Recognising Frailty: Insights from The Irish Longitudinal Study on Ageing (TILDA)

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Integrated Care Approach for Frailty in the Older Person
Clayton Hotel, Galway, 7th March 2017
What is Frailty?
Frailty: Health Risk

Advancing age → adverse health outcomes + increased health services use

BUT

Same Age ≠ Same Risk
(Chronological) (Biological)

Frailty captures differential vulnerability or biological risk

Frailty: What is it?

Frailty is:

- A distinct health state related to the ageing process
- Characterised by decreased physiological reserve across multiple body systems
- Prevalent at 4-59% among age 65+ years
- A transition phase between healthy ageing and disability.
- May be considered alongside the other geriatric syndromes
  - Falls
  - Immobility
  - Delirium
  - Incontinence
  - Susceptibility to medication changes

(Clegg et al, 2013; Morley et al, 2012; Rockwood et al, 2007; Wlaston et al, 2006; Fried et al, 2001)
Frailty: What is it?

People with frailty are:

• More vulnerable to stressors

• At increased risk of adverse health outcomes e.g. falls, disability, healthcare use, mortality

(Adapted from Clegg et al. Lancet 2013)
Frailty is dynamic process, progression can be changed or reversed
Frailty: Significance

Frailty is significant:

Given the demographic ageing predicted in developed countries, what will more frail people with more complex needs mean?

The Irish context

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Population</th>
<th>65+ yrs</th>
<th>Frail</th>
<th>Prefrail</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>4.6 million</td>
<td>0.5 million</td>
<td>0.1 million</td>
<td>0.24 million</td>
</tr>
<tr>
<td>2041</td>
<td>6.1 million</td>
<td>1.4 million</td>
<td>0.3 million</td>
<td>0.75 million</td>
</tr>
</tbody>
</table>

The European Commission Economic Policy Committee predicts healthcare costs will rise by 0.9% of GDP by 2035.

Frailty: Significance

European Innovation Partnership on Active and healthy Ageing (EIP-AHA)

**Aim:** Increase average healthy lifespan of Europeans by 2 years by 2020

**Specific Action A3:** Prevention of functional Decline and Frailty
TILDA
Study Design
and Data Collection
The Irish Longitudinal Study on Ageing (TILDA)

Population representative prospective cohort study of the community dwelling older population aged 50 years or over

**Sample:**
Sampling from Geo-directory of households in ROI with residents 50+ years

**Response rate:**
62%

**Baseline Sample size:**
8,175.

**Excluded:**
< 50 years, nursing home or institutional care

**Data:** Collected
health, economic and social circumstances

**Data collection:**
every 2 years
health assessment, alternate waves, every 4 years
TILDA: Study Design

Computer-Assisted Personal Interview – CAPI (Home)

Self-Completion Questionnaire – SCQ (Home)

Comprehensive Health Assessment (Centre or Home)
TILDA: Study Design

Wave 1 (2010)
- CAPI: 8175
- SCQ: 6915
- Health Assessment: 6150
- Health Centre: 5274
- Home: 876
- Bloods: 5637

Wave 2 (2012)
- CAPI: 7282
- SCQ: 6123
- Health Assessment: 5347
- Health Centre: 4263
- Home: 1084
- Bloods: 4907

Wave 3 (2014)
- CAPI: 6618
- SCQ: 5513
- Health Assessment: 5347
- Health Centre: 1084
- Home: 1084
- Bloods: 4907

Wave 4 (2016)
- CAPI: 5978
- SCQ: 5000
- Health Assessment: 5347
- Health Centre: 1084
- Home: 1084
- Bloods: 4907
TILDA: Data Collected

Computer-Assisted Personal Interview – CAPI

Demographics

Income & Employment

Health Behaviours

Health Conditions

Medications

Health Service Use
TILDA: Data Collected

Self-Completion Questionnaire – SCQ

Social Circumstances

Quality of Life

Stress

Diet

Personality

Sexual Activity
TILDA: Data Collected

Health Assessment

Anthropometry

Visual Function

Cardiovascular Function

Cognitive Function

Musculoskeletal Function

Blood Biomarkers
Frailty
How to measure it?
Diagnosis & Management of Frailty

Comprehensive Geriatric Assessment (CGA)

