Frailty and Transition of Care for Hospitalized Older Adults

ECHO-CT Webinar

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- **I have no financial relationships with a commercial entity producing healthcare-related products and/or services.**

Goals and objectives

After participating in this activity, you will be able to

- Define frailty using commonly used frailty definitions
- Perform a brief screening test of frailty
- Interpret the results of comprehensive geriatric assessment-based frailty index
- Develop a transition-of-care plan for medically complex older adults based on frailty assessment

94-yo man with fall and fracture

- Fall, resulting in 4 rib fractures (concern for flail chest) and vertebral fracture
- PMH: AF on warfarin, COPD, hypothyroidism, PE, BPH, HTN, HFpEF, CAD, anemia, valvular heart disease (s/p mitraclip)
- Hospital course: ICU admission for respiratory monitoring
  - Pain control: APAP, hydromorphone PRN, oxycodone PRN
  - Tachycardia (due to AF), fatigue
- Prior to admission: lives with wife at home; use a rollator; ADLs independent; IADLs help with housekeeping
- Inpatient functional change: impaired safety awareness, requires assistance with functional mobility
- Discharged to rehab on hospital day 4

89-yo woman with pneumonia and AF

- Fell at home, unable to get up; pneumonia and new-onset AF with RVR
- PMH: depression, weight loss (>10 lbs), osteoporosis, incontinence, syncope, recurrent falls, macular degeneration
- Hospital course: IV antibiotics, metoprolol and apixaban for AF, straight cath PRN for urinary retention, delirium
- Prior to admission: live alone independently (ADL/IADL)
- Inpatient functional change: loss in endurance, mobility, and self-care ability
- Discharge to rehab on hospital day 12

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Part 1: Overview of frailty

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What is frailty?

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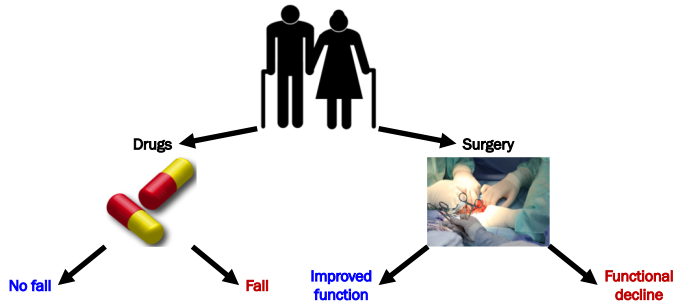
Same treatment, different outcomes: some patients are more prone to poor outcomes



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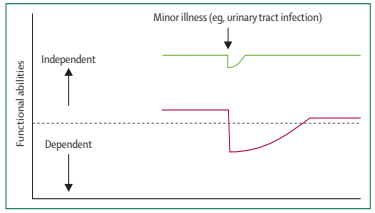
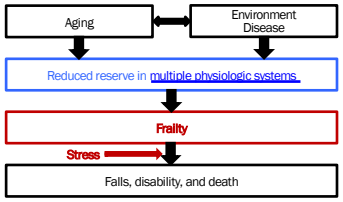
Frailty: a geriatric syndrome underlying heterogeneity

- A state of reduced physiologic reserve to maintain homeostasis (homeostenosis)
- Increased vulnerability to poor health outcomes after a stressor
- Manifestation: fatigue, weight loss, falls, delirium, and fluctuating disability





Clegg et al. Lancet 2013; 381: 752-62

Frailty prevalence and outcomes

- Frailty affects one in every 10 community-dwelling older adults and one in every 2 nursing home residents.
- Frailty prevalence is higher with advancing age and in women.
- Frailty is a risk factor for adverse health outcomes, independently of demographic characteristics and comorbidities.
  - Falls
  - Worsening disability
  - Hospitalization
  - Long-term care institutionalization
  - Mortality

Collard et al. J Am Geriatr Soc. 2012;60:1487-1492, Kojima. J Am Med Dir Assoc. 2015; 16: 940-945, Clegg et al. Lancet. 2013;381:752-762

Frailty phenotype (physical frailty)

- Frailty is diagnosed based on the 5 characteristics:

