Frailty

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Doris

84 yo female who comes into your clinic with her daughter. She complains of feeling increasingly fatigued and just slowing down. She uses a cane and her last fall was 3 years ago. She leaves the house to go the grocery store and church with her daughter. Otherwise she stays at her apartment in her independent living facility. Doris expresses delight in not having to deal with all of those stairs of her old home.
Doris

She has a past medical history of osteoporosis, mild cognitive impairment, macular degeneration and hypothyroidism. She has assistance with her medications and finances but does some light cooking. She has a caregiver in the apartment twice per week for bathing assistance. She was widowed 8 years ago. She misses her husband but can speak freely about their life together and his death.
What is frailty? Anyone?
Frailty is not like other diseases

- Hypertension
- Diabetes
- Heart Failure
- Chronic Obstructive Pulmonary Disease
- Chronic Kidney Disease
- Asthma
Geriatric Syndromes

• Syndrome = Group of signs and symptoms that characterize a specific disorder
• Multi-factorial in origin
• No single common pathway to the disorder

• Falls
• Urinary Incontinence
• Dizziness
• Syncope
• Insomnia
• Malnutrition
• Dementia

• Delirium
• Gait Disorders
• Hearing Loss
• Visual Loss
• Osteopenia
• Pressure Ulcers
• Frailty
Meanings of Frailty over time

- Easily Broken or destroyed
- Likely to fail or die quickly
- Unusually susceptible to disease or infirmity
- Lacking normal strength
- Weak, tenuous, thin and slight

So what is frailty?

• “Frailty is theoretically defined as a clinically recognizable state of increased vulnerability resulting from aging-associated decline in reserve and function across multiple physiologic systems such that the ability to cope with everyday or acute stressors is compromised.”

Are you concerned about frailty for Doris?

• What in her history makes you concerned about potential frailty?
Doris

84 yo female who comes into your clinic with her daughter. She complains of feeling increasingly fatigued and just slowing down. She uses a cane and her last fall was 3 years ago. She leaves the house to go the grocery store and church with her daughter. Otherwise she stays at her apartment in her independent living facility. Doris expresses delight in not having to deal with all of those stairs of her old home.
Doris

She has a past medical history of osteoporosis, mild cognitive impairment, macular degeneration and hypothyroidism. She has assistance with her medications and finances but does some light cooking. She has a caregiver in the apartment twice per week for bathing assistance. She was widowed 8 years ago. She misses her husband but can speak freely about their life together and his death.
Are you concerned about frailty for Doris?

• What in her history makes you concerned about potential frailty?
Pathogenesis of Frailty
Features of Frailty

- Weakness
- Fatigue
- Weight loss
- Decreased balance
- Low level of physical activity
- Slowed motor processing
- Social withdrawal
- Mild cognitive changes
- Increased vulnerability to stressors
Progression to Frailty

• Weakness
• Decreased Walking Speed
• Low physical activity
• Fatigue
• Weight Loss
• 76% of women first experience weakness
• If fatigue/weight loss first sign up to 5x likely to become frail
• Heterogenous progression
Sarcopenia

• Age associated loss of lean muscle mass and quality

• Due to

  • Oxidative stress
  • Inflammatory cytokines
  • Neuroendocrine dysregulation
  • Malnutrition
  • Physical inactivity
  • Muscle Cell Apoptosis
Sarcopenia

• Increased IL-6
  • Atherosclerosis
  • Cancer
  • Alzheimer's type dementia
  • Autoimmune disorders
  • Chronic CMV infection
• Decreased Testosterone
• Decreased IGF-1
• Decreased GH
Fatigue and Weight Loss

• Appear in 80% of cases just prior to onset of frailty

• Thought due to:
  • Progressive multi-system dysfunction
  • loss of organ system reserve
  • loss of total body reserve
  • failure/frailty
Are there ways to test Doris for frailty?

What types of physical exam maneuvers would you consider?
When to Screen

- Advancing Age
- Multiple Medical Prob
- Admission to long term care
- Osteoporosis
- Osteoarthritis
- Rheumatologic Disease
- Autoimmune disorders
- Cardiac Disease
- Kidney Disease
- Dementia
When to Screen

• Precursor of frailty
  – Decreased living space
• Women who leave neighborhood <4x/wk were 1.7x more likely to become frail
• Decrease mobility, IADL and ADL did not lead to decreased living space
• Not well measured by fixed-distance and fixed-time testing
Screening/Diagnostic Tools
2 schools of thought

• Goal of clinically quantifying frailty
  • Fried
    • Measurable Phenotype
  • Rockwood
    • Frailty Risk Index
Rockwood Frailty Index

• Accumulation Theory
  • Diseases
  • Disability
  • Physical and cognitive impairment
  • Psychosocial risk
  • Geriatric Syndromes
• 70 point scale
# Frailty Index