(CGA)

- Social Support
- Cognition
- Mobility
- Energy
- Mood
- Physical Activity
- Nutritional Status
- Strength

(De Vires et al. 2011)
Measurement of Frailty

Phenotype Frailty (PF)

Exhaustion  Weakness  Slowness  Low Activity  Unintended Weight Loss

0 or 1  0 or 1  0 or 1  0 or 1  0 or 1

0 = Non-frail
1-2 = Pre-frail
3-5 = Frail

(Fried et al, 2004; 2001)
### Measurement of Frailty

#### Frailty Index (FI)

<table>
<thead>
<tr>
<th>32 Age-related Health Deficits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Difficulty walking 100m</td>
</tr>
<tr>
<td>2. Difficulty rising from chair</td>
</tr>
<tr>
<td>3. Difficulty climbing one flight of stairs</td>
</tr>
<tr>
<td>4. Difficulty stooping, kneeling or crouching</td>
</tr>
<tr>
<td>5. Difficulty reaching above shoulder height</td>
</tr>
<tr>
<td>6. Difficulty pushing/pulling large objects</td>
</tr>
<tr>
<td>7. Difficulty lifting/carrying weights ≥10lb</td>
</tr>
<tr>
<td>8. Difficulty picking up coin from table</td>
</tr>
<tr>
<td>9. Poor self-rated vision</td>
</tr>
<tr>
<td>10. Poor self rated hearing</td>
</tr>
<tr>
<td>11. Difficulty following a conversation</td>
</tr>
<tr>
<td>12. Cataracts</td>
</tr>
<tr>
<td>13. Glaucoma/Age related macular degeneration</td>
</tr>
<tr>
<td>14. Hypertension</td>
</tr>
<tr>
<td>15. Angina</td>
</tr>
<tr>
<td>16. Heart attack</td>
</tr>
<tr>
<td>17. Stroke/Transient ischemic attack</td>
</tr>
<tr>
<td>18. Irregular heart rhythm</td>
</tr>
<tr>
<td>19. Other CVD</td>
</tr>
<tr>
<td>20. Diabetes</td>
</tr>
<tr>
<td>21. High cholesterol</td>
</tr>
<tr>
<td>22. Arthritis</td>
</tr>
<tr>
<td>23. Knee pain</td>
</tr>
<tr>
<td>24. Osteoporosis</td>
</tr>
<tr>
<td>25. Cancer</td>
</tr>
<tr>
<td>26. Varicose ulcer</td>
</tr>
<tr>
<td>27. Urinary incontinence</td>
</tr>
<tr>
<td>28. Polypharmacy</td>
</tr>
<tr>
<td>29. Poor self-rated physical health</td>
</tr>
<tr>
<td>30. Daytime sleepiness</td>
</tr>
<tr>
<td>31. Poor self-rated memory</td>
</tr>
<tr>
<td>32. Feeling lonely</td>
</tr>
</tbody>
</table>

Each deficit scored 0 or 1

Number of deficits present = 0.00 – 1.00.

Total deficits measured

- Physical Function Deficits
- Sensory Deficits
- Cardiovascular Deficits
- Chronic illnesses
- Cognitive problems
- Other Health Deficits e.g. sleep, mood, meds

<0.10 = Non-frail
0.10-0.24 = Pre-frail
≥0.25 = Frail

(Theou et al, 2015; Rockwood et al, 2011; 2007)
Measurement of Frailty: Timed Up and Go (TUG)

Frailty increases with slower TUG time

TUG time cut-off at >10 s identifies 93% of frail (specificity).

