Measures of Frailty

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Disclosures

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• Consultant- Astellas on clinical trial design; Vantia on QoL instrument for nocturia; Medtronic Urinary Incontinence in LTC
• Opinions expressed mine; not necessarily the views of the US Government
Atul Gawande’s

Automatic Defrailer

If scientists came up with a device—call it an automatic defrailer—that wouldn’t extend your life but would slash the likelihood you’d end up in a nursing home or miserable with depression, we’d be clamoring for it.

Learning Objectives

The learner will be able to:

- Explain what is meant by frailty, and how it differs from disability and comorbidity
- Wrestle with important questions:
  - Is your patient really old (aging prematurely)?
  - How do you properly recommend care, cure, prevention?
- Apply these concepts to patient care and clinical research
Outline

• What is frailty?
• Measuring frailty
  – Fried’s phenotype of frailty
  – Component measures/gait speed
• Counterpoint: accumulated deficit model
• Measurers of frailty
Outline

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Clinical Scenarios

• 77 yo increasing falls at home
• Healthy 82 yo asking about preventive care
• Symptomatic 87 yo with AoS
• 74 yo with muscle invasive bladder cancer
• 83 yo with worsening CKD, now Stage 4
• Screening detected 5 cm AAA in 74 yo
• Pre-op, obese 30 yo multiple comorbidities
• Fatigued 55 yo HIV+ otherwise well on HAART
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Question 1: Fried’s Frailty

Which of the following is true regarding Linda Fried’s conceptualization of frailty?

A. Cognition is a one of the 5 main components
B. All are derived from patient’s answers to questions
C. Frailty is a subset of disability
D. Frailty predicts nursing home admission but not death
E. Frailty is distinct from comorbidity

Columbia’s Linda P. Fried: 
Robust research on frailty

Geriatrician and Dean of the Mailman School of Public Health
• Noted that definitions of frailty as written in 1980’s ‘were all over the map’
• She noted that many early clinical trial intervening with frail elders were negative
Key Article

Frailty in Older Adults: Evidence for a Phenotype

Linda P. Fried,1 Catherine M. Tangen,2 Jeremy Walston,1 Anne B. Newman,3 Calvin Hirsch,4 John Gottdiener,5 Teresa Seeman,6 Russell Tracy,7 Willem J. Kop,8 Gregory Burke,9 and Mary Ann McBurnie2 for the Cardiovascular Health Study Collaborative Research Group

- Frailty not just you “know it when you see it”
- Frailty consists of: slowness; weakness; fatigue; weight loss; and low activity
- Cited 5330 times

Fried Frailty Definitions

- 2 measures
  - Gait speed
  - Grip
- 3 questions
  - Weak
  - Exhausted
  - Low activity

<table>
<thead>
<tr>
<th>Table 1. Operationalizing a Phenotype of Frailty</th>
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<tbody>
<tr>
<td>A. Characteristics of Frailty</td>
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<tr>
<td>Shrinking: Weight loss (unintentional)</td>
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<tr>
<td>Sarcopenia (loss of muscle mass)</td>
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<td>Weakness</td>
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<td>Poor endurance; Exhaustion</td>
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<td>Slowness</td>
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<td>Low activity</td>
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C. Presence of Frailty
Positive for frailty phenotype: ≥3 criteria present
Intermediate or prefrail: 1 or 2 criteria present
Components of Frailty

<table>
<thead>
<tr>
<th>Reference</th>
<th>Mobility</th>
<th>Strength</th>
<th>Balance</th>
<th>Motor Processing</th>
<th>Cognition</th>
<th>Nutrition</th>
<th>Endurance</th>
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Ferrucci JAGS 2004

Fried: Primary Findings

- Frailty predicted adverse outcomes (falls, mortality, NH admission, mobility, ADL disability) and intermediate frailty showed risk for these outcomes, yet reduced.