<table>
<thead>
<tr>
<th>Self-Rated Health</th>
<th>Hospitalization in Past Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comorbidities:</strong></td>
<td></td>
</tr>
<tr>
<td>Heart attack</td>
<td>Stroke or CVD</td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>Asthma</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>Cancer</td>
</tr>
<tr>
<td>Parkinson disease</td>
<td>Cataracts</td>
</tr>
<tr>
<td><strong>Signs &amp; symptoms:</strong></td>
<td></td>
</tr>
<tr>
<td>Falling down</td>
<td>Sleeping problems</td>
</tr>
<tr>
<td>Stomach or intestine problems</td>
<td>Incontinence</td>
</tr>
<tr>
<td>Difficulty biting on hard foods</td>
<td>Problems with eyesight</td>
</tr>
<tr>
<td>Breathlessness</td>
<td></td>
</tr>
<tr>
<td><strong>Function:</strong></td>
<td></td>
</tr>
<tr>
<td>Climbing several flights of stairs</td>
<td>Stooping/kneeling/crouching</td>
</tr>
<tr>
<td>Pulling/pushing large objects</td>
<td>Lifting/carrying weights &gt;5 kg</td>
</tr>
<tr>
<td>Dressing</td>
<td>Walking across a room</td>
</tr>
<tr>
<td>Eating</td>
<td>Getting in or out of bed</td>
</tr>
<tr>
<td>Using a map to get around</td>
<td>Making telephone calls</td>
</tr>
<tr>
<td>Managing money</td>
<td>Vigorous activities</td>
</tr>
<tr>
<td>Limitations with activities</td>
<td></td>
</tr>
<tr>
<td><strong>Cognition:</strong></td>
<td></td>
</tr>
<tr>
<td>Orientation</td>
<td>Mathematical performance</td>
</tr>
<tr>
<td>Mental well-being:</td>
<td></td>
</tr>
<tr>
<td>Suicidality</td>
<td>Trouble sleeping</td>
</tr>
<tr>
<td>Appetite</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Lack of enjoyment</td>
<td>Fear of falling down</td>
</tr>
<tr>
<td></td>
<td>High blood cholesterol</td>
</tr>
<tr>
<td></td>
<td>Diabetes mellitus or high blood sugar</td>
</tr>
<tr>
<td></td>
<td>Long-term illness</td>
</tr>
<tr>
<td></td>
<td>Arthritis</td>
</tr>
<tr>
<td></td>
<td>Stomach or duodenal ulcer</td>
</tr>
<tr>
<td></td>
<td>Hip or femoral fracture</td>
</tr>
<tr>
<td></td>
<td>Dizziness</td>
</tr>
<tr>
<td></td>
<td>Swollen legs</td>
</tr>
<tr>
<td></td>
<td>Persistent cough</td>
</tr>
<tr>
<td></td>
<td>Require dentures</td>
</tr>
<tr>
<td></td>
<td>Hearing problems</td>
</tr>
<tr>
<td></td>
<td>Pain in any joint</td>
</tr>
</tbody>
</table>

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Rockwood Frailty Index

- **Strengths**
  - Graded risk scale
  - Clinical inferences

- **Weaknesses**
  - Frailty is a definable clinical state
  - Naturally progressive syndrome
  - Easier way to assess frailty
Fried Phenotype

- Measurable physical characteristics
  - Walking Speed
  - Unintentional Weight loss
  - Recreational Calorie Expenditure
  - Fatigue
  - Grip Strength
  - $\geq 3 = \text{Frail}$
- Subgroups
  - Frail, pre-frail, not frail
Fried Phenotype

• Strengths
  • Gold standard
  • Measurable and objective
  • Correlates with patient outcomes

• Weaknesses
  • Clinically intensive
# Frailty Hazard Ratios

<table>
<thead>
<tr>
<th>Event</th>
<th>3 yr Risk</th>
<th>7 yr Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>1.29</td>
<td>1.23</td>
</tr>
<tr>
<td>Worsening Mobility</td>
<td>1.50</td>
<td>1.36</td>
</tr>
<tr>
<td>Worsening ADLs</td>
<td>1.98</td>
<td>1.79</td>
</tr>
<tr>
<td>First Hospitalization</td>
<td>1.29</td>
<td>1.27</td>
</tr>
<tr>
<td>Death</td>
<td>2.24</td>
<td>1.63</td>
</tr>
</tbody>
</table>

Fried Frailty

Walking speed and survival

Studenski, Stephanie et al. JAMA. 2011; 305: 50-58
Screening tools

- Over 30 instruments
- Most dichotomous but not all
- Wide range of frailty prevalence
Fried vs. The World

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<table>
<thead>
<tr>
<th>Table 3. Agreement of Survey of Health, Ageing and Retirement in Europe Frailty Scales (Cohen Kappa Statistic)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Groningen Frailty Indicator</strong></td>
</tr>
<tr>
<td>Tilburg Frailty Indicator</td>
</tr>
<tr>
<td>Frailty Index</td>
</tr>
<tr>
<td>FI-CGA</td>
</tr>
<tr>
<td>Clinical Frailty Scale</td>
</tr>
<tr>
<td>Frailty phenotype</td>
</tr>
<tr>
<td>Edmonton Frail Scale</td>
</tr>
<tr>
<td>FRAIL scale</td>
</tr>
</tbody>
</table>
Fried vs. The World

