Part 3: Practical Frailty Testing

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Auckland City Hospital
First things first

I am not a geriatrician

I am an anaesthetist
  I work full time in public in Auckland, NZ

I did about a year of geriatrics at registrar level (inpatient and community) about 15 years ago prior to training in anaesthesia

I have regular sessions in an anaesthetist led anaesthetic assessment clinic which includes a high risk assessment arm (and a lot of older frail patients)

This is my (anaesthetic) take on how we could apply frailty in our perioperative environment
Intent of this session

Quick overview of frailty and what has been covered so far in this meeting

Explore how anaesthetists could consider screening for frailty in a time poor anaesthetic clinic

Introduce how to conduct a selected number of tests
“Frailty” is a fashionable word in perioperative circles

Frail people undergoing surgery are at increased risk of
  Death
  Institutionalisation
  Postoperative mortality and morbidity

As an anaesthetist in a preoperative clinic
  How do I measure It?
Overview of frailty

No consensus definition
Accepted as a physiological state where a person is vulnerable to external stressors

2 main theoretical concepts of frailty around which testing is anchored
   Phenotype of frailty
   Accumulation of deficits
Phenotype of frailty

Based on article by Fried et al where they used the US Cardiovascular Health Study data to test a theoretical concept.

Developed the 5 Fried criteria

- **Shrinking**
  Unintentional weight loss of $>10\text{ lbs (4.5kg)}$

- **Weakness**
  Grip strength lowest 20% by gender and BMI

- **Exhaustion**
  Self reported

- **Slowness**
  15 ft (4.5m) walking time lowest 20% by gender and height

- **Low activity**
  Self reported
Comorbidity and disability $\neq$ frailty
Frailty by deficit accumulation

Concept proposed by Rockwood and Mitnitski

As people age they accumulate deficits.
  Rate and deficits vary between people

Frailty index counts deficits and generates index.
  Deficits counted usually in the order of 40-80
  Can be gained from a comprehensive geriatric assessment (CGA)

Fig. 3. The relationship between frailty index and mortality. Note that at all levels of the frailty index, deficit accumulation is more lethal for men than women. Triangles represent men and circles represent women.

Rockwood & Mitnitski

doi: 10.1016/j.cger.2010.08.008
Why test frailty in the perioperative setting?

Risk stratification

*additive information to ASA and comorbidity*

Identification of factors for potential modification

*Those who may benefit from a comprehensive geriatric assessment*

*Enable intervention from a geriatric/older peoples service*
Anyone in the audience measure frailty routinely preoperatively?
Administering a test in the anaesthetic clinic environment

If we administered a frailty screen to all elderly patients how long do you think is acceptable for this to take?

<5 minutes
5-10 minutes
10-20 minutes
>20 minutes
What options are out there?

Systematic review in 2011 identified 20 frailty instruments.

8 domains of which only the frailty index covered all.

- Nutritional status
- Physical activity
- Mobility
- Energy
- Strength
- Cognition
- Mood
- Social relations/Social Support

Performance based measures (PBM)

- A performance based test may be useful as it also informs clinician about actual functioning

Questionnaires

Combinations of PBM and questionnaires
Ideal perioperative frailty test

- Easy to administer by non-geriatricians
- Quick and easy to calculate
- Highly predictive of complications, mortality and level of care

Many of the options appear unfeasible due to time required

British Geriatric Society “Fit for Frailty” 2014 guidelines

*Recommended Gait Speed and Edmonton Frail scale for potential perioperative use*
Tests covered

Performance based measures
  Slow gait speed
    Timed Up and Go (TUG) Test
Phenotype scales (modified Fried criteria)
Edmonton Frail Scale
For each test I will cover

The test

Description

Demonstration for performance based measures

\textit{Gait speed}

\textit{Timed up and Go test}

Evidence in perioperative settings
Gait speed

Patients normal gait speed measured over a distance between 4-10 metres
  Usually 4, 5, or 6 metres.

Patients walks at normal pace across a measured distance

Patient can use normal walking aids
Demonstration from YouTube

Sourced from PaulPotterPT
Setting up the test

Measure out distance.

