand key definitions of frailty syndrome
- Discuss associations between frailty and adverse outcomes after surgery in older adults
- Explore implications of frailty in the care of vulnerable older adults undergoing surgery

Clinical Case

- 94 years old man, vibrant, physically active, independent, lived alone
- Medical history – arthritis, diabetes, hypertension

Acute Illnesses and Decline

- 1st subdural hematoma (SDH) - Burr hole
  - Adequate recovery, almost returned to baseline physical function
  - Weight loss, frequent fatigue, generalized weakness, falls
- 2nd SDH - Burr hole
  - Poor recovery, post-operative complications, significant loss of function (unable to ambulate)
  - Looked “frail” (cachectic, muscle atrophy)

Nursing Home

- Dysphagia
  - NG tube + physical restraints
- Delirium and agitation
  - Pharmacologic sedation
- Pressure ulcers
- Recurrent hospitalizations
  - Altered mental status, infections, aspiration, polypharmacy, fecal impaction

End-of-Life

- Last hospitalization
  - Acute multi-organ failure
    - Septic shock (pneumonia, bacteremia)
    - Pneumothorax (hypoxia)
    - Renal failure (no urine output)
  - Management
    - IV fluids, pressors, antibiotics and albumin
    - MD offered chest tube – declined by family
    - MD offered dialysis – consented by family
  - Died in hospital

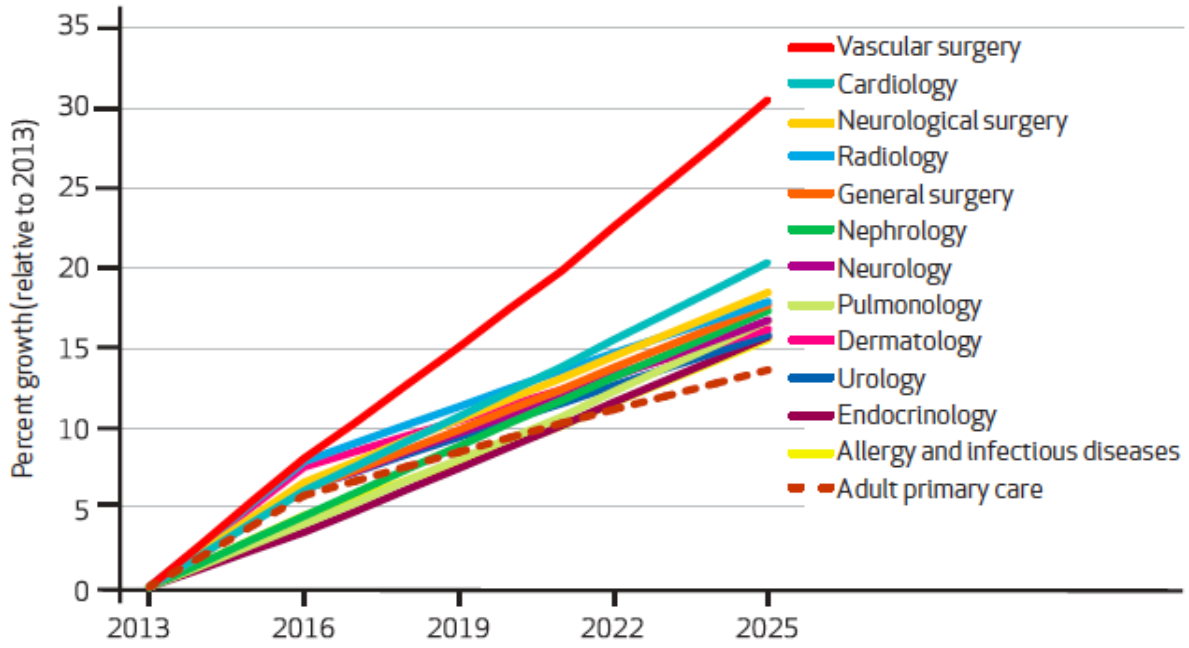
Missed opportunities for geriatric, palliative and hospice care!

- Alternatives to surgery, physical restraints, tube feeding, chemical sedation for agitation?
- Palliation and hospice focused care goal discussions?
- Implementing palliative and hospice care at nursing home or acute hospital?
- *Using frailty to help guide management?*

Surgery: A common intervention in older patients

- More than 50% of all surgeries are performed in patients >65 years of age in US
- Demand for surgical interventions continues to increase as population ages

Projected Growth In Demand For Full-Time-Equivalent Physicians In Selected Specialties, 2013–25



SOURCE Health Care Demand Microsimulation Model projections.

Dall et al, *Health Aff* 32(11):2013-20, 2013

Surgical risk stratification

- Post-operative complications increase healthcare costs, hospital & ICU length of stay, readmissions and mortality
  - More common in older patients (1 or more complications in 20% of those >80 years old)

- Current clinical risk assessments (e.g., ASA physical status classification, Goldman cardiac risk) do not reliably predict surgical outcomes in older patients

- There is a need to improve the inexact science of preoperative risk assessment
  - *Does frailty better quantitate physiological compromise with age?*
  - *Can we use frailty measures for preoperative risk stratification?*

Khan et al, *J Gen Intern Med* 21(2):177-180, 2006
Hamel et al, *J Am Geriatr Soc* 53(3):424-429, 2005

What is frailty?

Characteristics of frailty

- Older age
- Weight loss
- Fatigue
- Weakness
- Falls
- Disability and dependency
- Multisystem decline
- Iatrogenic complications
- Delayed and incomplete recovery
- Vulnerability
- Higher mortality

Frailty: From idea to syndrome

- *American Geriatrics Society/National Institute on Aging Research Conference on Frailty, 2004*
  - A distinct clinical syndrome characterized by multisystem physiological decline with increased vulnerability to stressors and adverse clinical outcomes (i.e., reduction in physiological reserve)
  - Decreased muscle mass and strength (sarcopenia)
  - Decreased physical activity and exercise tolerance
  - Weight loss and under nutrition

Walston et al, *JAGS* 54:991–1001, 2006

Fried definition of frailty
(i.e., Physical frailty phenotype)