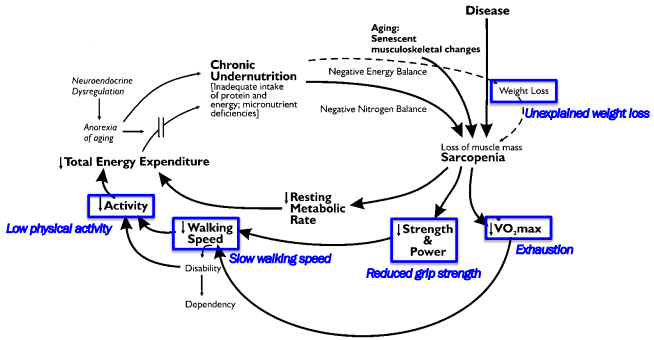
weight loss	exhaustion	inactivity	slowness	weakness
				
	(self-report)	(physical activity questionnaire)	(timed walk test)	(hand dynamometer)

- Identify a clinically recognizable group of people who have unique characteristics

Score	Classification
0	Non-frailty
1-2	Pre-frailty
3-5	Frailty

Fried et al. J Gerontol A Biol Sci Med Sci. 2001; 56: M146-56

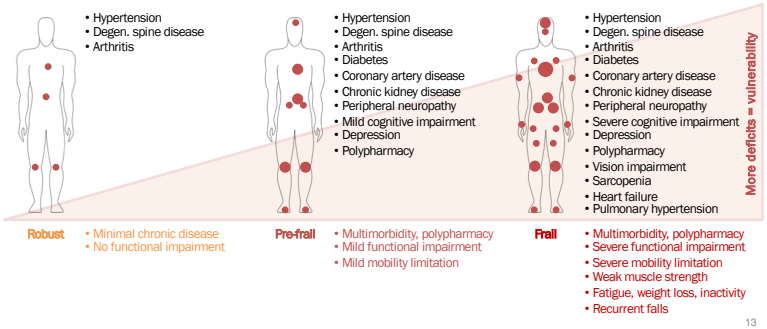
Frailty phenotype attempts to measure altered stress response and energy metabolism abnormalities



Fried et al. J Gerontol A Biol Sci Med Sci. 2001; 56: M146-56

Frailty as deficit accumulation: "The problems of old age come as a package"

(Fontana et al. Nature 2014; 511: 405-406)



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Deficit-accumulation frailty index (FI)

- Frailty can be quantified as deficit accumulation.
- Proportion of deficits (range: 0 to 1): $FI = \frac{\text{n of health deficits present}}{\text{n of health deficits considered}}$
  - Need ≥30 deficit items
  - Deficits should be age-associated and acquired
    (e.g., symptoms, diagnoses, functional limitations, physical examination, diagnostic test abnormalities)
  - The overall burden is important; less emphasis on specific items
  - Increasing popularity for implementation in EHR

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

Rockwood et al. Sci World J 2001; 1: 323-36, Rockwood et al. Clin Geriatr Med 2011; 27: 17–26

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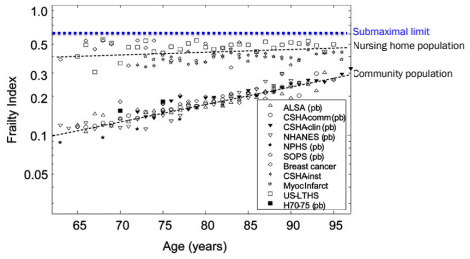
Submaximal limit of a deficit-accumulation FI

- Submaximal limit of a frailty index (typically ~0.7) indicates "very few people can survive with more than 70% deficits."



Rockwood et al. J Gerontol A Biol Sci Med Sci. 2007; 62A: M722-M727, Rockwood et al. Clin Geriatr Med 2011; 27: 17-26.

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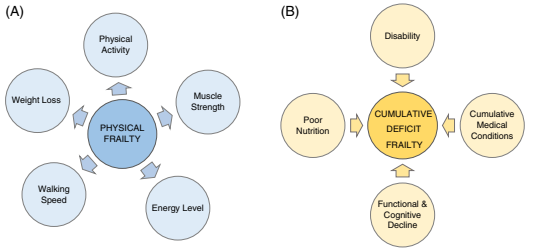
Frailty phenotype vs deficit-accumulation FI

- Correlation between the two measures: 0.65



Rockwood et al. J Gerontol A Biol Sci Med Sci. 2007;62A:M738-M743, Walston et al. J Am Geriatr Soc 2019;67:1559-1564.