Allow 2 metres before 0 metre line to allow patient to “get up to speed”
Start stopwatch at first footfall after 0 metre line
Stop stopwatch after the first footfall over the end distance.
Allow 2 metres after end distance to slow down
Repeat 2-3 times and record average
How long do you think this should take in a healthy person?

<2 seconds
2-3 seconds
4-5 seconds
>5 seconds
Let's have a go!
Perioperative evidence for gait speed

Often part of a larger frailty score

Recommended by British Geriatric Society for perioperative use in their “Fit for Frailty” guidelines

Evidence in cardiac surgical patients
   Afilalo et al 2010 and Afilalo et al 2012
131 patients >70 years undergoing cardiac surgery
4 university affiliated hospitals in US and Canada
Measured 5m gait speed
  Slow defined as >6 seconds

Independent predictor of mortality
  OR 3.17 (1.17, 8.59) along with age > 80yr and repeat cardiac surgery

Independent predictor of discharge to a health care facility
  OR 3.19 (1.40, 8.41) along with age >80 year
152 patients ≥ 70 years undergoing cardiac surgery

Same cohort source (4 university affiliated hospitals in US/Canada)

Looked at 4 frailty scales
- 5-item Cardiovascular Health Study (CHS) frailty scale (Fried)
- 7 item expanded CHS scale (5 + cognitive impairment and depressed mood)
- 4 item MacArthur Study of Successful Aging frailty scale
  - gait speed, handgrip strength, inactivity, cognitive impairment
- 5 m gait speed.

Single measure of gait speed had superior predictive ability to other frailty scales
OR for mortality and increased morbidity 2.63 (1.17, 5.90)
AUC 0.64
Timed Up and Go test (TUG)

Time taken to
  Get up out of a chair (standard height with arms)
  Walk 3 metres
  Return and sit down again

Start stopwatch when you say “Go”
Stop stopwatch when patient buttocks touch the chair
Do an average of 3 times
How long do you think this should take in a healthy person?

<5 seconds
5-10 seconds
10-15 seconds
>15 seconds
TUG test video from the CDC

Viewable on YouTube
Let’s have a go!
Evidence for perioperative TUG

Only 1 study that specifically examines TUG (but it is included in other scales)

Slower Walking SpeedForecasts Increased Postoperative Morbidity and 1-Year Mortality across Surgical Specialties

Thomas N. Robinson, MD, MS, †, ‡ Daniel S. Wu, MD, †, ‡ Angela Sawaia, MD, PhD, †, ‡ Christina L. Dunn, BA, †
Jennifer E. Stevens-Lapsley, PT, PhD, †, ‡ Marc Moss, MD, †, ‡ Greg Y. Stiegmann, MD, †, ‡ Csaba Gajdos, MD, †
Joseph C. Cleveland, Jr, MD, †, ‡ and Sharon K. Inouye, MD, MPH, †


272 patients >65 years undergoing colorectal and cardiac operations
Single centre Denver
VA hospital (98% male cohort)

Compared a slow group to combined fast and intermediate group
Fast TUG test <10 seconds
Intermediate TUG test 11-14 seconds
Slow TUG test >15 seconds
## TABLE 3. Post-Operative Outcomes

