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-yr 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

Part 1: Overview of frailty

What is frailty?

Same treatment, different outcomes: some patients are more prone to poor outcomes
Frailty: a geriatric syndrome underlying heterogeneity

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

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

Frailty phenotype (physical frailty)

- Frailty is diagnosed based on the 5 characteristics:
  - Weight loss
  - Exhaustion
  - Inactivity
  - Slowness
  - Weakness

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


Frailty phenotype attempts to measure altered stress response and energy metabolism abnormalities
Frailty as deficit accumulation: “The problems of old age come as a package”

(Fortana et al. Nature 2014; 511: 404-409)

Frailty phenotype vs deficit-accumulation FI

- Correlation between the two measures: 0.65

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

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.”
Part 2: Brief screening tests for frailty

**FRAIL questionnaire**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Scoring Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>“How often of the time during the past 4 weeks did you feel tired?”</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>If all of the time or most of the time, give 1 point.</td>
<td></td>
</tr>
<tr>
<td>Resistance</td>
<td>“Do you ever get out of breath when walking a story or less of level ground?”</td>
<td>1</td>
</tr>
<tr>
<td>Ambulation</td>
<td>“Do you ever get short of breath?”</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>“Do you ever get short of breath when walking any distance?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Do you ever get short of breath when you are climbing stairs?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Do you ever get short of breath when you are doing any activity?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Do you ever get short of breath when you are doing any activity?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Do you ever get short of breath when you are doing any activity?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Do you ever get short of breath when you are doing any activity?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Do you ever get short of breath when you are doing any activity?”</td>
<td></td>
</tr>
<tr>
<td>Loss of weight</td>
<td>More than 5% weight loss over 1 year</td>
<td>1</td>
</tr>
</tbody>
</table>

**Clinical Frailty Scale**

<table>
<thead>
<tr>
<th>CFS Class</th>
<th>Median CFS Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Very frail</td>
<td>0.08</td>
</tr>
<tr>
<td>2 Well</td>
<td>0.12</td>
</tr>
<tr>
<td>3 Moderate</td>
<td>0.36</td>
</tr>
<tr>
<td>4 Vulnerable</td>
<td>0.62</td>
</tr>
<tr>
<td>5 Mild frail</td>
<td>1.27</td>
</tr>
<tr>
<td>6 Moderate</td>
<td>0.38</td>
</tr>
<tr>
<td>7 Severely</td>
<td>0.43</td>
</tr>
</tbody>
</table>

**FRAIL scale**

<table>
<thead>
<tr>
<th>Characteristics assessed (self-report)</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>1</td>
</tr>
<tr>
<td>Resistance</td>
<td>1</td>
</tr>
<tr>
<td>Ambulation</td>
<td>1</td>
</tr>
<tr>
<td>Loss of weight</td>
<td>1</td>
</tr>
</tbody>
</table>

**Gait speed**

4-meter or 5-meter usual gait speed

**Chair stands**

Time to complete 5 chair stands without use of arm

- Inability to complete the task is considered abnormal.
- A chair and small space are needed.
- May not be feasible in hospitals or SNFs.
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

<table>
<thead>
<tr>
<th>Gait Speed</th>
<th>Extremely Fit</th>
<th>Healthy</th>
<th>Mildly Impaired</th>
<th>Moderately Impaired</th>
<th>Severely Impaired</th>
<th>Very Severely Impaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>D2 m/s</td>
<td>1.6 m/s</td>
<td>0.8 m/s</td>
<td>0.6 m/s</td>
<td>0.4 m/s</td>
<td>0.2 m/s</td>
</tr>
</tbody>
</table>

Challenges in Gait Speed Assessment in BIDMC Gerontology

- Measurement of gait speed using a LIDAR sensor

Chair rise test

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

<table>
<thead>
<tr>
<th>Time to Complete Chair Rises Without Using Arms</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;11.2 sec</td>
</tr>
<tr>
<td>11.2-13.6 sec</td>
</tr>
<tr>
<td>13.7-16.6 sec</td>
</tr>
<tr>
<td>16.7-60.0 sec</td>
</tr>
<tr>
<td>Unable or &gt;60.0 sec</td>
</tr>
</tbody>
</table>

Part 3: Comprehensive geriatric assessment for frailty evaluation and management
**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
- Performed by a geriatrician or multidisciplinary team
- Reduce mortality, functional decline, and institutionalization

**Prognostication (risk prediction)**

**Comprehensive care plan**

**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)

**Interpretation of FI**

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

**Prognostication (risk prediction) based on FI**

- 1-Year Risk of Health Outcome
  - Non-frail (<0.15)
  - Pre-frail (0.15-0.24)
  - Mildly frail (0.35-0.44)
  - Severe frailty (≥0.45)

Data from National Health and Aging Trends Study (community-dwelling Medicare population)
Multi-component interventions for frailty

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

Examples of frailty intervention programs

- GIR (J Geriatr Soc Work, 2002; 24(4): 308-307)
  - 186 community-dwelling patients with frailty (mean age 83 y)
  - Home PT & home hazard reduction for 6 m vs. health education

- Cameron (JAMC Med 2013; 11: 66)
  - 216 community-dwelling patients with frailty (mean age 83 y)
  - Home PT, nutrition, mood, pain, chronic disease management for 12 m vs. usual care

  - 187 community-dwelling adults with frailty (mean age 77 y)
  - Group exercise, nutrition, mood, de-prescribing, home hazard reduction for 6 m