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Part 2: Brief screening tests for frailty

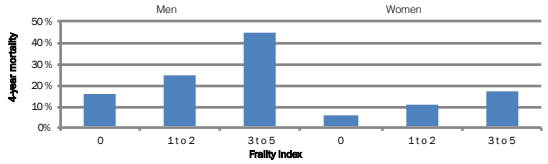
Brief frailty screening tools (<3 mins)

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.

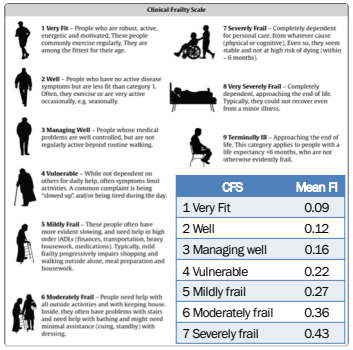
FRAIL questionnaire

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

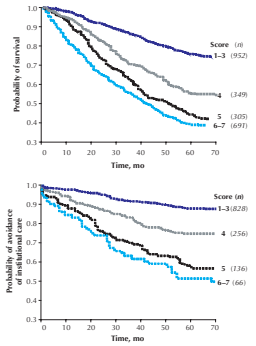


Morley et al. J Nutr Health Aging. 2012; 16: 601-608, J Am Geriatr Soc 2012; 60: 1478-86

Clinical Frailty Scale



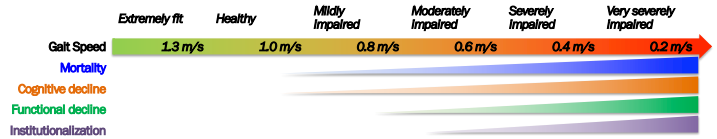
CFS	Mean FI
1 Very Fit	0.09
2 Well	0.12
3 Managing well	0.16
4 Vulnerable	0.22
5 Mildly frail	0.27
6 Moderately frail	0.36
7 Severely frail	0.43



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

Usual gait speed

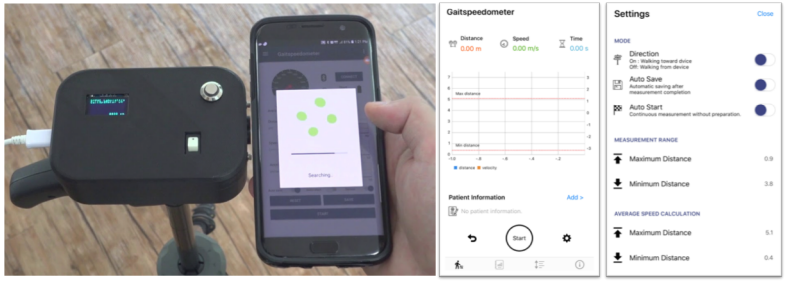
- Time to complete a 4-meter or 5-meter walk
- 0.1 m/s difference ~ 12% relative change in mortality
- Gait speed <0.8 m/s: sensitivity 99%, specificity 64% for frailty phenotype
- Gait speed depends on sensory organs, brain and nervous system, cardiopulmonary function, and musculoskeletal system



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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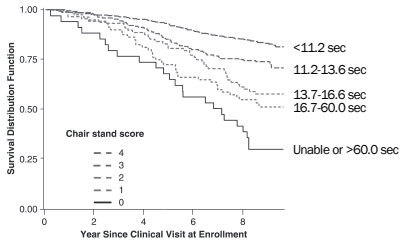
Chair rise test

- 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

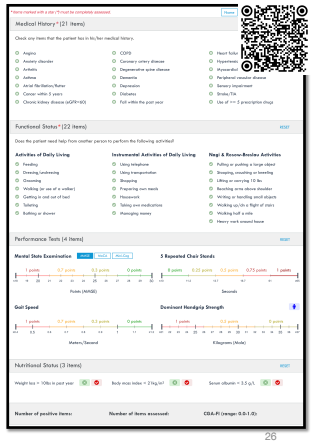
- Performed by a geriatrician or multidisciplinary team
- Reduce mortality, functional decline, and institutionalization