<table>
<thead>
<tr>
<th>colorectal Surgery Group</th>
<th>Total Group</th>
<th>Fast (≤10 s)</th>
<th>Intermediate (11–14 s)</th>
<th>Slow (≥15 s)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>One or more complications</td>
<td>37% (36)</td>
<td>13% (4)</td>
<td>29% (12)</td>
<td>77% (20)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cardiac</td>
<td>4% (4)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>Respiratory</td>
<td>11% (11)</td>
<td>0</td>
<td>2% (1)</td>
<td>38% (10)</td>
<td>0.01</td>
</tr>
<tr>
<td>Renal</td>
<td>3% (3)</td>
<td>0</td>
<td>0</td>
<td>12% (3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Neurologic</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>Infection</td>
<td>20% (29)</td>
<td>10% (3)</td>
<td>26% (11)</td>
<td>58% (15)</td>
<td>0.005</td>
</tr>
<tr>
<td>Sepsis</td>
<td>14% (14)</td>
<td>3% (1)</td>
<td>7% (3)</td>
<td>38% (10)</td>
<td>0.04</td>
</tr>
<tr>
<td>DVT</td>
<td>2% (2)</td>
<td>0</td>
<td>0</td>
<td>8% (2)</td>
<td>0.50</td>
</tr>
<tr>
<td>Reoperation</td>
<td>9% (9)</td>
<td>3% (1)</td>
<td>0</td>
<td>31% (8)</td>
<td>0.03</td>
</tr>
<tr>
<td>30-d readmission</td>
<td>7% (7)</td>
<td>0</td>
<td>5% (2)</td>
<td>19% (5)</td>
<td>0.001</td>
</tr>
<tr>
<td>Institutionalization</td>
<td>26% (25)</td>
<td>0</td>
<td>58% (15)</td>
<td>55% (10)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital mortality</td>
<td>2% (2)</td>
<td>0</td>
<td>0</td>
<td>8% (2)</td>
<td>0.068</td>
</tr>
<tr>
<td>6-mo mortality</td>
<td>6% (6)</td>
<td>0</td>
<td>0</td>
<td>23% (6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1-y mortality</td>
<td>12% (12)</td>
<td>3% (1)</td>
<td>10% (4)</td>
<td>31% (8)</td>
<td>0.006</td>
</tr>
<tr>
<td>Cardiac Surgery Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One or more complications</td>
<td>26% (46)</td>
<td>11% (6)</td>
<td>26% (23)</td>
<td>52% (17)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cardiac</td>
<td>3% (5)</td>
<td>0</td>
<td>2% (2)</td>
<td>9% (3)</td>
<td>0.03</td>
</tr>
<tr>
<td>Respiratory</td>
<td>4% (7)</td>
<td>0</td>
<td>5% (4)</td>
<td>9% (3)</td>
<td>0.03</td>
</tr>
<tr>
<td>Renal</td>
<td>3% (5)</td>
<td>0</td>
<td>1% (1)</td>
<td>12% (4)</td>
<td>0.20</td>
</tr>
<tr>
<td>Neurologic</td>
<td>2% (3)</td>
<td>0</td>
<td>1% (1)</td>
<td>6% (2)</td>
<td>1.00</td>
</tr>
<tr>
<td>Infection</td>
<td>14% (23)</td>
<td>8% (4)</td>
<td>13% (11)</td>
<td>24% (8)</td>
<td>0.006</td>
</tr>
<tr>
<td>Sepsis</td>
<td>2% (4)</td>
<td>0</td>
<td>5% (4)</td>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>DVT</td>
<td>1% (2)</td>
<td>2% (1)</td>
<td>0</td>
<td>3% (1)</td>
<td>0.20</td>
</tr>
<tr>
<td>Reoperation</td>
<td>5% (9)</td>
<td>4% (2)</td>
<td>5% (4)</td>
<td>9% (3)</td>
<td>0.03</td>
</tr>
<tr>
<td>30-d readmission</td>
<td>12% (21)</td>
<td>4% (2)</td>
<td>13% (11)</td>
<td>24% (8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Institutionalization</td>
<td>40% (69)</td>
<td>23% (12)</td>
<td>41% (35)</td>
<td>67% (22)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

DVT indicates deep venous thrombosis. *Patients who died during their hospital stay were not considered in the discharge institutionalization analysis.

Cumulative survival stratified by TUG test

**FIGURE 2.** Cumulative survival—colorectal group. TUG indicates Timed Up and Go.

**FIGURE 3.** Cumulative survival—cardiac group. TUG indicates Timed Up and Go.
Cardiac surgical population in Norway

213 patients ≥ 74 years followed up 1 yr after surgery.