Fl 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)

Prehabilitation and geri-surgery co-management

- Barberan-Garcia (Ann Surg 2018; 267: 80-86)
  - 125 elective abdominal surgery patients (mean age 71 years; 75% cancer)
  - Personalized program for daily activity (pedometer) + stationary bike, 1/3-wk for 6 wk vs. usual care

- McDonald (JAMA Surg 2018; 153: 465-470)
  - 183 high-risk patients undergoing elective abdominal surgery
  - Integrated care (geriatrics, surgery, anesthesia, preop-CGA and plan, geri-surgery co-mgmt vs. usual care

Discussion

As such, a consistent level of improvement across the three

- Postoperative Complications
  - 1.3% vs 2% (P <.001)
  - Comparison of 1% vs 0% vs 1% (P <.001)
  - Group exercise, nutrition, mood, de-prescribing, home hazard reduction for 6 m
Part 4: Frailty and Post-Acute Care

Table 2

<table>
<thead>
<tr>
<th>Intervention successful in frail patients</th>
<th>Focused on cognitive component</th>
<th>Focused on physical component</th>
<th>Malnutrition</th>
<th>Gait speed</th>
<th>Grip strength</th>
<th>Functional decline</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Social support</td>
</tr>
<tr>
<td>Frailty scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quality of life</td>
</tr>
<tr>
<td>Comorbidity assessments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Frailty scale</td>
</tr>
</tbody>
</table>

No standardized frailty assessment in PAC

Deficit-accumulation Fl 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 Fl: 0.42 (SD, 0.13); 99% percentile: 0.69
  - OR of higher level of care or death per 0.1 increase in Fl: 1.38 (95% CI, 1.11-1.70)
Clinical Frailty Scale in PAC

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

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>T1 (Mean (SD))</th>
<th>T2 (Median (IQR))</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBB (30)</td>
<td>27 (22.3)</td>
<td>39 (15.5)</td>
<td>≤0.0001*</td>
</tr>
<tr>
<td>TUG (seconds)</td>
<td>59 (59)</td>
<td>40 (17.3)</td>
<td>≤0.0001*</td>
</tr>
<tr>
<td>5MWT (metres)</td>
<td>56 (55)</td>
<td>108 (70.5)</td>
<td>≤0.0001*</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EQ-VAS (%)</td>
<td>61.35 (18.27)</td>
<td>72.5 (20.12)</td>
<td>=0.002*</td>
</tr>
<tr>
<td>BI (100)</td>
<td>57.66 (20.32)</td>
<td>76.41 (19.35)</td>
<td>≤0.0001*</td>
</tr>
<tr>
<td>CFS (7)</td>
<td>6.54 (0.48)</td>
<td>5.63 (0.66)</td>
<td>≤0.0001*</td>
</tr>
</tbody>
</table>

Data presented for subjects who were available for T1 and T2 assessments (n = 32).

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.

Part 5: Recommendations

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

<table>
<thead>
<tr>
<th>Diagnostic instrument</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse’s salary for 1 hour</td>
<td>29</td>
</tr>
<tr>
<td>Complete blood count</td>
<td>13</td>
</tr>
<tr>
<td>Carcinoembryonic antigen</td>
<td>50</td>
</tr>
<tr>
<td>Chest x-ray</td>
<td>67</td>
</tr>
<tr>
<td>Bilateral screening mammography</td>
<td>321</td>
</tr>
<tr>
<td>Abdominal or chest CT scan</td>
<td>640</td>
</tr>
<tr>
<td>MRI pelvis</td>
<td>739</td>
</tr>
<tr>
<td>Liver biopsy</td>
<td>878</td>
</tr>
<tr>
<td>Wholebody PET-CT</td>
<td>1,786</td>
</tr>
<tr>
<td>Colonoscopy with biopsy</td>
<td>2,187</td>
</tr>
<tr>
<td>Breast cancer genomic testing (Chorion)</td>
<td>3,648</td>
</tr>
<tr>
<td>Liquid biopsy (Quartet-DEB)</td>
<td>5,820</td>
</tr>
</tbody>
</table>

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

- Significant at the p<0.05 level.
- T1 = Assessment after admission to rehabilitation service; T2 = Assessment following 6 weeks of rehabilitation.

Roberts et al. PM R 2018; 10: 1211-1320

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Time to Stop Saying Geriatric Assessment Is Too Time Consuming

Table 1. Comparative Cost of Nurse’s Salary Compared With That of Other Diagnostic Instruments Used in Oncologic Workup
Address barriers to assessment in routine care

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

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”)

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
- Discharged to rehab on hospital day 12
### Managing frail patients across care spectrum

<table>
<thead>
<tr>
<th>Role</th>
<th>Clinical management</th>
<th>Hospital</th>
<th>Post-acute care</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prognostication</strong>&lt;br&gt;(risk prediction)</td>
<td>- Education about prognosis&lt;br&gt;- Goals of care discussion&lt;br&gt;- Social worker/case manager</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Risk stratification</strong>&lt;br&gt;(inform other disease management)</td>
<td>- Prioritize chronic condition mgmt&lt;br&gt;- Relax disease target&lt;br&gt;- Medication reconciliation&lt;br&gt;- Deprescribing medications&lt;br&gt;- Minimize stressful interventions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Target of intervention</strong>&lt;br&gt;(improve frailty per se)</td>
<td>- Physical exercise&lt;br&gt;- Nutritional supplementation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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