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

BIDMC FI calculator

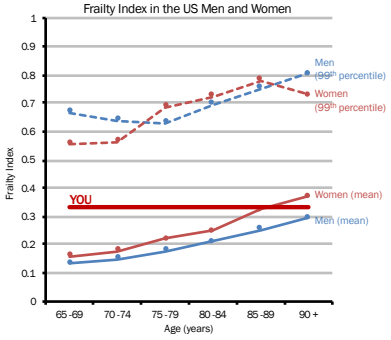
- A 50-item deficit-accumulation FI
  - Range: 0 to 1
  - Submaximal limit: ~0.7
- Based on CGA items
  - Medical history and polypharmacy (21 items)*
  - Functional status (22 items)*
  - Cognitive and physical performance (4 items)
  - Nutritional status (3 items)

(* Mandatory)



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

Interpretation of FI



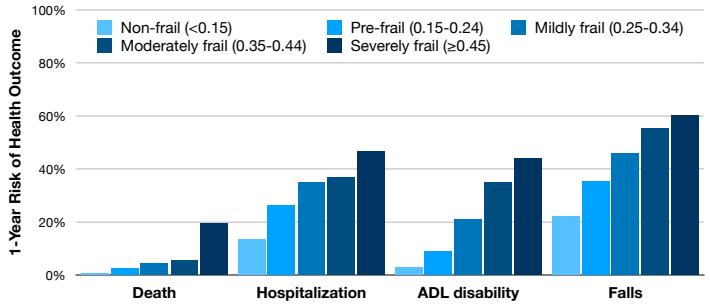
- Severity of frailty

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)

Prognostication (risk prediction) based on FI



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

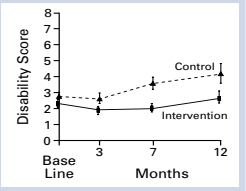
Multi-component interventions for frailty

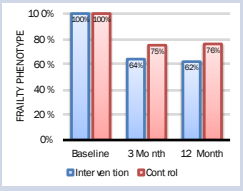
Domain	Interventions
Medical	❑ Prioritize management of conditions that have a major impact on functioning ❑ Relax disease management targets (e.g., diabetes, hypertension) ❑ Deprescribe medications that have high likelihood of harms and unclear benefits (i.e., time-to-benefit > life expectancy)
Physical 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

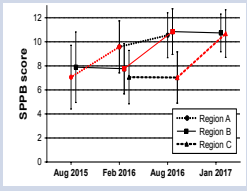
Turner and Clegg. Age Ageing. 2014; 43: 744-747.

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







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)

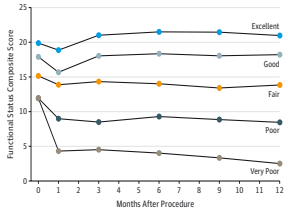


Table 2. Preoperative Frailty Index and Functional Status Trajectory After Aortic Valve Replacement[a]

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

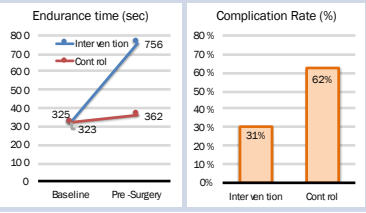
Abbreviations: CGA-FI, comprehensive geriatric assessment-based frailty index; SAVR, surgical aortic-valve replacement; TAVR, transcatheter aortic-valve replacement.

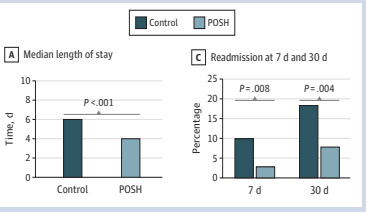
[a] Five patients whose functional status trajectory could not be determined due to in-hospital mortality were excluded. In the absence of randomization, these results cannot be used to compare the effectiveness of TAVR vs SAVR on functional status.