Table 6: Incidence of Adverse Outcomes Associated With Frailty: Kaplan-Meier Estimates at 3 Years and 7 Years* After Study Entry for Both of the Cohorts† (N = 5317)

<table>
<thead>
<tr>
<th>Frailty Status at Baseline</th>
<th>Deed</th>
<th>First Hospitalization</th>
<th>First Fall</th>
<th>Worsening ADL Disability</th>
<th>Worsening Mobility Disability</th>
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<tr>
<td></td>
<td>3 yr %</td>
<td>7 yr %</td>
<td>3 yr %</td>
<td>7 yr %</td>
<td>3 yr %</td>
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<tr>
<td>Not Frail</td>
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<tr>
<td>(2480)</td>
<td>3</td>
<td>12</td>
<td>33</td>
<td>70</td>
<td>11</td>
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<td>Intermediate</td>
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<td>(2480)</td>
<td>7</td>
<td>23</td>
<td>43</td>
<td>83</td>
<td>10</td>
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<td>Frail</td>
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<td>(308)</td>
<td>18</td>
<td>43</td>
<td>59</td>
<td>90</td>
<td>25</td>
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</table>

*7-year estimates are only available for the first cohort.
†Only those evaluable for frailty are included.
‡p value is based on the 2 degree of freedom log rank test using all available follow-up.
Fried: Primary Findings

- Frailty predicted adverse outcomes
- Frail 6%; Intermediately frail/frail 46%/46%

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<thead>
<tr>
<th>Frailty Status at Baseline</th>
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<th>First Hospitalization</th>
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<td>(n)</td>
<td>3 yr %</td>
<td>7 yr %</td>
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<td>Not Frail</td>
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<td>3</td>
<td>12</td>
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<td>33</td>
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<td>Frail</td>
<td>368</td>
<td>18</td>
<td>43</td>
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Comorbidity, Disability, Frailty are Separate, Related

- Co-morbidity, disability, and frailty are three separate concepts, were frailty is defined as weight loss, exhaustion, weakness, slow walking speed, and low physical activity (3 or more)

M151, Figure 2
Question 1: Fried’s Frailty

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Comorbidity: 30d: readmission by # conditions

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Falling Apart

Hard Conversations
• She was experiencing what I have come to think of as the ODTAA syndrome: the syndrome of One Damn Thing After Another.

Gawande, Atul.
Being Mortal
Henry Holt and Company.
Rockwood Deficit Accumulation Model

Rockwood frailty index (FI) as a measure of deficit accumulation

- measure of the cumulative burden
- symptoms, diseases, conditions, disability
- Cited 1256 times

2Rockwood et al. CMAJ 2005

Appendix 1: List of variables used by the Canadian Study of Health and Aging to construct the 70-item CSHA Frailty Index

- Changes in everyday activities
- HEAD and neck problems
- Poor muscle tone in neck
- Bradykinesia, facial
- Problems getting dressed
- Problems with bathing
- Problems carrying out personal grooming
- Urinary incontinence
- Toiletting problems
- Bulk difficulties
- Rectal problems
- Mood problems
- Feeling sad, blue, depressed
- History of depressed mood
- Tiredness all the time
- Depression (clinical impression)
- Sleep changes
- Restlessness
- Memory changes
- Short-term memory impairment
- Long-term memory impairment
- Changes in general mental functioning
- Seizures, partial complex
- Seizures, generalized
- Syncope or blackouts
- Headache
- Cerebrovascular problems
- History of stroke
- History of diabetes mellitus
- Arterial hypertension
- Peripheral pulses
- Cardiac problems
- Myocardial infarction
- Bradykinesia of the limbs
- Poor muscle tone in limbs
- Poor limb coordination
- Poor coordination, trunk
- Poor standing posture
- Irregular gait pattern
- Falls
- Impaired vibration
- Tremor at rest
- Postural tremor
- Intention tremor
- History of Parkinson's disease
- Family history of degenerative disease
- Skin problems
- Malignant disease
- Breast problems
- Abdominal problems
- Presence of snout reflex
- Presence of the palmompal reflex
- Other medical history

70-item Canadian Study of Health and Aging Frailty Index (FI)
Survival vs. Age

or vs. Frailty

Figure 2. Survival in relation to age and frailty. (A) With increasing age strata, survival declined. (B) With increasing values of the Frailty Index based on a Comprehensive Geriatric Assessment, survival declined.