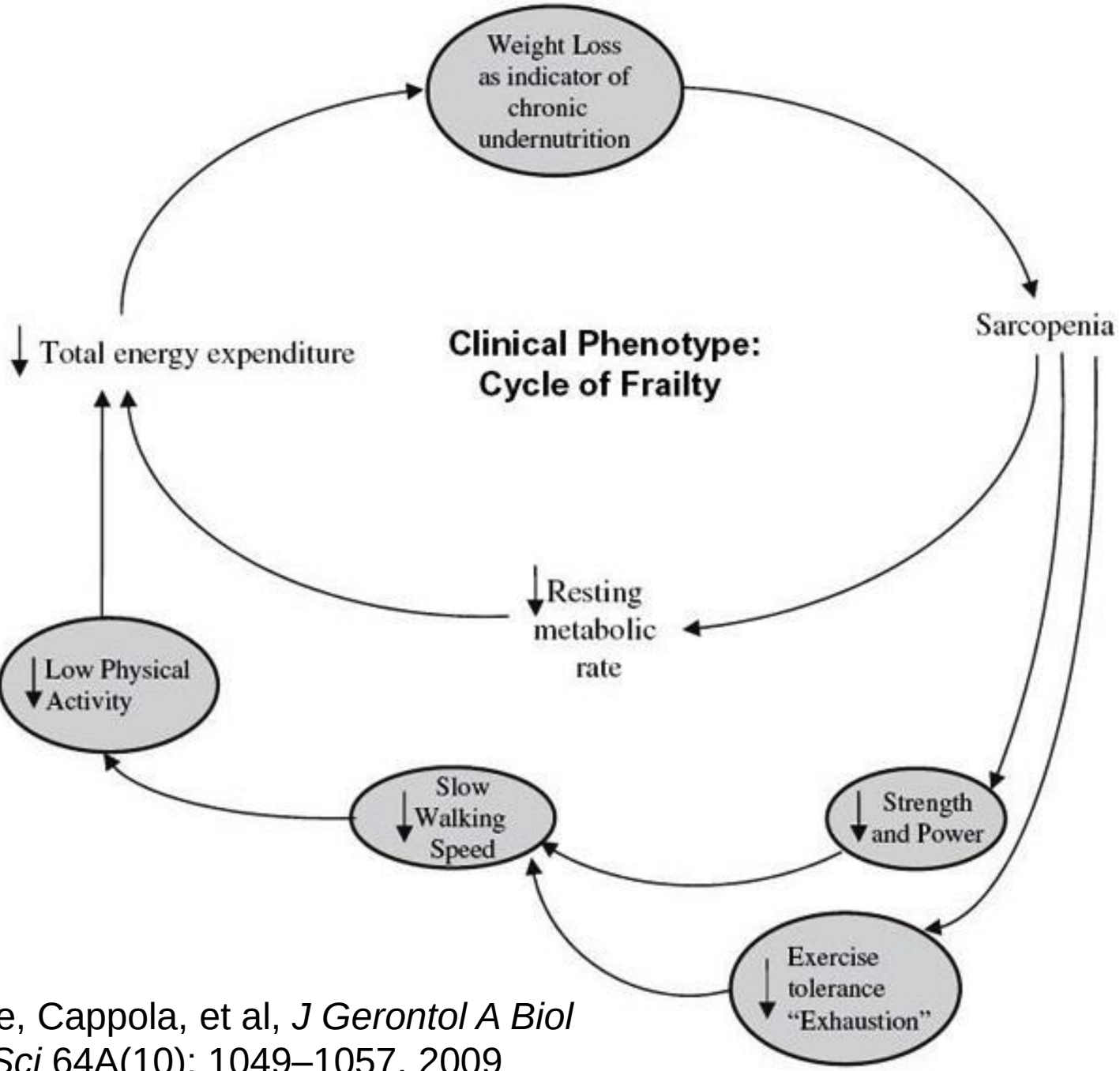
How do we identify frail, older adults?

- **Unintentional weight loss**
  - 10 lbs or more in past year
- **Weakness**
  - Grip strength: lowest 20%
- **Exhaustion**
- **Slow walking speed**
  - Walking time/15 ft: lowest 20%
- **Low physical activity**
  - Kcals/week: lowest 20%

* Frail if 3 - 5 are present
* Prefrail if 1 - 2 are present

Hopkins Frailty Assessment Calculator:
https://www.johnshopkinssolutions.com/solution/frailty/

Fried et al, *J of Gerontology* 56(3):M146-156, 2001



Fried, Xue, Cappola, et al, *J Gerontol A Biol Sci Med Sci* 64A(10): 1049–1057, 2009

Rockwood definition of frailty
(i.e., Deficit accumulation model)

The Frailty Index (FI)

- Frailty is an at-risk state caused by the age-associated accumulation of deficits
  - Multi-morbid state
  - Vulnerability is due to aggregation of related or unrelated abnormal health conditions

- Frailty Index:
  - Calculates risks for frailty in older adults by accounting for deficits identified through a routine comprehensive geriatric assessment (FI-CGA)

Jones et al, *Aging Clin Exp Res* 17(6):465-471, 2005
Mitnitski, Mogilner, & Rockwood, *ScientificWorldJournal* 1:323-336, 2001

Deficits assessed by FI-CGA

Cognitive status	MCI, dementia, delirium
Emotional	Depression, anxiety, fatigue
Motivation	Degree, health attitude
Communication	Speech, hearing, vision
Strength	Proximal and distal upper and lower extremities
Mobility	Level of dependence on transfer, walking
Balance	Balance, falls
Elimination	Bowel and bladder incontinence
Nutrition	Weight, appetite
ADLs	Feeding, bathing, dressing, toileting
IADLs	Cooking, cleaning, shopping, medications, driving, banking
Sleep	Disrupted sleep, daytime drowsiness
Socially engaged	Frequency of social interaction
Social and home environment	Marital status, living arrangement, support system, caregiver relationship, caregiver stress
Medications	Type and indication

Jones et al, *J Am Geriatr Soc* 52(11):1929-1933, 2004

Beth Israel Deaconess Online FI Calculator

https://www.bidmc.org/research/research-by-department/medicine/gerontology/calculator

CGA-FI = 0.256

CGA-FI

** Items marked with a star (*) must be completely assessed.*

Name | RESET ALL | Score : 0.256

Medical History* (6/21 items) RESET

Check any items that the patient has in his/her medical history.

- ✓ Angina
- ✗ Anxiety disorder
- ✗ Arthritis
- ✗ Asthma
- ✗ Atrial fibrillation/flutter
- ✗ Cancer within 5 years
- ✗ Chronic kidney disease (eGFR<60)
- ✓ COPD
- ✓ Coronary artery disease
- ✗ Degenerative spine disease
- ✓ Dementia
- ✗ Depression
- ✗ Diabetes
- ✗ Fall within the past year
- ✓ Heart failure
- ✓ Hypertension
- ✗ Myocardial infarction
- ✗ Peripheral vascular disease
- ✗ Sensory impairment
- ✗ Stroke/TIA
- ✗ Use of >= 5 prescription drugs

Functional Status* (5/22 items) RESET

Does the patient need help from another person to perform the following activities?

Activities of Daily Living

- ✓ Feeding
- ✗ Dressing/undressing
- ✓ Grooming
- ✓ Walking (or use of a walker)