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

Prehabilitation and geri-surgery co-management

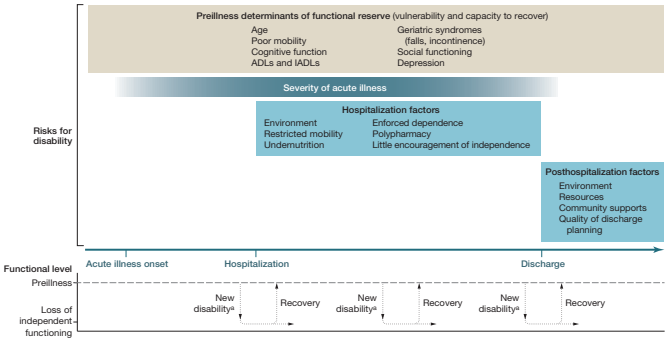
Barberan-Garcia (Ann Surg 2018; 267: 50-56)	McDonald (JAMA Surg 2018; 153: 454-462)
125 elective abdominal surgery patients (mean age 71 years; 75% cancer)	183 high-risk patients undergoing elective abdominal surgery
Personalized program for daily activity (pedometer) + stationary bike, 1-3/wk for 6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





Part 4: Frailty and Post-Acute Care

Hospitalization-associated disability



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

No standardized frailty assessment in PAC

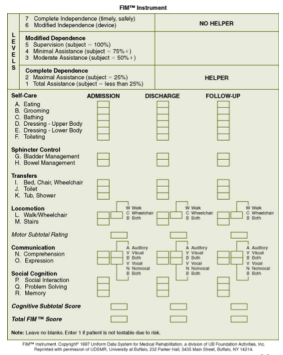
Categorization of Studies

	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	1	0	1	0	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

Clinical Frailty Scale in PAC

- Outcomes of 6-week inpatient rehabilitation
  - Balance
  - Functional exercise capacity
  - Strength
  - Mobility
  - Transfers

Table II. Changes in outcome measures from initial to final assessment (n = 32)[a].

	T1	T2	
Outcome measure	Median (IQR)	Median (IQR)	*p* Value
BBS (/56)	27 (22.5)	37 (15.5)	≤0.0001*
TUG (seconds)	59 (59)	40 (17.5)	≤0.0001*
6MWT (metres)	56 (55)	108 (70.5)	≤0.0001*
	Mean (SD)	Mean (SD)	
EQ-VAS (%)	61.25 (18.27)	72.5 (20.12)	=0.002*
BI (/100)	57.66 (20.32)	76.41 (19.35)	≤0.0001*
CFS (/7)	6.34 (0.48)	5.63 (0.66)	≤0.0001*

[a]Data presented for subjects who were available for T1 and T2 assessments (n = 32).
*Significant at the $p \leq 0.05$ level.
T1 = Assessment on admission to rehabilitation service, T2 = Assessment following 6 weeks of rehabilitation.
6MWT, 6-Minute Walk Test; BBS, Berg Balance Scale; BI, Barthel Index; CFS, Clinical Frailty Scale; EQ-VAS, EuroQol-Visual Analogue Scale; IQR, interquartile range; SD, standard deviation; TUG, Timed Up and Go.

Coleman et al. Disabil Rehabil 2012; 34: 1333-1338

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Frailty interventions in PAC

- Few studies evaluated interventions targeting frailty in PAC, with mixed results.
- Physical therapy / exercise program
  - Resistance training
  - Functional walking or balance training
- Deprescribing
- Little evidence on nutritional supplementation and social support, which does not mean lack of benefit; further research is warranted.

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

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Part 5: Recommendations

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JOURNAL OF CLINICAL ONCOLOGY COMMENTS AND CONTROVERSIES

Time to Stop Saying Geriatric Assessment Is Too Time Consuming

Marije E. Hamaker, *Diakonessenhuis, Utrecht, the Netherlands*
Tanya M. Wildes, *Washington University School of Medicine, St Louis, MO*
Siri Rostoft, *Oslo University Hospital and University of Oslo, Oslo, Norway*

Table 1. Comparative Cost of Nurse's Salary Compared With That of Other Diagnostic Instruments Used in Oncologic Workup

Diagnostic Instrument	Cost ($)
Nurse's salary for 1 hour*	28
Complete blood count	17
Carcinoembryonic antigen	50
Chest x-ray	67
Bilateral screening mammography	321
Abdominal or chest CT scan	640
MRI pelvis	739
Liver biopsy	879
Whole-body PET-CT	1,788
Colonoscopy with biopsy	2,187
Breast cancer genomic testing (Oncotype†)‡	3,416
Liquid biopsy (Guardant360§)‖	5,800

Hamaker et al. J Clin Oncol. 2017; 35: 2871-2874.

