Aging with Vitality:
Bench to bedside to improve hospital outcomes in older adults

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Faculty/Presenter Disclosure

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Objectives

Actually...bedside to the bench

1) **Understand how illness trajectories are changing**, and how acute illness or injury in the context of multi-morbidity alters the prognosis – delirium and mobility decline are key indicators

2) **Assess level of frailty in establishing goals of care** and use the 48/5 strategy in interprofessional collaborative care to engage older patients and their caregivers and promote independence

3) **Develop a framework for understanding** how to personalize, individualize and contextualize treatment approaches and advance care planning
Mrs. W: 94 year old woman living at home:

- Brought to ED by ambulance after a fall – confused and hip #
- Hx: Developed a cough and had increasing confusion in the three days prior to admission. Multiple previous falls all preceded by dizziness and legs giving way.
- P/E: tachy, bp 100/60, R 20, O₂ 3 lpm, T 37.0. No JVD, coarse crackles in bases. Normal WBC. BUN 9.0 Cr 103. CXR patchy infiltrates.
- Lives alone. Receives weekly home care for IADL support; manages her finances and meds (blister packed) – daughters are her POA
- PMH: HF, Afib, HT, chronic back pain, MCI (MMSE 26/30 Aug ‘09), hypothyroid, previous cataract surgery
- Meds: metoprolol 25 mg bid, warfarin 3 mg daily, furosemide 60 mg daily, Ca/Vit D, levothyroxine 100 µg daily
- Management: prn acetaminophen, catheterized, and IV fluids.
- Complications: deconditioning, UTI, dysphagia, poor oral intake, constipation, heart failure
Multi-morbidity in Older Adults

Promoting independence - Preventing disability

25% have three or more chronic diseases
1) Steep Downward Slant Trajectory

- Health
- Wellness
- Function
- Illness
- Death

Heart Attack / Car Accident
Few of us will die in this manner

Diagnosis
Death

Time
2) Gradual Slant Trajectory

- Health
- Wellness
- Function
- Illness
- Death
- Diagnosis
- Alzheimer’s / Dementia
- Time
- Death

Time line showing the gradual slant trajectory from Health Wellness through Function, Illness, Death, Diagnosis to Alzheimer’s / Dementia.
3) Peaks and Valleys Trajectory

- Health
- Wellness
- Function
- Illness
- Death

Mostly Chronic Heart and Lung Failure

Diagnosis | Death

Time
4) Gradual Descending Plateaus Trajectory

Health
Wellness
Function
Illness
Death

Frailty and Dementia
“Failure to Thrive”

Diagnosis
Death

Time
Functional Decline as Predictor of Hospital Outcomes

Outcomes at 12-months post-discharge

- Discharged with new or additional ADL disability
  - 41.3% died,
  - 28.6% alive but not recovered to baseline
  - 30.1% were at baseline function
- Discharged at baseline function
  - 17.8% died
  - 15.2% alive but worse than baseline function
  - 67% were at their baseline function
- Recovery by 1 month was associated with long-term outcomes
  - Age, cardiovascular disease, dementia, cancer, low albumin, and greater number of dependencies in instrumental ADLs independently predicted failure to recover.

Boyd CM et al. JAGS 56:2171-9, 2008
Mixed-Effect Logistic Regression on the Effect of Delirium Superimposed on Dementia (DSD)* on Walking Dependence at Rehabilitation Discharge and at 1-Year Follow-Up†