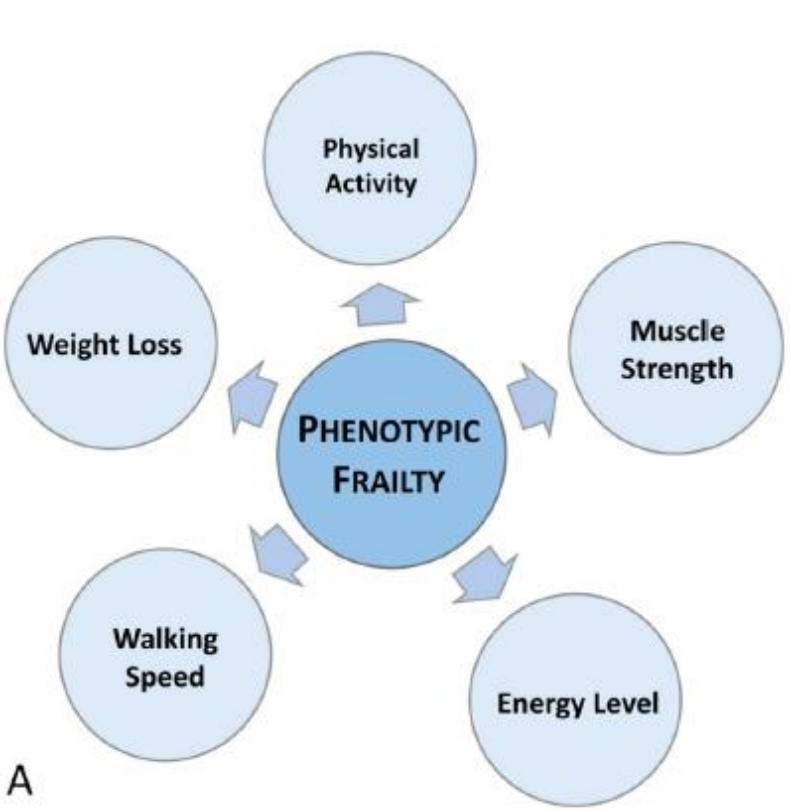
Instrumental Activities of Daily Living

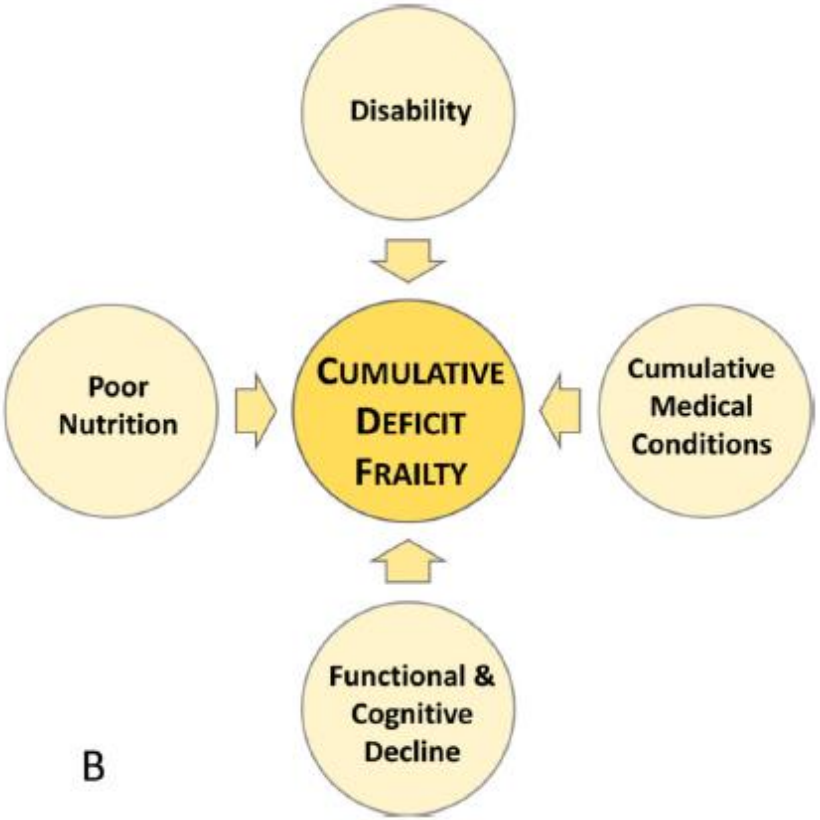
- ✗ Using telephone
- ✗ Using transportation
- ✗ Shopping
- ✓ Preparing own meals

Nagi & Rosow-Breslau Activities

- ✗ Pulling or pushing a large object
- ✓ Stooping, crouching or kneeling
- ✓ Lifting or carrying 10 lbs
- ✓ Reaching arms above shoulder

Frailty: Phenotype vs. FI





Walston et al, *J Am Geriatr Soc* 67(8):1559-1564, 2019

FRAIL Scale

- **F**atigue: Time felt tired in past 4 weeks?
- **R**esistance: Difficulty walking up 10 steps without resting and not using aids.
- **A**mbulation: Difficulty walking a couple of blocks.
- **I**llness: >4 illnesses (e.g., hypertension, diabetes, chronic lung disease)
- **L**oss of weight: >5% weight loss in past year

Prefrail 1-2; Frail 3-5

https://www.mass.gov/doc/frail-scale-screening-tool/download

Morley et al, *J Nutr Health Aging* 16(7):601-608, 2012

The Essential Frailty Toolset

CENTRAL ILLUSTRATION Essential Frailty Toolset in Older Adults Undergoing Aortic Valve Replacement

Five chair rises <15 seconds		0 Points
Five chair rises ≥15 seconds		1 Point
Unable to complete		2 Points

No cognitive impairment		0 Points
Cognitive impairment		1 Point

Hemoglobin	≥13.0 g/dL ♂ ≥12.0 g/dL ♀	0 Points
Hemoglobin	<13.0 g/dL ♂ <12.0 g/dL ♀	1 Point

Serum albumin	≥3.5 g/dL	0 Points
Serum albumin	<3.5 g/dL	1 Point

EFT Score	1-Year Mortality TAVR	SAVR
0-1	6%	3%
2	15%	7%
3	28%	16%
4	30%	38%
5	65%	50%

EFT Points: _____

Afilalo, J. et al. J Am Coll Cardiol. 2017;70(6):689–700.

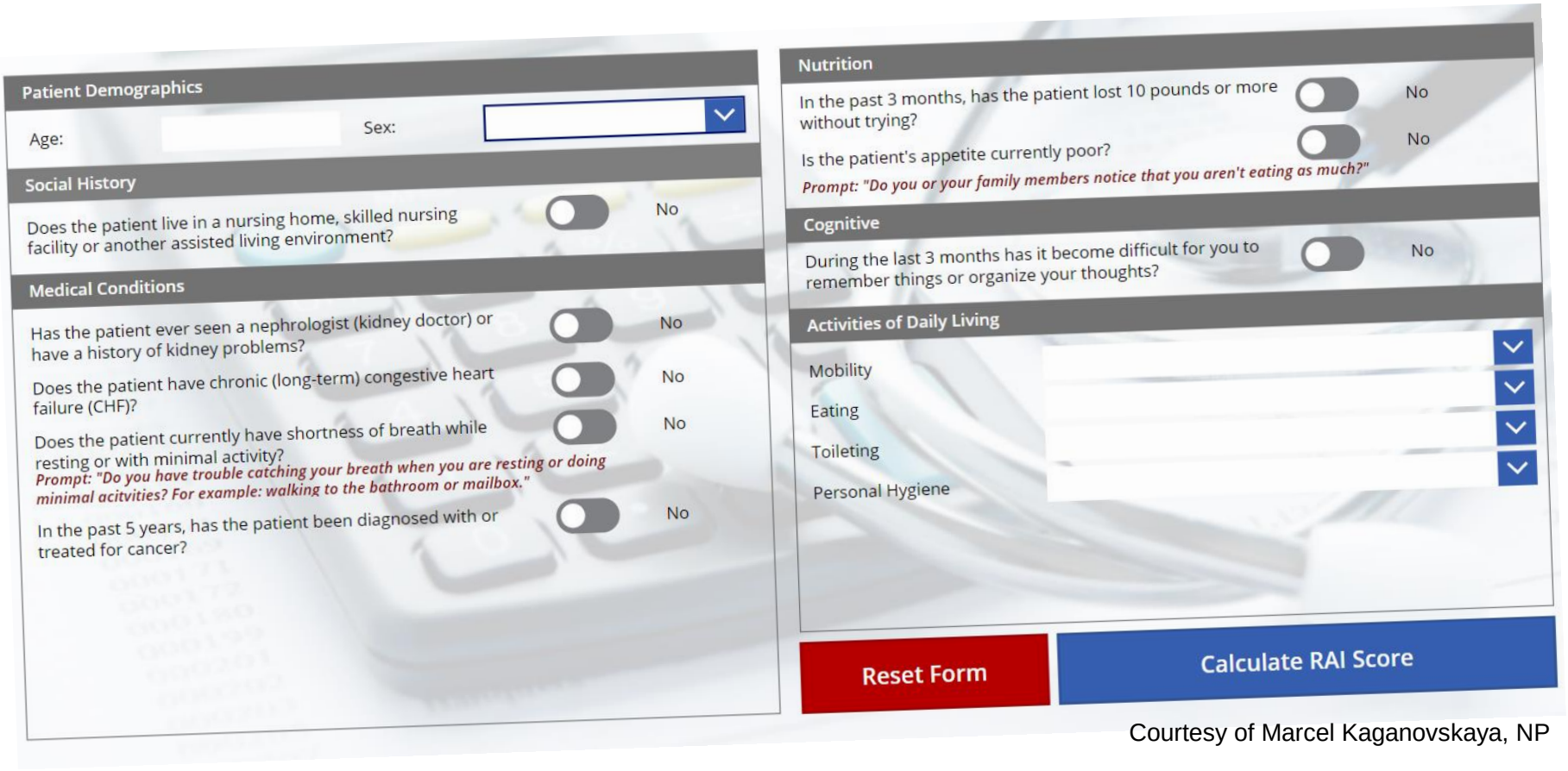
The EFT is scored 0 (least frail) to 5 (most frail) based on the following 4 items: pre-procedural anemia, hypoalbuminemia, lower-extremity muscle weakness defined as a time of ≥15 s or inability to complete five sit-to-stand repetitions without using arms, and cognitive impairment defined as a score of <24 on the Mini-Mental State Examination (which is highly unlikely if the patient is able to correctly recall 3 out of 3 words after a distractive task and may obviate the need for further cognitive testing). EFT = Essential Frailty Toolset; SAVR = surgical aortic valve replacement; TAVR = transcatheter aortic valve replacement.

