Prehabilitation for the Surgical Patient

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Prehabilitation

• Maximize function before surgery

• “Going into training”

• A lot of us already do it…
  – Incentive spirometer
  – ‘Go for long walks’
  – ‘Eat lean protein’
Why is this important?

• Frailty and functional dependence are associated with adverse surgical outcomes

• We like to stratify risk
  – Age, comorbidities
  – Informed consent

• We want to modify risk factors
  – Optimization
    • Cardiopulmonary, nutrition
    • What about function?
What is frailty?

‘A condition or syndrome which results from a multi-system reduction in reserve capacity to the extent that a number of physiological systems are close to, or past, the threshold of symptomatic clinical failure’

‘As a consequence the frail person is at increased risk of disability and death from minor external stresses’

• AKA: ‘knock him over with a feather’ or ‘not a candidate for a haircut’

What is frailty?

- Complex and poorly defined, hotly debated
- Frailty phenotype
  - Proposes a relationship between characteristics and outcomes
  - Criteria: weight loss, grip strength, exhaustion, gait speed, low physical activity
  - Inflammatory biomarkers: CRP, IL-6, TNF-a
  - Outcomes: new falls, loss of mobility, disability, hospitalization, death
- Frailty index
  - Deficit accumulation model
Regardless of the definition, it’s a major issue for us....

- **4-9% of community dwelling elders are frail**

- **42-50% of older patients undergoing elective cardiac and noncardiac surgery are frail**
## Frailty predicts outcomes

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Findings</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal surgery</td>
<td>↑ Compl, LOS</td>
<td>Klidjian, 1980</td>
</tr>
<tr>
<td>Cardiac surgery, 70+</td>
<td>↑ M&amp;M</td>
<td>Afilalo, 2010</td>
</tr>
<tr>
<td>Multiple major, 70+</td>
<td>↑ Compl, LOS, SNF</td>
<td>Dasgupta, 2009</td>
</tr>
<tr>
<td>Major &amp; minor, 65+</td>
<td>↑ Compl, LOS, SNF</td>
<td>Makary, 2010</td>
</tr>
<tr>
<td>Cardiac surgery</td>
<td>↑ 30d mortality</td>
<td>Sundermann, 2011</td>
</tr>
<tr>
<td>Major elective, 65+</td>
<td>↑ 6 mo mortality, SNF</td>
<td>Robinson, 2009</td>
</tr>
<tr>
<td>Cardiac surgery</td>
<td>↑ Mortality, SNF</td>
<td>Lee, 2010</td>
</tr>
<tr>
<td>Vascular surgery</td>
<td>↑ Post op delirium</td>
<td>Pol, 2011</td>
</tr>
<tr>
<td>Emergency GS</td>
<td>↑ Infection, mortality</td>
<td>Farhat, 2012</td>
</tr>
<tr>
<td>Elective CRS, 65+</td>
<td>↑ Cost</td>
<td>Robinson, 2011</td>
</tr>
</tbody>
</table>
How can surgeons assess frailty?

- Single measure is attractive
  - Grip strength
  - Timed get up and go
    - Time to rise from sitting, walk 3 meters, turn, walk back and sit down with usual aids
    - >=13s predicts falls
    - >=30s corresponds to functional dependence
How can surgeons assess frailty?

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- **Surrogate measures may risk stratify but don’t guide us in risk modification**

- **We need to identify aspects of frailty amenable to preoperative optimization**
Overlapping geriatric syndromes

- Sarcopenia
- Cachexia
- Frailty
Redefining pre-op assessment

- 110 patients undergoing surgery with planned ICU admission
- Comprehensive geriatric assessment
  - Mini-cog
  - Albumin
  - Falls
  - HCT
  - Functional status
  - Comorbidity
- Outcome: 6 mo mortality