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dementia alone</td>
<td>3.45</td>
<td>2.39–4.97</td>
<td>.00</td>
</tr>
<tr>
<td>Delirium alone</td>
<td>4.31</td>
<td>2.08–8.94</td>
<td>.00</td>
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<tr>
<td><strong>DSD</strong></td>
<td><strong>15.50</strong></td>
<td><strong>5.62–42.67</strong></td>
<td><strong>.00</strong></td>
</tr>
<tr>
<td>Age</td>
<td>1.03</td>
<td>1.02–1.04</td>
<td>.00</td>
</tr>
<tr>
<td>Sex, female</td>
<td>0.83</td>
<td>0.67–1.02</td>
<td>.08</td>
</tr>
<tr>
<td>Hospital before admission</td>
<td>1.11</td>
<td>0.91–1.37</td>
<td>.30</td>
</tr>
<tr>
<td>Length of stay, d</td>
<td>1.05</td>
<td>1.03–1.06</td>
<td>.00</td>
</tr>
<tr>
<td>Charlson Comorbidity Index</td>
<td>1.35</td>
<td>1.19–1.53</td>
<td>.00</td>
</tr>
<tr>
<td><strong>Mobility dependence preadmit</strong></td>
<td><strong>8.25</strong></td>
<td><strong>6.50–10.45</strong></td>
<td><strong>.00</strong></td>
</tr>
<tr>
<td>C-reactive protein, mg/dL</td>
<td>1.14</td>
<td>1.02–1.27</td>
<td>.02</td>
</tr>
<tr>
<td>Effect of diagnosis change/time</td>
<td>0.71</td>
<td>0.58–8.71</td>
<td>.00</td>
</tr>
<tr>
<td>Change over time, slope</td>
<td>0.72</td>
<td>0.59–0.87</td>
<td>.00</td>
</tr>
</tbody>
</table>

Morandi et al. JAMDA, 2014
Hospitalization is a potent predictor of disability, vulnerability in older adults\(^1\)

Hospitalization on its own confers a 60-fold odds of developing a new disability \(^2\)  
At discharge, 35% are more disabled and ½ never recover\(^3\)

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 keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) 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).

8. **Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9. **Terminally Ill** – Approaching the end of life. This category applies to people with a life expectancy < 6 months, who are not otherwise evidently frail.

Where dementia is present, the degree of frailty usually corresponds to the degree of dementia:

- **Mild dementia** – includes forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

- **Moderate dementia** – recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

- **Severe dementia** – they cannot do personal care without help.


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Geriatric Medicine Research, Dalhousie University, Halifax, Canada
**Preventable Disability**

*Catastrophic disability*

- Defined as a loss of independence in $\geq 3$ ADL
- 72% who experience catastrophic disability have been hospitalized
- Leading causes of catastrophic disability
  1. Strokes
  2. CHF
  3. Pneumonia and influenza
  4. Ischemic heart disease
  5. Cancer
  6. Hip fracture

Ferrucci et al. JAMA 277:728, 1997
The Care Process: “48/5”

- Starts within 48 hours and focuses on evidence-informed decisions about:
  - Appropriate medications
  - Delirium / Cognition
  - Pain Management
  - Oral Intake / Elimination
  - Functional mobility – “Every day is an activation day”

- Interprofessional collaborative practice

- Mobility is the “fifth vital sign”
When translation of “best” into practice fails...

...we respond by improving the evidence (getting it more right) or the translation strategy (like the hammer and the nail) ... it’s a bit like trying the same thing again expecting different results

Researchers, practitioners and policy makers face a choice between two competing kinds of practice knowledge ... 

• Evidence-based Practice: 
  – Based upon technical know how and skills; drive to standardization 
  – Equated with a ‘search for certainty’ and accountability 
  – Policy tells people what to do and how to do it 

• Critical Practice: 
  – Concerned with critical exploration and development to promote innovative forms of practice and education that work locally 
  – Makes creative use of uncertainty and considers context as vital 
  – Policy tells people what outcomes are needed and what improvements in outcomes are expected (why, not what or how)
## Traditional and Developmental Evaluation