Risk Analysis Index (RAI)

- A 14-item, validated brief survey (<2 min to administer) to screen frailty for elective surgery
  - Assesses social, functional, nutritional, physical and cognitive domains
  - Developed (Dr. Daniel Hall) and implemented as a perioperative screen at a growing number of VAMCs
  - Strikes a pragmatic balance between ease of administration (e.g., point-of-care testing) and predictive value (e.g., mortality) to identify high risk surgical patients & provide prognostication to inform shared decision-making.
  - *Most thoroughly validated measure of surgical frailty*

Hall et al, *JAMA Surg* 152(2):175-182, 2017

RAI



Courtesy of Marcel Kaganovskaya, NP

Score: 0-29 (Robust); 30-36 (Average); 37-44 (Frail); ≥ 45 (very frail)
*Score 37 = threshold of highest 10% with >2 times rates of postoperative mortality, complication, readmission and long-term ICU stay

Arya et al, *Ann Surg* 272(6):996-1005, 2020

Epidemiology

- **The Cardiovascular Health Study (CHS)**
  - 5,317 men and women 65 years and older
  - 7.2% four-year incidence
  - 6.9% overall prevalence
  - Frailty is associated with:
    - *Older age* (3.9% in 65-74 y.o. vs. 25% in > 85 y.o.)
    - *Female sex* (8% in women vs. 5% in men)
    - *Race* (13% in African Americans vs. 6% in Caucasian Americans)
    - *Lower education and income*

Fried et al, *J of Gerontology*, 2001
Newman et al, *J of Gerontology*, 2001

Frailty status predicts adverse outcomes in older non-surgical patients

	CHS[1]	WHAS[2]
Incident Fall	1.29 (1.00, 1.68)	1.18 (0.63, 2.19)
Worsening Mobility	1.50 (1.23, 1.82)	10.44 (3.51, 31.00)
Worsening ADL Disability	1.98 (1.54, 2.55)	15.79 (5.83, 42.78)
Hospitalization	1.29 (1.09, 1.54)	0.67 (0.33, 1.35)
Death	2.24 (1.51, 3.33)	6.03 (3.00, 12.08)

Hazard Ratios Estimated Over 3 Years

[1]Fried et al, *J Gerontology*, 2001
[2]Bandeen-Roche et al, *J Gerontology*, 2006

Preoperative frailty status predicts adverse surgical outcomes

- Adverse clinical consequences include impaired functional recovery, immobility, increased hospital readmission and mortality in a variety of surgeries

- Frailty is a predictor of adverse outcomes after major abdominal surgery (GI, GU, GYN)
  - Major morbidity (OR 2.56; 95% CI 2.08-3.16)
  - Death <90 days of surgery (OR 5.77; 95% CI 4.41-7.55)
  - Death <1 year after surgery (HR 2.71; 1.63-4.49)
  - Longer LOS (9.6 days; 95% CI 6.2-12.9 vs. 6.4 days; 95% CI 4.9-7.9)

Edwards et al. Arch Surg, 1982
Sandini et al. BJS Open, 2017
Hewitt et al. Age Ageing, 2018

Cohort studies: Association between preoperative frailty and postoperative adverse outcomes

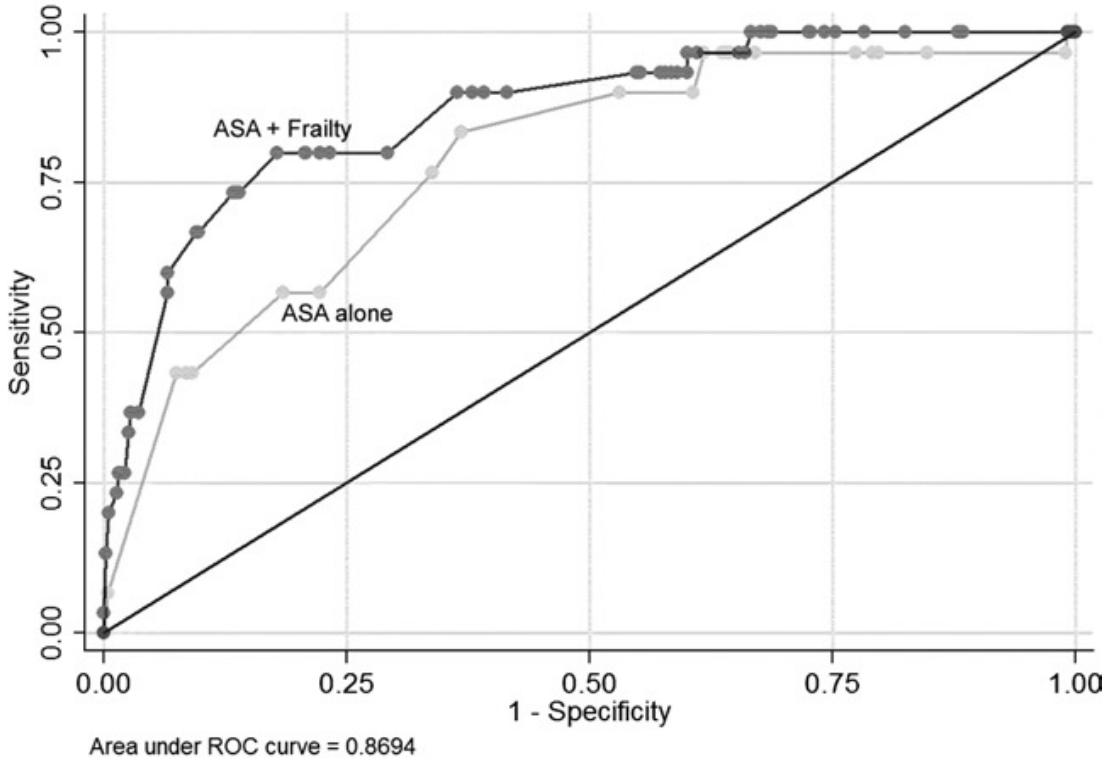
Author	Study population	Type of surgery	Frailty measure	Association with adverse outcomes: Post-operative complications	Hospital length of stay	Discharge to facility	30-day mortality	90-day or long-term mortality
Emergent surgery								
Joseph et al. (2016)	N = 220 Age: 75.5 ± 7.7 Men: 56%	Abdominal	50-variable Rockwood Preadmission FI	+	ND	ND	ND	ND
Kenig et al. (2015)	N = 184 Age: 76.9 ± 5.8 Men: 47%	Abdominal	VES-13 Geriatric-8 GFI Balducci	+	ND	ND	+	ND
Non-emergent surgery								
Makary et al. (2010)	N = 594 Age: 71.3 (65-94) Men: 40%	General	Fried phenotype	+	+	+	ND	ND
Hewitt et al. (2015)	N = 325 Age: 77.3 ± 8.2 Men: 43%	General	CSHA 7-point scale	ND	+	ND	+	+
Robinson et al. (2013)	N = 201 Age: 74 ± 6 Men: 98%	Abdominal	7-domain based score	+	+	ND	ND	ND
Saxton et al. (2011)	N = 226 Age: 61 ± 13 Men: 47%	General	CSHA 70-point scale	+	ND	ND	–	ND
Tegels et al. (2014)	N = 180 Age: 69.8 (73-88) Men: 59%	Abdominal	GFI	+	–	ND	+	–