### TABLE 3. Results of Univariate Logistic Regression With Cutoffs Predicting Six-Month Mortality

<table>
<thead>
<tr>
<th></th>
<th>OR (95% CI)</th>
<th>Univariate P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-Cog &lt; 4</td>
<td>4.153 (1.246–13.846)</td>
<td>0.0205</td>
</tr>
<tr>
<td>Albumin ≤ 3.3</td>
<td>8.625 (2.538–29.308)</td>
<td>0.0006</td>
</tr>
<tr>
<td>Falls ≥ 1</td>
<td>5.072 (1.661–22.401)</td>
<td>0.0044</td>
</tr>
<tr>
<td>Hematocrit &lt; 35</td>
<td>10.671 (3.260–34.930)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>ADLs &lt; 6</td>
<td>13.908 (2.992–65.487)</td>
<td>0.0008</td>
</tr>
<tr>
<td>Charlson ≥ 3</td>
<td>3.890 (1.040–14.555)</td>
<td>0.0436</td>
</tr>
</tbody>
</table>

Is frailty a modifiable risk factor?
Can frailty be modified?

Progression

• Frailty is a dynamic process
  – Transitions over time
    • 43% become more frail
    • 23% become less frail

• Interventions aimed at improving frailty may be effective
Progressive Functional Decline Associated with Adverse Outcomes

- 6822 NH residents undergoing major surgery
  - Functional decline 6 mo prior to surgery: 16%
    - 1 year mortality: 52% (OR 1.16, 1.06-1.27)
    - Post-op functional decline: 60% (OR 1.21, 1.11-1.32)

Finlayson et al, JAGS, 2011
Can frailty be modified?

Exercise

- Exercise has been shown to improve mobility and ADL in frail elders
  - Forster A, *Age Aging*, 2010

- Preoperative exercise interventions not well studied
Can frailty be modified? 
**Nutrition**

- **Contributes to anemia**
  - Iron, B12, folate at least 28d prior to surgery

- **Vit D deficiency associated with frailty**
  - Supplementation NOT shown to improve function

- **Amount and timing of protein supplementation for sarcopenia is controversial**
  - Leucine increases protein anabolism, decreases loss
    - Soybeans, beef, fish
Can frailty be modified?

Misc

• **Drug therapy?**
  – Steroids, growth hormone, anticytokine
  – ACE-I improve function in ADL impaired elders
    • Sumukadas et al, *CMAJ*, 2007

• **Depression**
  – Independent predictor of development of frailty
  – Unclear if treatment will modify

• **SES factors**
  – Individual and neighborhood
POPS study: Proactive Care of Older Persons undergoing Surgery

- Pre/post study, elective orthopedic surgery
- Preoperative comprehensive geriatric assessment (CGA)
- Referral if:

  - Uncontrolled HTN
  - Recent MI
  - Unstable angina
  - Heart failure
  - Poorly controlled DM
  - Prior stroke
  - Taking Warfarin
  - COPD

- Poor nutrition
- Falls
- Memory problems
- Assist with toilet
- Assist with bed to chair
- Assist with dressing
- Assist with walking
- Complex D/C planning

POPS study: Intervention

• Team: consult geriatrician, nurse specialist, OT, PT, SW
• Medical comorbidities optimized per EB practice
• Preop home interventions
  – Respiratory, muscle strengthening
  – Nutrition, relaxation, pain management
  – Home OT, PT for most patients

• Plans and goals disseminated to patient, family, and all providers within 48hr

POPS: Results

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>20%</td>
<td>4%</td>
</tr>
<tr>
<td>Delirium</td>
<td>19%</td>
<td>6%</td>
</tr>
<tr>
<td>Pressure sores</td>
<td>19%</td>
<td>4%</td>
</tr>
<tr>
<td>Poor pain control</td>
<td>30%</td>
<td>2%</td>
</tr>
<tr>
<td>Delayed mobilization</td>
<td>28%</td>
<td>9%</td>
</tr>
<tr>
<td>Prolonged catheter</td>
<td>20%</td>
<td>7%</td>
</tr>
<tr>
<td>LOS</td>
<td>15.8 +/-13.2</td>
<td>11.5 +/-5.2</td>
</tr>
</tbody>
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Conclusions

• Frailty predicts mortality, complications, and institutional discharge after surgery

• Some aspects of frailty may be amenable to preoperative interventions
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• Remaining questions
  – Should frailty be measured in all older patients?
  – What is the best/efficient assessment?
  – What should the standard intervention be?
  – What is the optimal timing of the intervention?