Looked at a number of items

- Chair rise
  - Not strictly a TUG test. "Patient is asked to get up and down from a chair 3 times and time is measured"
- Self reported weakness
- Stair climb
- Clinical Frailty Scale
- Creatinine

Chair rise most predictive of 1 year mortality.
Cut-offs for Performance Based Measures in the perioperative literature

Gait speed
- 5m ≥6 seconds (Afilalo 2010, Afilalo 2012)
- 15 ft ≥6 seconds for women >159cm or men >173cm (Hopkins Scale)
- 15ft ≥7 seconds for women ≤159 cm or men ≤173cm. (Hopkins scale)

TUG test
- Slow ≥15 seconds (Robinson 2013)
- EFS uses 11-20 seconds as 1 point, 20 seconds as 2 points
Edmonton Frail Scale

Combination of 9 measures

1 Performance based measure
   Timed up and Go Test
1 Cognition test
   Clock draw
7 Questions exploring frailty domains

Validated for use in non-geriatricians

Available as a free app for iOS and Android
# Edmonton Frail Scale

## Table 1. The Edmonton Frail Scale

<table>
<thead>
<tr>
<th>Frailty Domain</th>
<th>Item</th>
<th>0 Point</th>
<th>1 Point</th>
<th>2 Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognition</td>
<td>Please imagine that this pre-drawn circle is a clock. I would like you to place the numbers in the correct positions. Then place the hands to indicate a time of 'ten after eleven'.</td>
<td>No errors</td>
<td>Minor spacing errors</td>
<td>Other errors</td>
</tr>
<tr>
<td>General health status</td>
<td>In the past year, how many times have you been admitted to a hospital? In general, how would you describe your health?</td>
<td>0</td>
<td>1–2</td>
<td>$\geq 2$</td>
</tr>
<tr>
<td>Functional</td>
<td>With how many of the following activities do you require help? (meal preparation, shopping, transportation, telephone, housekeeping, laundry, managing money, taking medications)</td>
<td>0–1</td>
<td>2–4</td>
<td>5–8</td>
</tr>
<tr>
<td>independence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td>When you need help, can you count on someone who is willing and able to meet your needs?</td>
<td>Always</td>
<td>Sometimes</td>
<td>Never</td>
</tr>
<tr>
<td>Medication use</td>
<td>Do you use five or more different prescription medications on a regular basis? At times, do you forget to take your prescription medications?</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition</td>
<td>Have you recently lost weight such that your clothing has become looser?</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Mood</td>
<td>Do you often feel sad or depressed?</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Continence</td>
<td>Do you have a problem with losing control of urine when you don’t want to?</td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Functional</td>
<td>I would like you to sit in this chair with your back and arms resting. Then, when I say ‘GO’, please stand up and walk at a safe and comfortable pace to the mark on the floor (approximately 3 m away), return to the chair and sit down.</td>
<td>0–10 s</td>
<td>11–20 s</td>
<td>One of $\geq 20$ s patient unwilling, or requires assistance</td>
</tr>
<tr>
<td>performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Score:** $____/17$

Final score is the sum of column totals.

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Perioperative evidence for EFS

Frailty is associated with postoperative complications in older adults with medical problems

Monidipa Dasgupta, Daryl B. Rolfsen, Paul Stolee, Michael J. Borrie, Mark Speechley

125 pt >70 years undergoing non-cardiac surgery (82% lower limb orthopaedics)
- Edmonton Frail Scale Assessment in preoperative surgical clinic

Outcomes
- Postoperative complications
- Length of stay
- Inability to be discharged home

Age and EFS score independently associated with postoperative complications, discharge to institution and prolonged LOS
Key findings

EFS < 4 and EFS > 7 had clinical predictive utility

*Unclear what to do with intermediate scores (EFS 4-7)*

EFS of 3 or less had a lower risk of complication and higher chance of being discharged home.

   - Complication OR 0.27
   - 80% discharge home

EFS > 7 had a higher risk of complication and a lower chance of being discharged home

   - Complication OR 5.02
   - 40% discharged home
Frailty phenotype

Lots of modifications of Frieds criteria for frailty.

2 studies report the Hopkins Frailty Score
Makary 2010 (Fried as co-author), Revenig 2013

