Changes in physical activity and falls in older adults following an extended period of hospitalization:
Is there a missing part to this picture?

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Those worried about falling had increased depressive symptoms following discharge from hospital.
Community dwelling older adults with higher levels of depressive symptoms had worse gait velocity, stride and swing time variability.
Many classifications of depression

Figure 1. The Black Dog hierarchical model of depression
Many classifications of depression

• Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)

• Major depression
  – 1 or 2 of core symptoms
    • Depressed mood and lack of interest
  – four or more of ... for at least 2 weeks
    • Feelings of worthlessness or inappropriate guilt
    • Diminished ability to concentrate or make decisions
    • Fatigue
    • Psychomotor agitation or retardation
    • Insomnia or hypersomnia
    • Significant decrease or increase in weight or appetite
    • Recurrent thoughts of death or suicidal ideation
Many classifications of depression

- Age of onset of first episode has been suggested as another means of classifying depression.
Incidence / prevalence of depression

• ~8% lifetime incidence of major depressive disorder

• “Clinically significant” depressive symptoms in community-dwelling older adults
  – Prevalence: 8-16%

• In residential care
  – 12% - 20% major depression
  – 35% significant depressive symptoms
  – <50% are recognised as depressed by nursing and social work staff
  – Blazer D. Depression in Late Life: Review and Commentary Journals of Gerontology Medical Sciences; 2003, Vol. 58A, No. 3, 249–265
Does late age onset depression have a different aetiology?

• Different causative factors to early onset
  – More vascular factors
  – Less personality abnormalities
  – Less family history

• Similar severity of symptoms

Important additional consequences of late age onset depression

• Reduced bone mineral density
  – Possibly mediated by increased inflammatory activity (cytokine interleukin 6), leading to increased resorption and SSRI medication use

• Weight loss
• Heart disease
• Functional dependency
• Mortality
Aetiology of late age onset depression: Limitation of activities model

Falls, physical activity and the aetiology of late age onset depression
Risk factors for newly developed depression

- Decrease in ADL or IADL function
- Death of spouse
- Occurrence of new chronic disease
I knew it! 'Chicken' comes first!
Chicken or egg?

1st assessment ($t_n$)

Fall

2nd assessment ($t_{n+1}$)
• Cross-sectional survey of 21,900 older adults
• Depression and use of depression medications (particularly SSRIs) was associated with having multiple falls and injurious falls
Chicken or egg?
• Retrospective cohort study
• n=39,813 patients
  – Use of SSRIs and non-SSRI tricyclics increased risk of hospital admission for falls / fractures 2 – 3 fold.
Chicken or egg?

Assessment of risk factor → Fall → Outcome
Aim

• To investigate the temporal relationships between falls, physical activity and symptoms of depression amongst older adults
Anxiety and Depression during Transition from Hospital to Community in Older Adults: Concepts of a Study to Explain Late Age Onset Depression

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Prospective cohort method

Items administered pre-discharge with repeated administration of some items to capture retrospective perception of pre-morbid status

N=400, moderate-good cognition, ≥3 weeks in a Southern Health hospital, Aged >65 years, 50% male, 25% Culturally and Linguistically Diverse

Pre-discharge

1 month

2 months

3 month home visit

4 months

5 months

6 month home visit

Geriatric Depression Scale
Geriatric Anxiety Inventory

Falls
Health service use
Medications

Phone FITT (physical activity participation) Mobility limitation

Color Trails, COWAT Friendship scale Significant life events

Pittsburgh Sleep Quality Index Epworth Sleepiness Scale
Participant inclusion criteria

• Adults >65 years
• Cognitively intact
  – 6 item Cognitive Impairment Test
• > 2 weeks in hospital
  – Monash Health, Peninsula Health
• Not being discharged to nursing home
Participant flow

- Referred, screened n=2430
- Approached for consent n=1211
- Consent provided n=317
- Baseline completed n=311
  - 1 month n=273
  - 2 month n=248
  - 3 month n=241
  - 4 month n=230
  - 5 month n=222
  - 6 month n=218

- Discharged to nursing home n=656
- Discharged before able to be recruited n=181
- Other n=82

- Expressive / receptive language issues n=364
- Failed / unable cognitive screen n=242
- Refusal n=288

- Changed mind once baseline commenced n=6

- Deceased n=20
  - Medically unwell / transfer to hospital or HLC n=23
  - Withdrew n=33
  - Other n=17
Analysis 1

- Correlation between change in depression symptoms \((t_n - t_{n+1})\) and falls reported over the past month at \(t_{n+1}\)
Analysis 2

• Correlation between raw score for depression symptoms at $t_n$ and falls recorded over the past month at $t_{n+1}$
Analysis 3

• Correlation between falls reported over the past month ($t_n$) and change in depression symptoms over the following month ($t_n - t_{n+1}$)
Analysis