**Textbox 1: A Comparison of Traditional and Developmental Evaluation Approaches**

<table>
<thead>
<tr>
<th>Evaluation Component</th>
<th>Traditional Evaluation</th>
<th>Developmental Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Validate a model or hypothesis; accountability</td>
<td>Development, adaptation</td>
</tr>
<tr>
<td><strong>Situation</strong></td>
<td>Stable, goal oriented, predictable</td>
<td>Complex, dynamic, changing</td>
</tr>
<tr>
<td><strong>Mind-set</strong></td>
<td>Effectiveness, impact, compliance</td>
<td>Innovation, learning</td>
</tr>
<tr>
<td><strong>Measurement</strong></td>
<td>Based on predetermined indicators</td>
<td>Based on emergent indicators</td>
</tr>
<tr>
<td><strong>Unexpected consequences</strong></td>
<td>Paid token attention</td>
<td>Paid serious attention</td>
</tr>
<tr>
<td><strong>Evaluation design</strong></td>
<td>By evaluator</td>
<td>Collaborative with program staff</td>
</tr>
<tr>
<td><strong>Evaluation methods</strong></td>
<td>Emphasis on RCT’s</td>
<td>Emphasis on how outcomes change</td>
</tr>
<tr>
<td><strong>Evaluation results (ideal)</strong></td>
<td>Best practices</td>
<td>Best principles</td>
</tr>
<tr>
<td><strong>Evaluator qualities</strong></td>
<td>Strong methodological skills, credibility with external authorities and funders</td>
<td>Strong methodological skills, credibility with organizational and program staff</td>
</tr>
</tbody>
</table>

What we did…

1) Collaborated with our hospitalists to implement 48/5 – a willing group of physicians
2) COACH team did all geriatric screen assessments – no impact on ED workload
3) Each unit developed practice statements for “their” 48/5 pathway – engaged frontline staff

What we learned…

1) A willing group of physicians initiated 48/5 when geriatric assessment completed
2) ED staff observed mobility benefit and only 3-5 minutes of additional work to complete the screen
3) Nursing/allied health implemented “their” 48/5 pathway in all patients admitted to that unit
When reserve capacity is decreased to a **crucial level**, adaptive mechanisms to stressors can no longer be mobilized, leading to a breakdown of homeostasis and crossing the threshold to clinically manifested **frailty syndrome**.

Frailty masks what differentiates those who will recover from those who are unlikely to recover.
A frailty index based on a CGA (FI-CGA) better stratifies 70-month survival than does age

Rockwood et al., *J Am Geriatric Soc* 2010
Accumulation of Deficits

Health Status

Adding Biomarkers

Overall Health Status
Accumulation of Deficits

Vitality ↔ Independence

Granzymes

CD8+ T cell
NK cell

Mac
Mast
Neut
KC
Chond

Granzyme B:
Inflammaging vs. Killing

Inflammaging

Cleavage of IL-1α and extracellular matrix

Production of IL-6, IL-8, and GM-CSF
Loss of tissue structural integrity

Inflammation
Tissue injury and impaired tissue repair

Death of virus-infected cell

Granzymes – Beneficial, Pathogenic, or Both?

**Good**
(apoptosis)

**Bad**
(extracellular, inflammation, autoantigens, anoikis)

David Granville, PhD, UBC: With Permission
Frailty: Bench to the Bedside

• Frailty defined by biomarkers at the cellular level and clinical/functional deficits at the patient level aid in prognostication

• Framing difficult decisions/conversations - frailty provides a unifying construct for survival possibility in terms of number of things wrong

• To discuss the chance of death, or change, or extent of change, a better starting point than “if your heart were to stop…”

• Helps us focus not on disease but on the health consequences of illness, injury or a surgical intervention

• Can they walk, can they think, care for himself, interact with others…How likely are they to end up in a nursing home
Summary
And now...bench to the bedside

1) **Develop a framework** to personalize, individualize and contextualize treatment approaches and advance care planning

2) **Assess level of frailty in establishing goals of care** and use the 48/5 strategy for interprofessional collaborative care to engage older patients and their caregivers and promote independence

3) **Identify risk earlier in chronic illness trajectories** to promote independence and prevent disability related to hospitalization