Rockwood et al CMAJ 2005

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Q2: Frailty in Surgery Patients

Which is true regarding pre-operative frailty?
A. It predicts post-operative complications
B. It predicts prolonged length of stay
C. It predicts discharge to nursing home (instead of home)
D. It adds to the predictive power of the ASA (anesthesiology) score
E. All of the above

Frailty as a Predictor of Surgical Outcomes in Older Patients

Martin A Makary, MD, MPH, FACS, Dorry L Segev, MD, PhD, FACS, Peter J Pronovost, MD, PhD, Dora Syin, MD, Karen Bundein-Roche, PhD, Purvi Patel, MD, MPH, Ryan Takenaga, MD, Lara Devgan, MD, MPH, Christine G Holzmueller, BLA, Jing Tian, MS, Linda P Fried, MD, MPH

- Prospective cohort study of 594 patients ≥65 years old and undergoing elective surgery
- Frail patients were at an
  - increased risk of postoperative complications,
  - increased length of stay, and
  - discharge to a skilled facility after being admitted from home.
- Frailty further increased the power of traditional risk indices like ASA class, Eagle and Lee risk indices

Makary, et al. JACS 2010
Frailty Score Additive Prediction Power

![ROC curve graph showing AUC = 0.87](image)

Makary et al, J Am Col Surg 210: 2010

Too Frail for Surgery? Initial Results of a Large Multidisciplinary Prospective Study Examining Preoperative Variables Predictive of Poor Surgical Outcomes

Louis M Revenig, BS, Daniel J Canter, MD, Maxwell D Taylor, BA, Caroline Tai, MPH, John F Sweeney, MD, FACS, Juan M Sarmiento, MD, FACS, David A Kooby, MD, FACS, Shishir K Maithel, MD, FACS, Viraj A Master, MD, PhD, FACS, Kenneth Ogan, MD

- 189 patients major surgery in urology, surgical oncology, and general surgery
- Postoperative complications within 30 days of surgery (any grade Clavien-Dindo Classification)
- Patients who scored intermediately frail or frail on the Hopkins Frailty Score were twice (RR= 2.0) as likely to experience postoperative complications
- *Disease risk versus surgical risk*

Revenig, et al. JACS 2013
Frailty Predicting Cardiac Surgery Outcomes

- Frailty defined by ADL impairment, ambulation, history of dementia
- Predicted complications, in-hospital mortality, institutional d/c

Lee et al, Circulation 108: 2009

Frailty and AAA Outcomes

- Endovascular (EVAR) or open repair (OAR) of Abdominal Aortic Aneurysm (AAA)
- NSQIP data base 2005-2012
- mFI- Modified Frailty Index, independent of age and comorbidities predicted
  - Severe complications or death from EVAR (1.7, 95% CI 1.3-2.1) or OAR (1.8, 1.5-2.1)
  - Failure to rescue (death after a treatable complication) was 1.7 (1.2-2.5)

Frailty Status and TAVR

- PARTNER trial: Frailty assessed by gait speed, grip strength, serum albumin, and Katz ADL status
- 159 subjects (age 86±8) had assessment / TAVR
- Split group by median: frail / not frail
- Differs from Society Thoracic Surgery Score (12 ± 4)
  - Frailty adjusted OR 2.2 (more bleeding)
  - Frailty 1 year mortality HR 3.5 (95% CI: 1.4-8.5)

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Clinical Frailty Scale

1. Very Fit - People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2. Well - People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g., seasonally.

3. Managing Well - People whose medical problems are well controlled, but are not regularly active beyond routine walking.

4. Vulnerable - While not dependent on others for daily help, often symptoms limit activities. A common complaint is being "slowed up", and/or being tired during the day.

5. Mildly Frail - These people often have more evident slowing, and need help in high order IADLs (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6. Moderately Frail - People need help with all outside activities and with housekeeping. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (e.g., standing) with dressing.

7. Severely Frail - Completely dependent for personal care from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~6 months).
Outline

- Frailty should inform decision making
  - Watch people walk; shake hands; ask questions
- Frailty in clinical decision making
  - Protect from harm
  - Avoid strategies not likely to have benefit
  - Encourage exercise and diet
Summary

● Wrestle with evidence regarding two important questions: Am I really old? How will I know I’m dying?
● Be able to explain frailty, and how it differs from disability and comorbidity
● Critique the empirical evidence supporting concept of end-of-life trajectories
● Move from concepts to apply these theories to real world problems