+, $p < 0.05$; –, p is not significant

Abbreviations: FI = Frailty Index; VES-13 = Vulnerable Elderly Survey; GFI = Groningen Frailty Index; CSHA = Canadian Study of Health and Ageing; ND = not done

Ko, *Clin Ther* 42(3):387-399

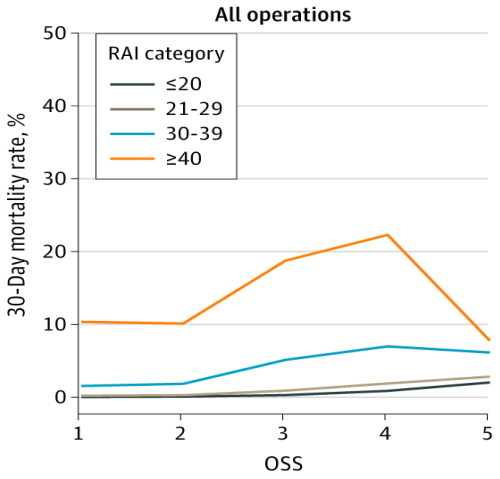
Frailty enhances predictive power of risk indices

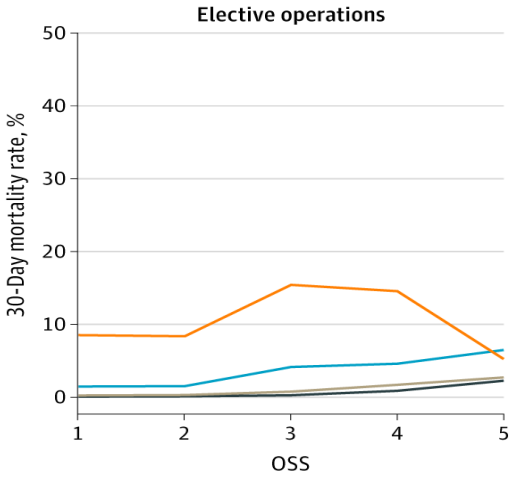


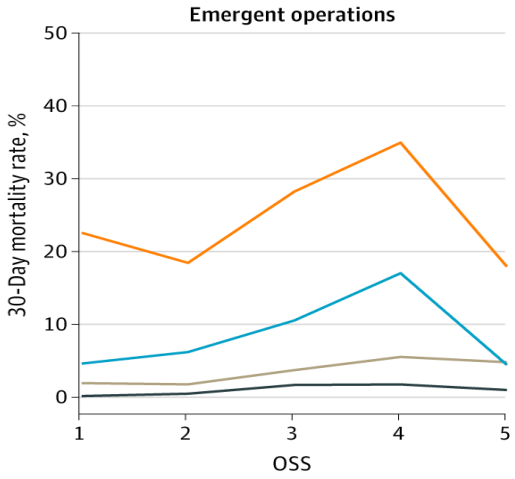
- Physical frailty phenotype (Fried definition) increases predictive power of ASA in postoperative complications and discharges to skilled or assisted-living facilities

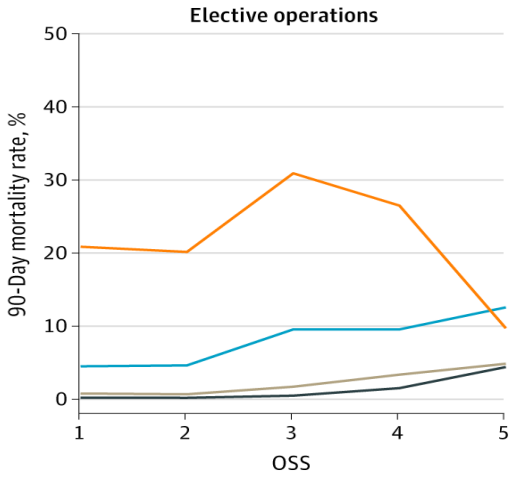
Makary et al, *J Am Coll Surg* 210(6):901-908, 2010

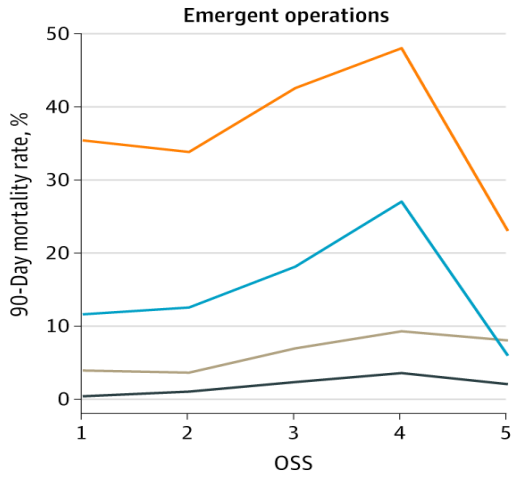
Frailty (RAI), surgical stress & mortality











No. at risk by OSS

	OSS1	OSS2	OSS3	OSS4	OSS5
Robust	18847	121507	49578	9104	641
Normal	20979	91693	58654	14507	1626
Frail	4255	11884	16086	3882	472
Very frail	464	1670	5528	1258	193