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Address barriers to assessment in routine care

Process	Barriers
Screening and assessment	• Time-related: lack of time, competing priority • Clinic process: inadequate staffing, lack of standardized process • Provider factors: reliance on patient or family report • Patient factors: patient's impairments preventing assessment
Documentation	• EHR: long reminders and complicated templates • Connection to clinical use: limited utility of the obtained information
Use of information to improve care	• Connection to patient outcomes: lack of meaningful metrics • Accessibility of data: lack of standardized data location in EHR • Provider knowledge of referrals and services

Nicosia et al. J Am Geriatr Soc 2019; 67: 493-502.

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Frailty assessment for transition of care

- Frailty is a key concept for understanding health status, estimating prognosis, and delivering individualized care in older adults.
- Adopt a brief standardized assessment (e.g., Clinical Frailty Scale) for clear communication of prognosis and treatment plan.
  - Hospital: document frailty status prior to hospitalization
  - PAC: comprehensive frailty assessment from a multidisciplinary team
- More research is needed on how frailty should be measured to enable individualized interventions to improve PAC outcomes.
  - Avoid therapeutic nihilism ("frailty ≠ no benefit from treatment")

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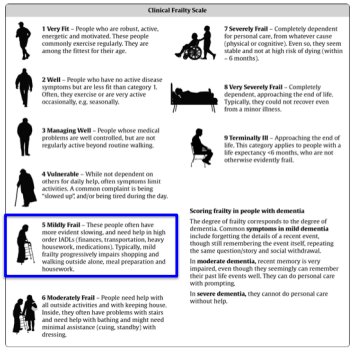
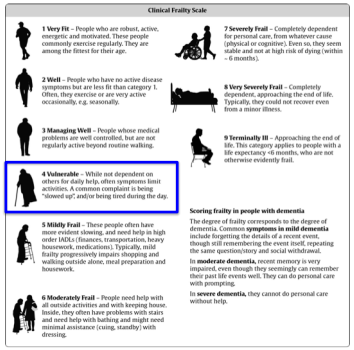
94-yo man with fall and fracture

- Fall, resulting in 4 rib fractures (concern for flail chest) and vertebral fracture
- PMH: multiple chronic conditions
- Prior to admission: use a rollator; ADLs independent; help with housekeeping
- Hospital course: pain control, tachycardia, fatigue, functional decline
- Discharged to rehab on hospital day #4



89-yo woman with pneumonia and AF

- Fell at home, unable to get up; pneumonia and new-onset AF with RVR
- PMH: multiple chronic conditions
- Prior to admission: live alone independently
- Hospital course: IV antibiotics, metoprolol and apixaban for AF, straight cath PRN for urinary retention, delirium
- Discharge to rehab on hospital day 12



Managing frail patients across care spectrum

Role	Clinical management	Hospital	Post-acute care	Community
Prognostication (*risk prediction*)	• Education about prognosis • Goals of care discussion • Social worker/case manager			
Risk stratification (*inform other disease management*)	• Prioritize chronic condition mgmt • Relax disease target • Medication reconciliation • Deprescribing medications • Minimize stressful interventions			
Target of intervention (*improve frailty per se*)	• Physical exercise • Nutritional supplementation			

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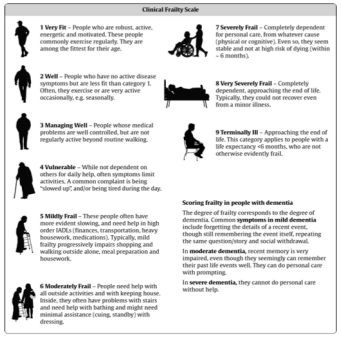
Checklist for hospital and PAC providers



- Hospital providers
  - ❑ Review prognosis and goals of hospitalization
  - ❑ Medication reconciliation (to PAC)
  - ❑ Minimize stressful interventions
  - ❑ Early mobilization
  - ❑ Geriatric consultation for co-management
- PAC providers
  - ❑ Review prognosis and goals of PAC
  - ❑ Medication reconciliation (to community)
  - ❑ Modify chronic disease management (medication reduction, BP target, fatigue)
  - ❑ Physical therapy, nutritional supplementation

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