Frailty: AUC ROC = 0.87

(Savva et al, JGMS 2013)
Frailty
Prevalence & Incidence
Frailty Prevalence & Age

**Phenotype Frailty**
- 50+ yrs: 33% Pre-frail, 4% Frail
- 65+ yrs: 43% Pre-frail, 8% Frail
- 75+ yrs: 56% Pre-frail, 14% Frail

**Frailty Index**
- 50+ yrs: 30% Pre-frail, 14% Frail
- 65+ yrs: 38% Pre-frail, 25% Frail
- 75+ yrs: 40% Pre-frail, 34% Frail

The Irish Longitudinal Study on Ageing (Tilda)
Frailty Prevalence & Gender

**Phenotype Frailty**
- **Female**
  - Pre-frail: 35%
  - Frail: 5%
- **Male**
  - Pre-frail: 32%
  - Frail: 4%

**Frailty Index**
- **Female**
  - Pre-frail: 39%
  - Frail: 18%
- **Male**
  - Pre-frail: 35%
  - Frail: 11%
Frailty Prevalence Wave 1 & 2

### Phenotype Frailty

<table>
<thead>
<tr>
<th>Wave</th>
<th>Pre-frail</th>
<th>Frail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1</td>
<td>32.1</td>
<td>3.1</td>
</tr>
<tr>
<td>Wave 2</td>
<td>31.5</td>
<td>4.6</td>
</tr>
</tbody>
</table>

### Frailty Index

<table>
<thead>
<tr>
<th>Wave</th>
<th>Pre-frail</th>
<th>Frail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1</td>
<td>38.4</td>
<td>14.0</td>
</tr>
<tr>
<td>Wave 2</td>
<td>32.8</td>
<td>15.4</td>
</tr>
</tbody>
</table>
Frailty Transitions Wave 1 & 2

Phenotype Frailty

- 100%: 16.8
- 80%: 68.1
- 60%: 15.1
- 40%: 0%
- 20%: 0%
- 0%: 0%

Frailty Index

- 100%: 12.5
- 80%: 71.3
- 60%: 16.2
- 40%: 0%
- 20%: 0%
- 0%: 0%

Legend:
- Green: Positive
- Blue: Stable
- Red: Negative
Frailty Incidence at Wave 2

Age 50+ Years

- Phenotype Frailty: 0.5% Pre-frail, 20.0% Frail
- Frailty Index: 0.8%

Age 65+ years

- Phenotype Frailty: 1.4% Pre-frail, 31.9% Frail
- Frailty Index: 1.3%
Frailty Prevalence ROI vs UK

(Clegg et al, 2016)
Frailty Prevalence ROI vs NI

Phenotype Frailty (modified)

TILDA

- Pre-Frail: 34.9%
- Frail: 6.7%

HSNI

- Pre-Frail: 38.4%
- Frail: 20.8%

(Scarlett et al, 2014)
Frailty & Blood Biomarkers
Frailty & Blood Biomarkers: Clinical Markers of Ageing Conditions

- Diabetes /Pre-diabetes
  - HbA1c: ≥48 mmol/mol
  - HbA1c: 39-47 mmol/mol

- Chronic Kidney Disease
  - Creatinine: eGFR < 60 ml/min
  - Cystatin c: eGFR < 60 ml/min

- Hypercholesterolemia
  - Total cholesterol: >5 mmol/L
  - HDL cholesterol: <1 mmol/L
  - LDL cholesterol: >3 mmol/L

- Inflammatory stress
  - CRP: >40 mg/L

- Micronutrient deficiency
  - Vitamin B12: <148 pmol/L
  - Vitamin D: <30 nmol/L
  - Lutein: <0.13 umol/L (lowest quartile)*
  - Zeaxanthin: <0.03 umol/L (lowest quartile)*
Frailty & Blood Biomarkers: Prevalence of Ageing Conditions

Fold difference in prevalence of age-related conditions among pre-frail and frail relative to non-frail, using biomarker clinical reference values

(O’Halloran et al 2017 In preparation)
Frailty & Medication Use
Frailty & Medication Use: Polypharmacy

Polypharmacy: ≥5 Medications

(Based on data from O’Hallloran et al, JGPS 2014)
Frailty & Medication Use: Sedative Use