Essentially the Fried phenotype.
### Fried phenotype

<table>
<thead>
<tr>
<th>Hopkins Fraility Score</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrinking</td>
<td>Self-reported unintentional weight loss ≥ 10 lbs in the last year.</td>
</tr>
<tr>
<td>Weakness</td>
<td>Measured by having the patient squeeze a hand-held JAMAR dynamometer. Three serial tests of maximum grip strength with the dominant hand were performed, and a mean of the 3 values was adjusted by sex and body mass index (BMI). Men met the criteria for weakness if their BMI and grip strength were ≤ 24 kg/m² and ≤ 29 kg of force; 24.1-26 and ≤ 30 kg; 26.1-28 and ≤ 31 kg; ≥ 28 and ≤ 32 kg, respectively. Women met the criteria for weakness if their BMI and grip strength were ≤ 23 kg/m² and ≤ 17 kg; 23.1-26 and ≤ 17.3 kg; 26.1-29 and ≤ 18; and ≥ 29 and ≤ 21 kg, respectively.</td>
</tr>
<tr>
<td>Exhaustion</td>
<td>Measured by responses to questions about effort and motivation. The following 2 statements were used from the modified 10-item Center for Epidemiological Studies-Depression scale: “I felt that everything I did was an effort” and “I could not get going.” Subjects were asked, “How often in the last week did you feel this way?” Potential responses were: 0 = rarely or none of the time (&lt; 1 day); 1 = some or little of the time (1-2 days); 2 = a moderate amount of the time (3-4 days); and 3 = most of the time. Subjects answering either statement with a response of 2 or 3 met the criteria for exhaustion.</td>
</tr>
<tr>
<td>Low activity</td>
<td>Determined by inquiring about leisure time activities. Physical activities were ascertained for the previous 2 weeks using the short version of the Minnesota Leisure Time Activities Questionnaire, and included frequency and duration. Weekly tasks were converted to equivalent kilocalories of expenditure, and individuals reporting a weekly kilocalorie expenditure below the following criteria were classified as having low physical activity: men, &lt; 383 kcal/week; women, &lt; 270 kcal/week.</td>
</tr>
<tr>
<td>Slowed walking speed</td>
<td>Measured by the speed at which a patient walks 15 feet. The final time was taken by averaging 5 trials of walking the 15 feet at a normal pace. Men met the slowness criteria if height and walk time were ≤ 173 cm and ≥ 7 seconds, or &gt; 173 cm and ≥ 6 seconds, respectively. Women met criteria if height and walk time were ≤ 159 cm and ≥ 7 seconds, or &gt; 159 cm and ≥ 6 seconds, respectively.</td>
</tr>
</tbody>
</table>
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 Bandeen-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


596 patients ≥65 yr presenting to John Hopkins over 1 year period for elective surgery

- 10.4% frail (4-5 on Hopkins Scale)
- 31.3% intermediately frail (2-3 on Hopkins Scale)

Outcomes

30 day complications

- OR 2.06 intermediate frail, OR 2.54 frail

Length of Stay

Discharge deposition

- Risk of being discharge to skilled/assisted care
- OR 3.16 intermediate frail, OR 20.48 frail
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 ≥18 years undergoing major intra-abdominal urological, general or oncologic surgery.

Collected preoperative variables including Hopkins Frailty Score
  3.7% frail, 22.8% intermediately frail

Primary outcome 30 day complications
  38.6% suffered at least 1 complication

Only composite frailty score predictive of postoperative complication OR 2.05
  Also examined ASA, Katz (ADL), CES-D (depression), Charlson comorbidity score, albumin, CRP, eGFR, Hb
Resources required for tests described

Gait speed
   Stopwatch
   Measured distance

TUG test
   Stopwatch
   Chair
   Measured distance

Edmonton Frail Scale
   App or paper scale
   Paper and pen for a clock draw
   Resources for TUG test

Fried phenotype scale
   Paper scale
   Hand dynamometer
   Resources for gait speed test
Problems with frailty testing

Everyone has had a go at making up their own test or does different versions of the same test
   The perioperative literature is messy

When to do it
   Preoperative anaesthetic clinic?
   Surgical clinic?

What to do with the patient who can’t perform a performance based measure

Cut-offs for frailty
   What to do with the poor scoring patient
      ?Refer to geriatric service
      ?Defer surgery
      ?Negotiate different surgery
A large number of patients in frailty studies with performance measures can not complete and therefore we have missing data in the most frail or ill.

Using the Canadian Study for Successful Aging, Rockwood et al showed that if you can’t complete a performance based measure you have a poor outcome (49.3% couldn’t complete)

Take home:
Failing to perform a PBM is BAD NEWS
How should we use frailty testing in our practice?

The floor is open for discussion and comment