No. at risk by OSS

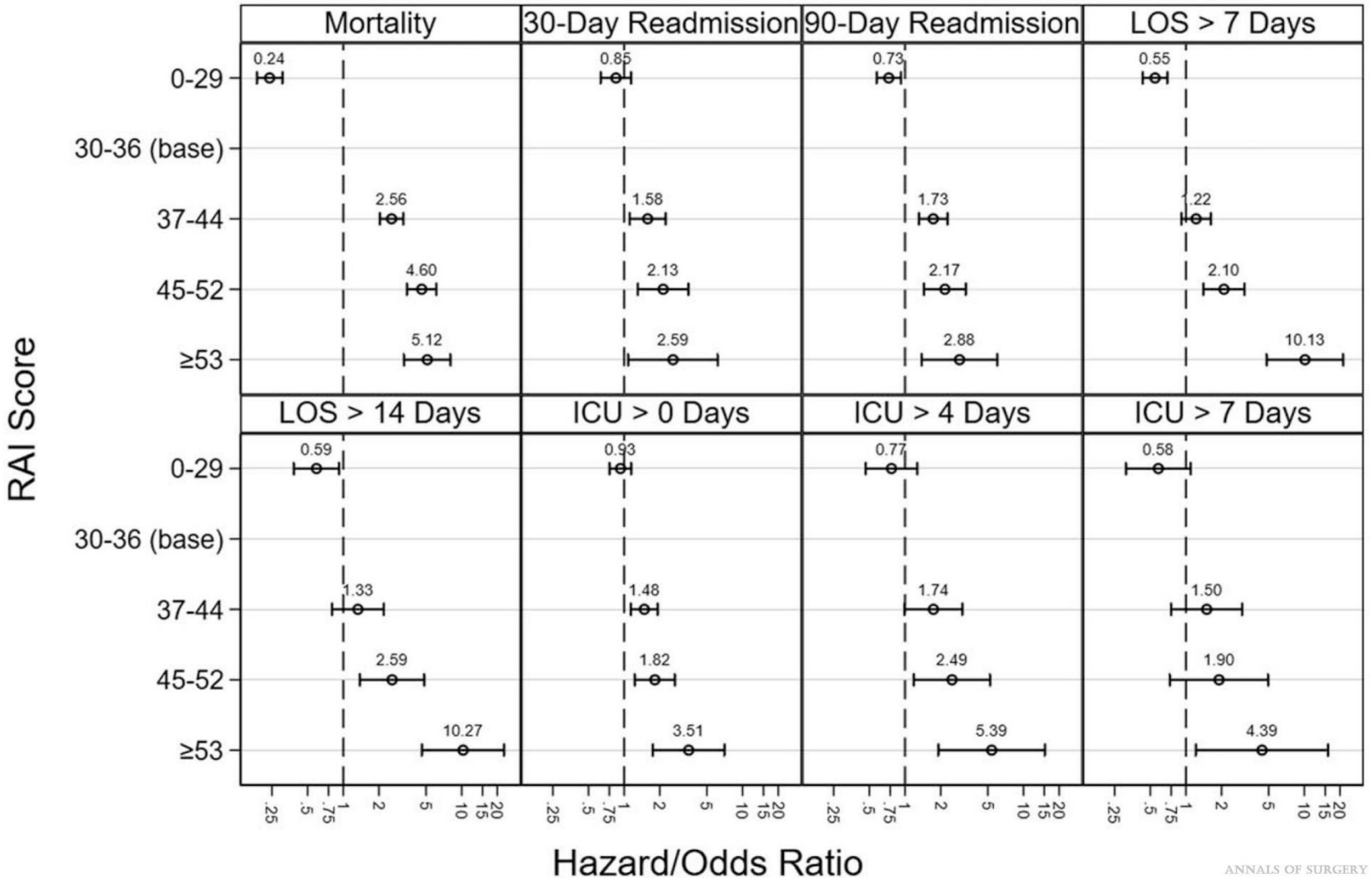
	OSS1	OSS2	OSS3	OSS4	OSS5
Robust	18347	117855	47022	8601	544
Normal	20572	89306	54865	13626	1502
Frail	4083	10937	13510	3125	405
Very frail	402	1372	4072	780	154

No. at risk by OSS

	OSS1	OSS2	OSS3	OSS4	OSS5
Robust	500	3652	2556	503	97
Normal	407	2387	3789	881	124
Frail	172	947	2576	757	67
Very frail	62	298	1456	478	39

Shinall et al, *JAMA Netw Open* 3(7):e2010358

Frailty (RAI), hospital readmission & LOS



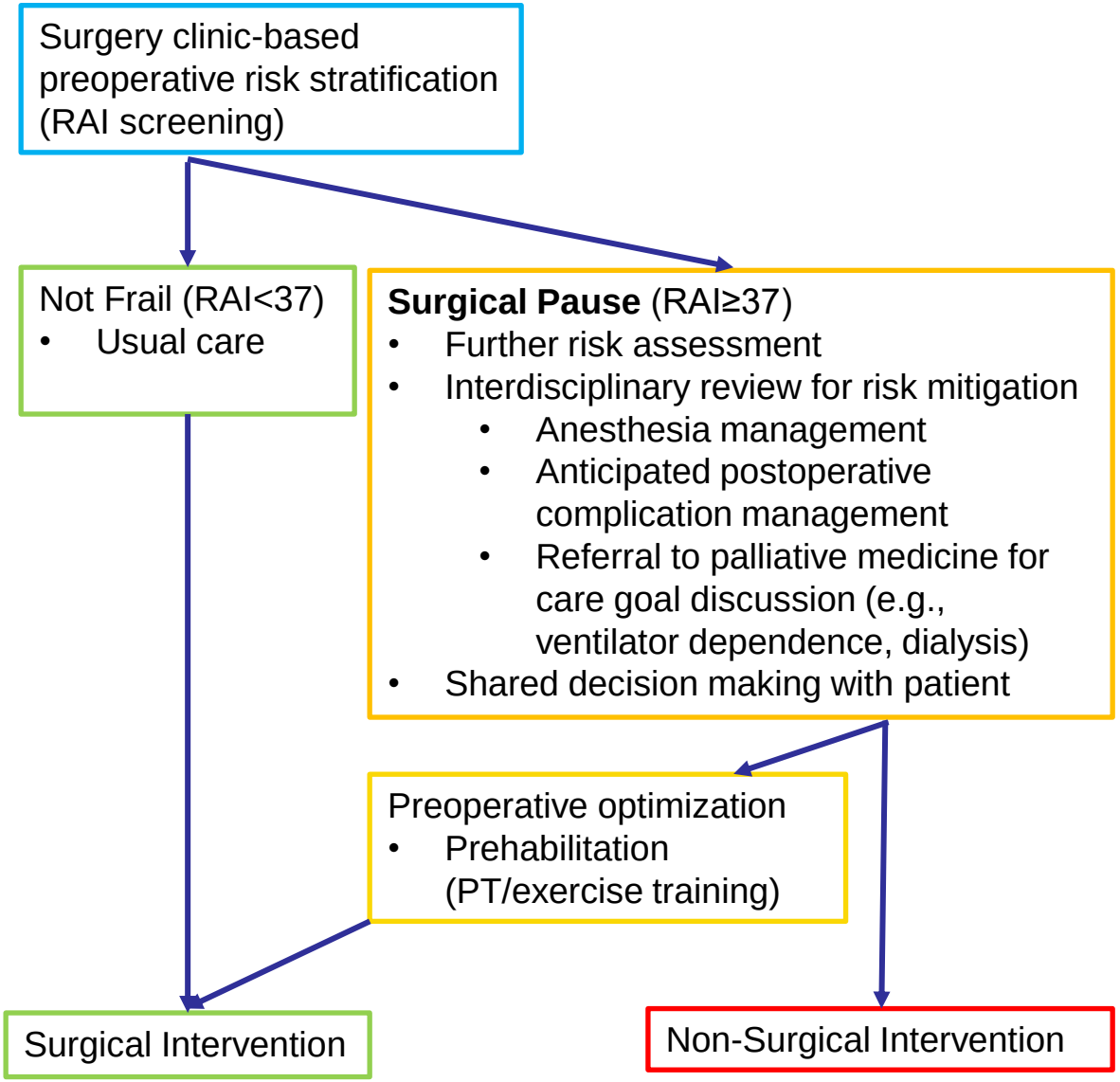
Varley et al, *Ann Surg* 274(6):e1230, 2021

How do we care for frail older adults undergoing surgery?