• Comparable analyses using physical activity subscales and depression symptom scores
Demographics at baseline

<table>
<thead>
<tr>
<th></th>
<th>Mean (sd) or number (%)</th>
<th>Past GP Dx of depression</th>
<th>51 (17%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>78.4 (7.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (female)</td>
<td>180 (58%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faller while in hospital</td>
<td>33 (11%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>45 (15%)</td>
<td>Usual activities</td>
<td>113 (38%)</td>
</tr>
<tr>
<td>Slight problems</td>
<td>114 (39%)</td>
<td></td>
<td>90 (31%)</td>
</tr>
<tr>
<td>Moderate problems</td>
<td>87 (30%)</td>
<td></td>
<td>41 (14%)</td>
</tr>
<tr>
<td>Sever problems</td>
<td>41 (14%)</td>
<td></td>
<td>16 (5%)</td>
</tr>
<tr>
<td>Cannot walk</td>
<td>8 (3%)</td>
<td></td>
<td>34 (12%)</td>
</tr>
<tr>
<td>Self-care (eg. washing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>152 (52%)</td>
<td>Pain / discomfort</td>
<td>150 (51%)</td>
</tr>
<tr>
<td>Slight problems</td>
<td>84 (28%)</td>
<td></td>
<td>81 (27%)</td>
</tr>
<tr>
<td>Moderate problems</td>
<td>36 (12%)</td>
<td></td>
<td>44 (15%)</td>
</tr>
<tr>
<td>Sever problems</td>
<td>15 (5%)</td>
<td></td>
<td>19 (6%)</td>
</tr>
<tr>
<td>Unable</td>
<td>8 (3%)</td>
<td></td>
<td>1 (0%)</td>
</tr>
</tbody>
</table>
GDS over time

Geriatric Depression Scale

Median

IQR (Q1 – Q3)

Q₁ +1.5 x IQR

Outliers

GDS SF >5 suggestive of depression

GDS SF >10 almost always depression

Follow-up month
GDS over time by past history of depression
% Fallers by month of follow-up

Follow-up month

% Fallers

Risk of falls: Male – Odds ratio (robust 95% CI) = 2.16 (1.40, 3.35), p=0.001
Physical activity over time

![Graph showing physical activity over time with Household and Recreation activity levels.]
Analysis 1

• Association between depression symptoms at $t_n$ and falls reported over the past month at $t_n$

• Odds ratio (robust 95% CI), p-value:
  1.23 (1.17, 1.28), $p<0.001$
Analysis 2

- Association between raw score for depression symptoms at $t_n$ and falls recorded over the past month at $t_{n+1}$

- Odds ratio (robust 95% CI), p-value:
  $1.19 (1.12, 1.27), p<0.001$
Analysis 3

• Association between falls reported over the past month \((t_n)\) and change in depression symptoms over the following month \((t_n - t_{n+1})\)

• Odds ratio (robust 95% CI), p-value:
  
  1.03 (0.96, 1.11), p=0.39
Analysis 1

• Association between depression symptoms at $t_n$ and Phone FITT household at $t_n$

• Coef (robust 95% CI), p-value:
  -0.06 (-0.08, -0.05), p<0.001
Analysis 2

• Association between raw score for depression symptoms at $t_n$ and change in Phone FITT household over the next month $t_n - t_{n+1}$

• Coef (robust 95% CI), p-value:
  -0.01 (-0.02, 0.00), $p=0.12$
Analysis 3

- Association between phone FITT household measured at $t_n$ and change in depression symptoms over the following month ($t_n - t_{n+1}$)

- Coef (robust 95% CI), p-value: -0.01 (-0.01, 0.00), p=0.14
Analysis 1

- Association between depression symptoms at $t_n$ and Phone FITT household at $t_n$
- Coef (robust 95% CI), p-value:
  - $-0.03$ (-0.05, -0.02), $p<0.001$
Analysis 2

- Association between raw score for depression symptoms at $t_n$ and change in Phone FITT household over the next month $t_n - t_{n+1}$

- Coef (robust 95% CI), p-value: 0.00 (-0.01, 0.01), $p=0.97$
Analysis 3

• Association between phone FITT household measured at $t_n$ and change in depression symptoms over the following month ($t_n - t_{n+1}$)

• Coef (robust 95% CI), p-value: 0.01 (-0.01, 0.01), p=0.99
Discussion
Recommendations

• Although falls, physical activity and depression all appear to be inter-related, only raw depressive symptoms was found to have a prior temporal relationship with falls.
  – Increases likelihood that depressive symptoms are causally related to falls.
Limitations

- Fall
- 1st assessment ($t_n$)
- 2nd assessment ($t_{n+1}$)
Limitations

Fall

1st assessment ($t_n$)

2nd assessment ($t_{n+1}$)
Limitations

• Possibility of confounding factor X
  – ?Impact of using anti-depressant medications
  – ?Social support
  – ?Other life changing events

• