Part 2: Brief screening tests for frailty

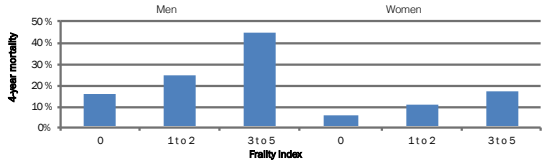
Brief frailty screening tools (<3 mins)

FRAIL scale	Clinical Frailty Scale	Gait speed	Chair stands
5 characteristics are assessed (self-report) ! Fatigue ! Resistance ! Ambulation ! Illness ! Loss of weight	A general assessment of medical history, ADL and IADL disability is needed. 	4-meter or 5-meter usual gait speed ! Usual gait speed is more prognostic than maximum gait speed. ! A stopwatch and a long corridor are needed. ! A sensor/wearable device is available.	Time to complete 5 chair stands without use of arm ! Inability to complete the task is considered as abnormal. ! A chair and small space are needed. ! May not be feasible in hospitals or SNFs
Morley et al. J Nutr Health Aging. 2012; 16: 601-608	Rockwood et al. CMAJ. 2005; 173: 489-495.	Studenski et al. JAMA. 2011; 305: 50-58.	Bandinelli et al. J Am Geriatr Soc. 2009; 57: 2172–2173.

Kim DH. (2018). Frailty and Functional Assessment. In S. Barnett & S. Neves (Eds.), Perioperative Care of the Elderly Patient (pp. 83-98). Cambridge: Cambridge University Press.

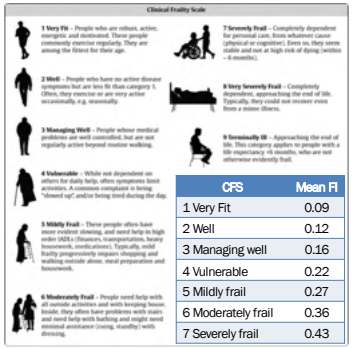
FRAIL questionnaire

Domain	Scoring Criteria	Pts
Fatigue	*"How often of the time during the past 4 weeks did you feel tired?"* If all of the time or most of the time, give 1 point.	1
Resistance	*"By yourself and not using aids, do you have any difficulty walking up 10 steps without resting?"*	1
Ambulation	*"By yourself and not using aids, do you have any difficulty several hundred yards?"*	1
Illness	*"Did a doctor ever tell you that you have [illness]?"* The illnesses are hypertension, diabetes, cancer (other than a minor skin cancer), chronic lung disease, heart attack, CHF, angina, asthma, arthritis, stroke, and kidney disease. If 5-11 illnesses, give 1 point.	1
Loss of weight	More than 5% weight loss over 1 year	1

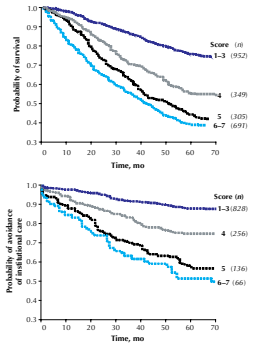


Morley et al. J Nutr Health Aging. 2012; 16: 601-608, J Am Geriatr Soc 2012; 60: 1478-86

Clinical Frailty Scale



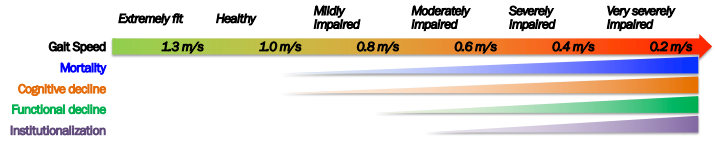
CFS	Mean FI
1 Very Fit	0.09
2 Well	0.12
3 Managing well	0.16
4 Vulnerable	0.22
5 Mildly frail	0.27
6 Moderately frail	0.36
7 Severely frail	0.43



Rockwood et al. CMAJ. 2005; 173: 489-495.

Usual gait speed

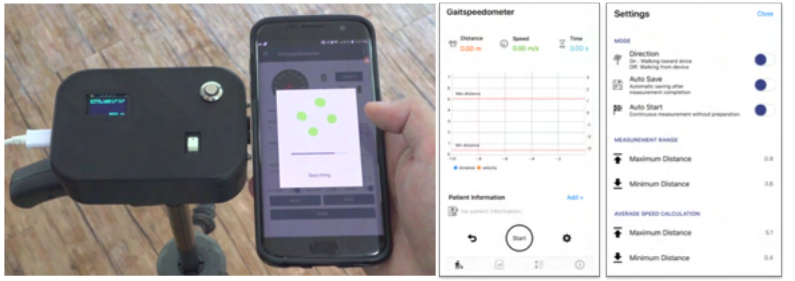
- Time to complete a 4-meter or 5-meter walk
- 0.1 m/s difference ~ 12% relative change in mortality
- Gait speed <0.8 m/s: sensitivity 99%, specificity 64% for frailty phenotype
- Gait speed depends on sensory organs, brain and nervous system, cardiopulmonary function, and musculoskeletal system



Studenski et al. JAMA 2011; 305: 50-58, Clegg et al. Age Ageing 2015; 44: 148-152, Abellan Van Kan et al. J Nutr Health Aging 2009; 13: 881-889. 21

Gait speed assessment in BIDMC Gerontology

- Measurement of gait speed using a LIDAR sensor



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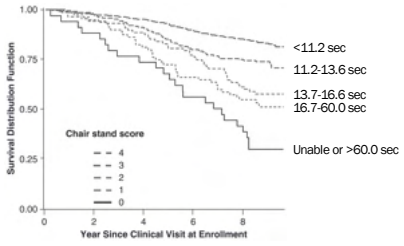
Chair rise test

- Time to complete 5 chair rises without using arms
- A test of lower extremity muscle strength



Bandinelli et al. J Am Geriatr Soc. 2009; 57: 2172–2173. https://www.cdc.gov/steadi/pdf/STEADI-Assessment-30Sec-508.pdf 23

Part 3: Comprehensive geriatric assessment for frailty evaluation and management

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Comprehensive geriatric assessment (CGA)

- Assessment of multiple domains:
  - Medical history and medications
  - Functional status and disability
  - Cognition and mood
  - Physical performance
  - Nutritional status
  - Social support

→ Prognostication (risk prediction)
→ Comprehensive care plan

- Performed by a geriatrician or multidisciplinary team
- Reduce mortality, functional decline, and institutionalization

Stuck and Iliffe. BMJ 2011; 343: d6799, Ellis et al. BMJ 2011; 343: d6553

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BIDMC FI calculator

- A 50-item deficit-accumulation FI
  - Range: 0 to 1
  - Submaximal limit: ~0.7
- Based on CGA items
  - Medical history and polypharmacy (21 items)*
  - Functional status (22 items)*
  - Cognitive and physical performance (4 items)
  - Nutritional status (3 items)

(* Mandatory)

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

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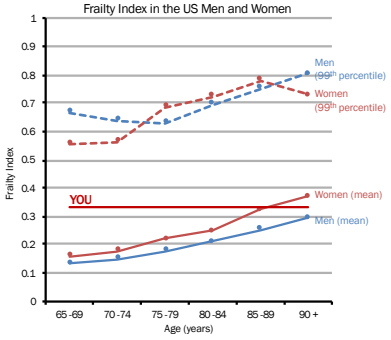
Interpretation of FI



- Severity of frailty

Score	Classification
<0.15	Non-frailty
0.15-0.24	Pre-frailty
0.25-0.34	Mild frailty
0.35-0.44	Moderate frailty
0.45-0.54	Severe frailty
!0.55	Advanced frailty

- FI as a biologic age?
  - Example: a 75-yo woman with FI 0.33 (similar to the mean FI of 85-89 year-olds)

Data from National Health and Aging Trends Study (community-dwelling Medicare population)

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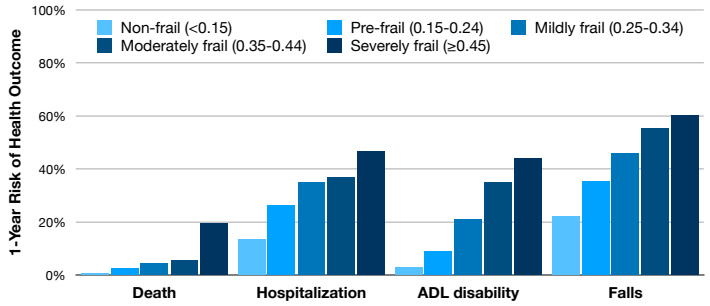
Prognostication (risk prediction) based on FI



Data from National Health and Aging Trends Study (community-dwelling Medicare population)

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Multi-component interventions for frailty

Domain	Interventions
Medical	❑ Prioritize management of conditions that have a major impact on functioning ❑ Relax disease management targets (e.g., diabetes, hypertension) ❑ Deprescribe medications that have high likelihood of harms and unclear benefits (i.e., time-to-benefit > life expectancy)
Physical function (mobility, strength)	❑ Physical therapy or exercise program ❑ Home hazard modification and vitamin D supplementation for fall prevention
Disability (ADL, IADL disability)	❑ Provide services to assist medication management and housework ❑ Social worker referral
Cognitive function	❑ Cognitive training ❑ Deprescribe psychoactive drugs; consider medications for memory
Nutrition	❑ Nutritional supplementation

Turner and Clegg. Age Ageing. 2014; 43: 744-747.

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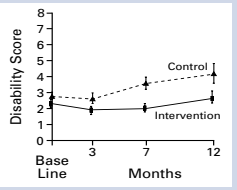
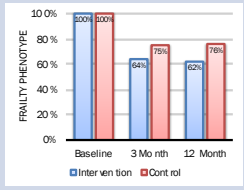
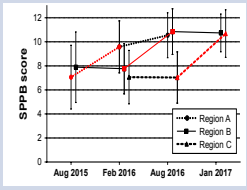
Examples of frailty intervention programs

Gill (N Engl J Med 2002; 347: 1068-1074)	Cameron (BMC Med 2013; 11: 65)	Jang (Clin Int Aging 2018; 13: 1799-1814)
188 community-dwelling patients with frailty (mean age 83 y)	216 community-dwelling patients with frailty (mean age 83 y)	187 community-dwelling adults with frailty (mean age 77 y)
Home PT & home hazard reduction for 6 m + monthly phone calls for 6 m vs. health education	Home PT, nutrition, mood, pain, chronic disease management for 12 m vs. usual care	Group exercise, nutrition, mood, deprescribing, home hazard reduction for 6 m







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FI for shared decision-making before surgery

- A prospective cohort study (n=246; mean age 82 years) of TAVR and SAVR
- Functional status: number of physical tasks one can perform without help (0-22)

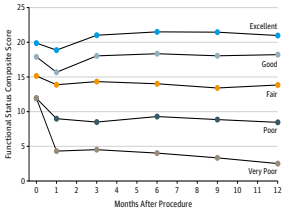

Table 2. Preoperative Frailty Index and Functional Status Trajectory After Aortic Valve Replacement[a]

CGA-FI	No. (%) Excellent (n = 58)	Good (n = 72)	Fair (n = 74)	Poor (n = 24)	Very Poor (n = 13)	Total (N = 241)
TAVR						
≤0.20	3 (50.0)	3 (50.0)	0	0	0	6
0.21-0.30	12 (35.3)	11 (32.4)	10 (29.4)	1 (2.9)	0	34
0.31-0.40	3 (6.8)	13 (29.6)	22 (50.0)	2 (4.6)	4 (9.1)	44
0.41-0.50	2 (5.9)	6 (17.7)	15 (44.1)	8 (23.5)	3 (8.8)	34
≥0.51	0	0	7 (31.8)	10 (45.5)	5 (22.7)	22
SAVR						
≤0.20	24 (58.5)	15 (36.6)	1 (2.4)	1 (2.4)	0	41
0.21-0.30	14 (43.8)	13 (40.6)	4 (12.5)	1 (3.1)	0	32
0.31-0.40	0	10 (47.6)	10 (47.6)	1 (4.8)	0	21
0.41-0.50	0	1 (14.3)	5 (71.4)	0	1 (14.3)	7
≥0.51	0	0	0	0	0	0

Abbreviations: CGA-FI, comprehensive geriatric assessment-based frailty index; SAVR, surgical aortic valve replacement; TAVR, transcatheter aortic valve replacement.

[a] Five patients whose functional status trajectory could not be determined due to in-hospital mortality were excluded. In the absence of randomization, these results cannot be used to compare the effectiveness of TAVR vs SAVR on functional status.

Kim et al. JAMA Intern Med 2019;179:383-391.

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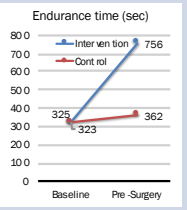
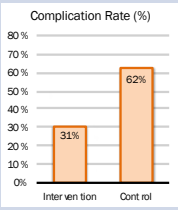
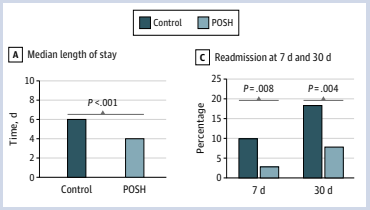
Prehabilitation and geri-surgery co-management

Barberan-Garcia (Ann Surg 2018; 267: 50-56)	McDonald (JAMA Surg 2018; 153: 454-462)
125 elective abdominal surgery patients (mean age 71 years; 75% cancer)	183 high-risk patients undergoing elective abdominal surgery
Personalized program for daily activity (pedometer) + stationary bike, 1-3/wk for 6 wk vs. usual care	Integrated care (geriatrics, surgery, anesthesia), preop-CGA and plan, geri-surgery co-mgmt vs. usual care







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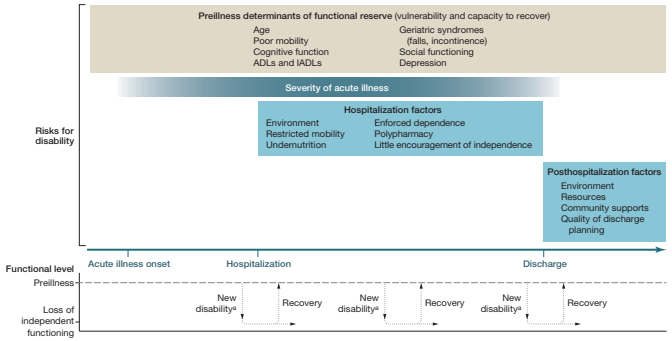
Part 4: Frailty and Post-Acute Care

Hospitalization-associated disability



Covinsky et al. JAMA 2011; 306: 1782-1793.

No standardized frailty assessment in PAC

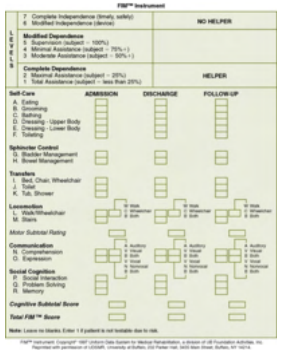
Categorization of Studies

	Charlton, 2012 [17]	Chen, 2014 [18]	Coleman, 2012 [19]	Faber, 2006 [20]	Fairhall, 2014 [21]	Galloway, 2016 [22]	Gonzalez-Vaca, 2014 [12]	Haley, 2014 [23]	Hussain, 2009 [24]	Jerez-Roig, 2017 [25]	Latham, 2003 [26]	Maddocks, 2016 [27]	Morandi, 2013 [28]	Peel, 2014 [29]	Potter, 2016 [30]	Roberts, 2014 [31]	Singh, 2012 [32]	Trombetti, 2013 [33]	Frequency (n)	Percent (%)
Frailty scales																				
Physical tests	1	0	1	3	2	1	0	1	1	1	0	2	6	5	2	6	6	4	42	54%
Cognitive tests	0	0	2	1	0	0	0	2	2	0	0	1	2	1	1	1	1	2	16	21%
Comorbidity assessments	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	3%
Frailty scale	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	3	4%
Quality of life	0	0	0	0	0	0	0	2	0	0	0	0	1	1	0	1	1	0	6	8%
Nutrition	0	0	0	1	0	0	1	0	0	0	0	0	2	0	1	0	0	0	5	6%
Social support	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1%
Other	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3	4%

Roberts et al. PM&R 2018; 10: 1211-1220.

Deficit-accumulation FI in PAC

- A pilot study in an inpatient geriatric rehabilitation unit in Australia
  - 258 patients (mean age 79 yrs, female 54%)
  - Routinely collected data:
    - Functional Independence Measure (18 items)
    - Comorbidities (14 items)
    - Polypharmacy
  - Mean FI: 0.42 (SD, 0.13); 99% percentile: 0.69
  - OR of higher level of care or death per 0.1 increase in FI: 1.38 (95% CI, 1.11-1.70)



Arjunan et al. Australas J Ageing 2018; 37: 144-146