Clinical care of frailty: Challenges

- Broad clinical spectrum of frailty
- High medical and psychosocial complexity
- Lack of gold standard definition
- Lack of definitive therapy
- Lack of consensus treatment guideline

The Surgical Pause Practice



Frailty screening initiative is associated with reduced mortality in frail patients:

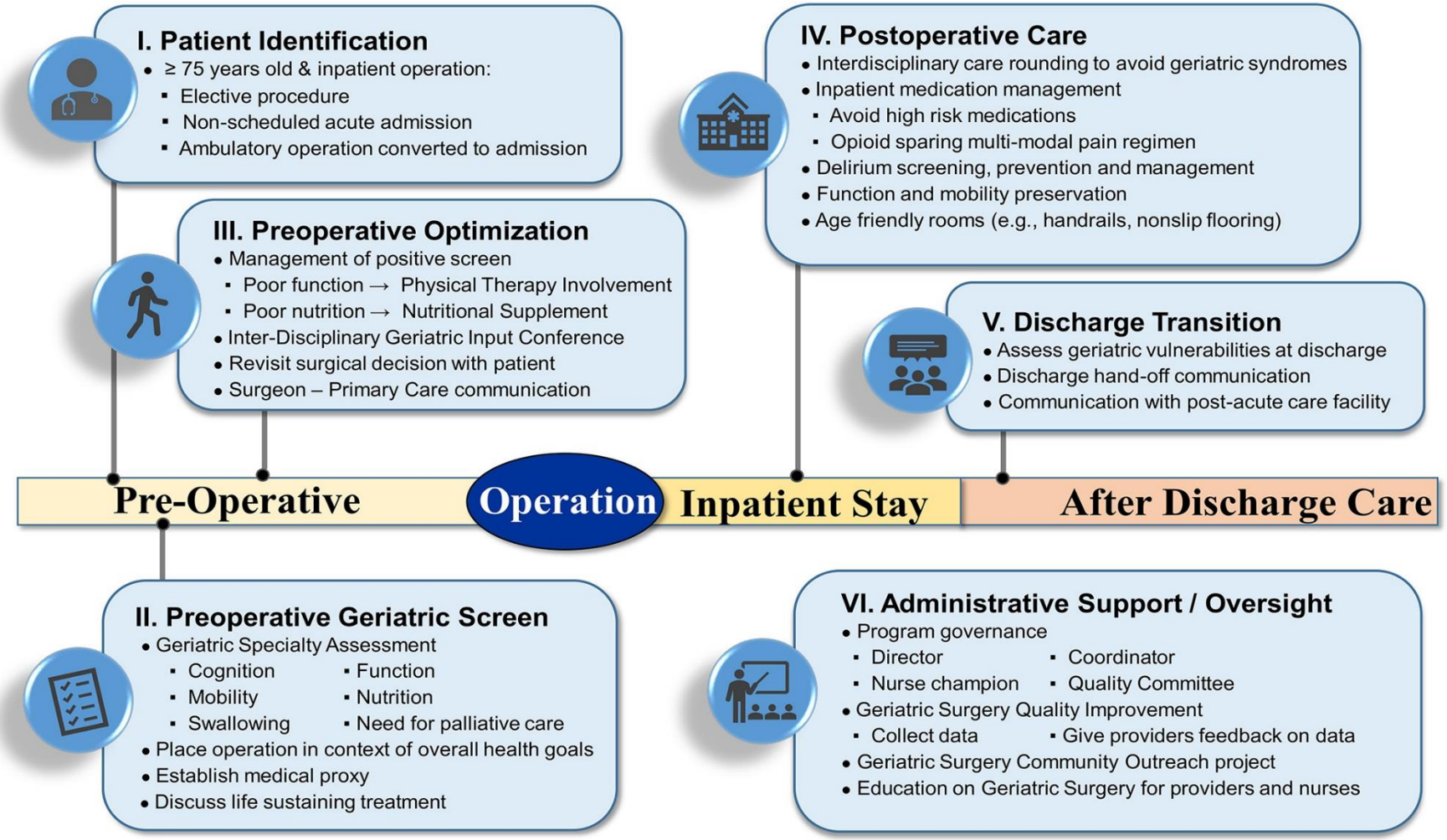
- 30 day mortality
  - 12.2% → 3.8%
- 180 day mortality
  - 23.9% → 7.7%
- 365 day mortality
  - 34.5% → 11.7%

VA Diffusion of Excellence Gold Status

- *Ongoing implementation efforts in 18 VISNs*

Hall et al, *JAMA Surg* 152(3):233-240, 2017

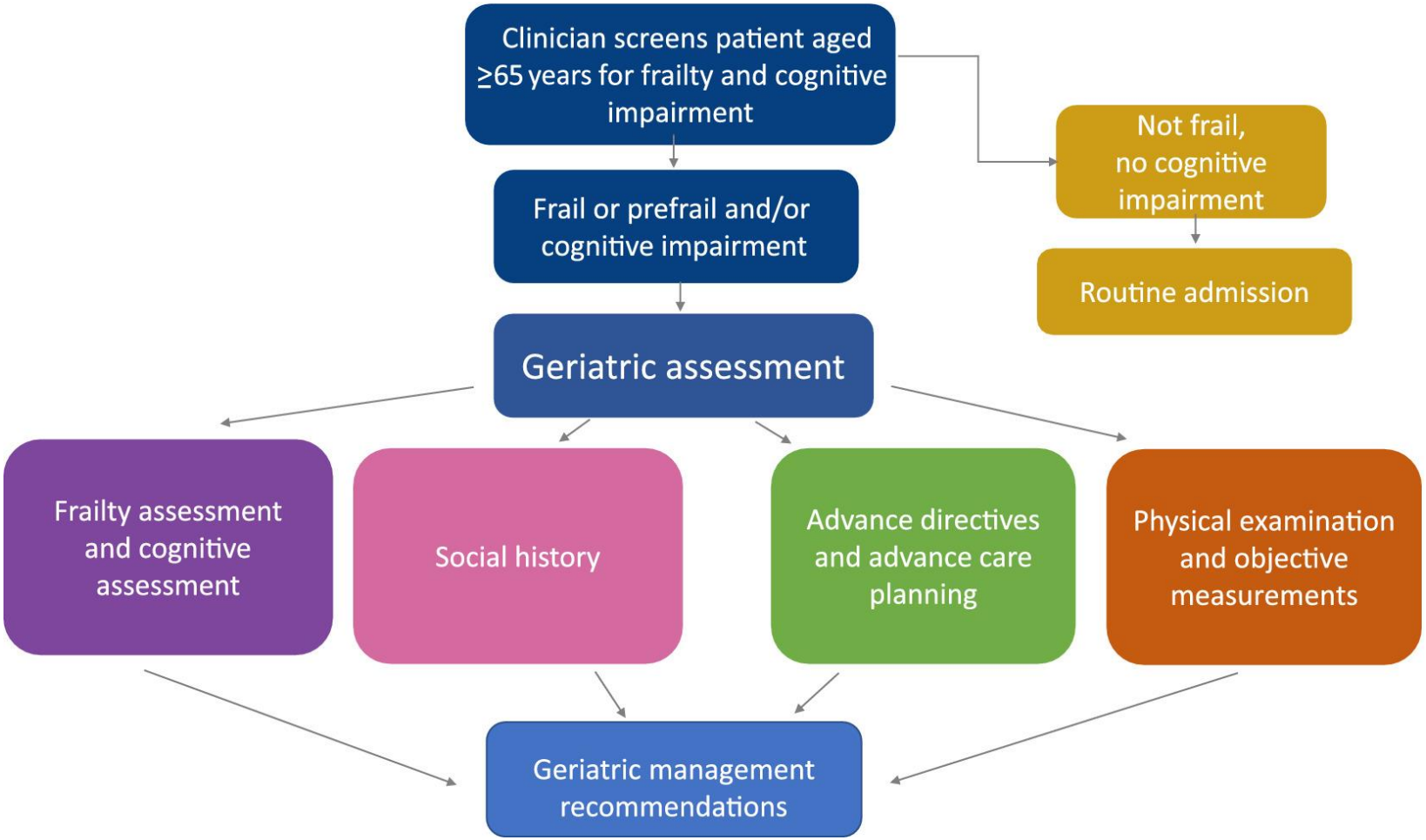
American College of Surgeons Geriatric Surgery Verification (GSV) Program