(Peklar et al, JAMDA 2015)
Frailty & Health Service Use
Frailty and Health Service Use

n=3,422; ≥65 years

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Frail</th>
<th>Pre-frail</th>
<th>Non-frail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal care attendant</td>
<td>87</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Respite</td>
<td>77</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>OT</td>
<td>72</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>Psychological</td>
<td>64</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Home Help</td>
<td>62</td>
<td>35</td>
<td>7</td>
</tr>
<tr>
<td>Public Health Nurse</td>
<td>58</td>
<td>32</td>
<td>6</td>
</tr>
<tr>
<td>Day Care</td>
<td>55</td>
<td>37</td>
<td>8</td>
</tr>
<tr>
<td>Social worker</td>
<td>54</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>Meals on wheels</td>
<td>53</td>
<td>32</td>
<td>13</td>
</tr>
<tr>
<td>Dietician</td>
<td>52</td>
<td>34</td>
<td>10</td>
</tr>
<tr>
<td>Physiotherapy</td>
<td>48</td>
<td>42</td>
<td>10</td>
</tr>
<tr>
<td>Chiropody</td>
<td>43</td>
<td>47</td>
<td>10</td>
</tr>
<tr>
<td>Hearing</td>
<td>42</td>
<td>42</td>
<td>18</td>
</tr>
<tr>
<td>Overnight Hospital Admissions</td>
<td>39</td>
<td>44</td>
<td>17</td>
</tr>
<tr>
<td>Length of stay (≥1)</td>
<td>39</td>
<td>44</td>
<td>17</td>
</tr>
<tr>
<td>GP Visits (≥4)</td>
<td>39</td>
<td>47</td>
<td>13</td>
</tr>
<tr>
<td>Speech and Language</td>
<td>36</td>
<td>47</td>
<td>13</td>
</tr>
<tr>
<td>ED Visits (≥1)</td>
<td>34</td>
<td>46</td>
<td>20</td>
</tr>
<tr>
<td>Outpatient Visits (≥1)</td>
<td>34</td>
<td>48</td>
<td>21</td>
</tr>
<tr>
<td>Optician</td>
<td>32</td>
<td>47</td>
<td>21</td>
</tr>
<tr>
<td>Dental</td>
<td>27</td>
<td>48</td>
<td>25</td>
</tr>
</tbody>
</table>

(Roe et al 2017 In preparation)
Frailty and Health Service Use

n=745; ≥65 years; frail

(Roe et al 2017 In preparation)
Frailty and Health Service Use

n=745; ≥65 years; frail

Probability of service use

Optician service, Dental service, Chiropody service, Physiotherapy service, Occupational therapy service, Home help service, Personal care service, Meals on wheels service, Day care service, Informal care service, Public health nurse service, ≥7 General practitioner visits, ≥3 Outpatient clinic visits, ≥1 Day case procedures, ≥1 Emergency department visits, ≥1 Hospital overnight admissions, ≥4 Nights in hospital

Non Users 52% (n=387) Community Users 26% (n=194)

(Roe et al 2017 In preparation)
Frailty and Health Service Use

n=745; ≥65 years; frail

(Roe et al 2017 In preparation)
Frailty and Health Service Use

n=745; ≥65 years; frail

- Optician service
- Dental service
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- ≥7 General practitioner visits
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- ≥1 Day case procedures
- ≥1 Emergency department visits
- ≥1 Hospital overnight admissions
- ≥4 Nights in hospital

- Non Users 52% (n=387)
- Community Users 26% (n=194)
- Hospital Users 20% (n=149)
- Community and Hospital Users 2% (n=15)

(Roe et al 2017 In preparation)
Summary of Findings & Future Directions
Summary of findings from TILDA

Prevalence of frailty 5-15% in 50+, 10-20% in 65+ age group

Prevalence of pre-frailty is 30% in 50+, and 40% in 65+ age-group

Prevalence of frailty in R.O.I is similar to UK but lower than NI

TUG time >10s is a good proxy measure of frailty, less reliable for pre-frailty

Frail older adults have altered levels of biomarkers associated with common age-related conditions

70% of frail older adults are taking ≥5 medications and have 3-fold higher sedative use.

Frailty is associated with greatly increased GP, community and hospital services, but on-third receive no community services, unmet need?
(1) New evidence-based targets for early frailty detection and intervention.

(2) Identify healthcare needs of those who are frail and at risk of frailty.

(3) Raise awareness of frailty and frailty prevention in Ireland

(4) Promote an increase in healthy life-years in Ireland
Thank you

For more information:
www.tilda.ie