Table 1. Death Rate of Included and Excluded Cases for Each Scale

<table>
<thead>
<tr>
<th>Survey of Health, Ageing and Retirement in Europe Frailty Scale</th>
<th>Cases with Zero Missing Items, %</th>
<th>Inclusion Criterion, Number of Missing Items (% of All Items)</th>
<th>Included Cases, %</th>
<th>Death Rate at 2 Years, %</th>
<th>Included Cases</th>
<th>Excluded Cases</th>
<th>Death Rate at 5 Years, %</th>
<th>Included Cases</th>
<th>Excluded Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groningen Frailty Indicator</td>
<td>95.6</td>
<td>≤3 items (≤20%)</td>
<td>97.0</td>
<td>2.9</td>
<td>15</td>
<td>11.4</td>
<td>34.8</td>
<td>11.4</td>
<td>34.8</td>
</tr>
<tr>
<td>Tilburg Frailty Indicator</td>
<td>87.8</td>
<td>≤3 items (≤20%)</td>
<td>97.9</td>
<td>3.1</td>
<td>11.9</td>
<td>11.6</td>
<td>34.8</td>
<td>11.6</td>
<td>34.8</td>
</tr>
<tr>
<td>Frailty Index</td>
<td>95.6</td>
<td>≤14 items (≤20%)</td>
<td>99.1</td>
<td>3.2</td>
<td>3.6</td>
<td>12</td>
<td>16.3</td>
<td>12</td>
<td>16.3</td>
</tr>
<tr>
<td>FI-CGA</td>
<td>94.5</td>
<td>≤8 items (≤20%)</td>
<td>99.0</td>
<td>3.2</td>
<td>6.2</td>
<td>12</td>
<td>20.8</td>
<td>12</td>
<td>20.8</td>
</tr>
<tr>
<td>Clinical Frailty Scale</td>
<td>99.1</td>
<td>0 items (0%)</td>
<td>99.1</td>
<td>3.2</td>
<td>4.8</td>
<td>12</td>
<td>21.2</td>
<td>12</td>
<td>21.2</td>
</tr>
<tr>
<td>Frailty phenotype</td>
<td>88.9</td>
<td>≤1 item (≤20%)</td>
<td>97.9</td>
<td>3.1</td>
<td>13.3</td>
<td>11.6</td>
<td>36.8</td>
<td>11.6</td>
<td>36.8</td>
</tr>
<tr>
<td>Edmonton Frail Scale</td>
<td>96.3</td>
<td>≤3 items (≤20%)</td>
<td>99.0</td>
<td>3.2</td>
<td>3.6</td>
<td>12</td>
<td>15</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>FRAIL scale</td>
<td>97.6</td>
<td>≤1 item (≤20%)</td>
<td>98.0</td>
<td>3.1</td>
<td>10.4</td>
<td>11.7</td>
<td>31</td>
<td>11.7</td>
<td>31</td>
</tr>
</tbody>
</table>

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FRAIL Scale

- John Morley
- 30 seconds to complete
  - Fatigued
  - Flight of Stairs (Resistance)
  - Walk a block (Aerobic)
  - > 5 chronic Illnesses
  - Lost 5% weight in 6 months
Back to Doris

– Walking speed 0.4 m/s
– Grip strength of 18 kg
– Subjective fatigue
– Weight has increased 0.5% in past 6 months
– Physical activity is < 270 kcal per week

• What does all of this mean?
Do you think Doris is Frail?

- Any treatment recommendations?
- If so, what types?
Treatments for Frailty

• Resistance Training
  • Reduced falls
  • Increased muscle strength
  • Improved quality of life
  • Reduced pain
  • Functional independence
Treatments for Frailty

• Nutritional Support
  – Nutritionally dense foods
  • Protein intake (additional 18-26 g)
  – Vitamin D 1,000 IU daily
  – Once support stopped then benefits lost
Treatments for Frailty

- Comprehensive Geriatric Assessment
- Optimize disease burden
- Minimize polypharmacy
- Screen for co-morbid geriatric conditions
- Tai Chi and functional training programs have mixed data
- Reduce the social isolation
- Assess and treat underlying mood disorder
Future of Frailty

• Future Research
  – Standardized clinical phenotype
  – Identify subclinical mechanisms of frailty at the molecular, cellular and physiologic level
  – Is there one common pathway to frail state?
  – Medical options to prevent/reverse frailty?
  – How specific disease, social and psychological conditions contribute to frailty
  – Identify clusters of risk factors
Recent Articles

- The prognostic importance of frailty in cancer survivors – JAGS Dec 2015
- Cost-effectiveness of a chronic model for frail older adults in primary care JAGS Dec 2015
- Effects of Changes in Number of Medications and Drug Burden Index Exposure on Transitions Between Frailty States and Death – JAGS Jan 2016
- Frailty and Mortality outcomes in cognitively normal older people – JAGS 2016
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- Rockwood et al. CMAJ 173: 489-495. 2005
- Studenski, Stephanie et al. JAMA. 2011; 305: 50-58
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- Walston et al. JAGS. 54: 991-1001, 2006