https://www.facs.org/quality-programs/accreditation-and-verification/geriatric-surgery-verification/

Jones et al, *J Am Geriatr Soc* 69(7):1993-1999, 2021

Society for Perioperative Assessment and Quality Improvement (SPAQI)

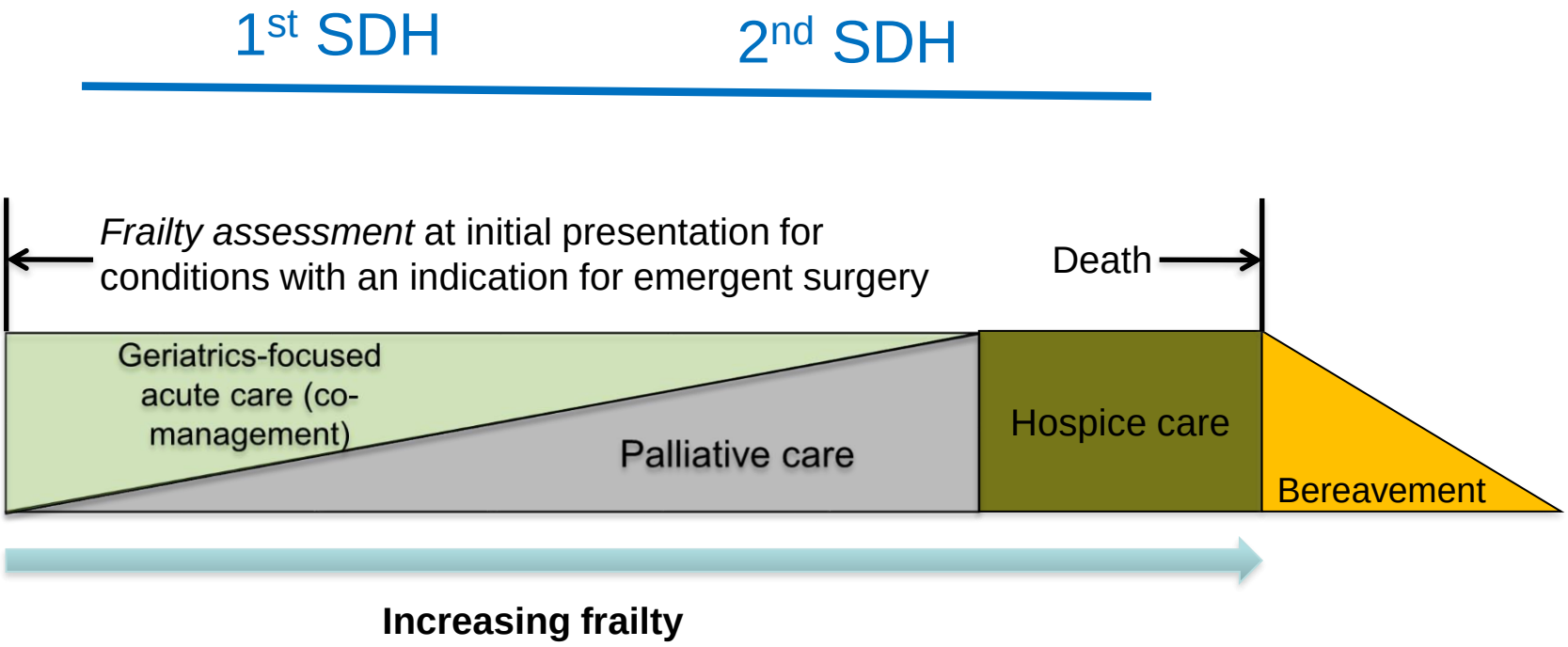


Cooper et el, *J Am Geriatr Soc* 68(9):1941-1946, 2020

Emerging frailty-focused perioperative practice guidelines

- American Society of Colon and Rectal Surgeons (Saur et al, Dis Colon Rectum 65(4):473-488, 2022)
- British Geriatrics Society for elective and emergency surgery (https://www.bgs.org.uk/cpocfrailty)

Back to the patient…



Summary

- Frailty predicts poor surgical outcomes in vulnerable older adults and is an essential aspect of preoperative screening/risk stratification.

- Best practice for the care of frail older surgical patients should incorporate a multidisciplinary approach, coupled with shared decision making, across their surgical journey (preoperative geriatric screen/optimization, postoperative care, discharge transition).

- Research is needed to identify effective and targeted interventions (e.g., exercise, nutrition) to optimize recovery after surgery in frail patients.

Thank You!

Frailty phenotype defined by Cardiovascular Health Study (Fried et al, *J Gerontol* 56(3):M146-156*A*, 2001)

Frailty Characteristics	Assessment	
Unintentional weight loss	*Baseline:* lost >4.5 kg in the last year *Follow-up:* ([weight in previous year - current weight]/[weight in previous year]) ≥0.05	
Weakness (loss of strength)	Grip strength	
	Women:	*Men:*
	≤17 kg for BMI ≤23	≤29 kg for BMI ≤24
	≤17.3 kg for BMI 23.1–26	≤30 kg for BMI 24.1–26
	≤18 kg for BMI 26.1–29	≤30 kg for BMI 26.1–28
	≤21 kg for BMI >29	≤32 kg for BMI >28
Exhaustion	Self-report of either: Feeling that everything the person did was an effort in the last week, or inability to get going in the last week	
Slowness	Observed walking for 4.57 m at usual pace	
	Women:	*Men*:
	Time ≥7 s for height ≤159 cm	Time ≥7 s for height ≤173 cm
	Time ≥6 s for height >159 cm	Time ≥6 s for height >173 cm
Low physical activity	*Women:* energy <270 kcal on activity scale (18 items) *Men:* energy <383 kcal on activity scale (18 items)	

Frail if ≥3 criteria present; Pre-frail if 1 or 2 criteria present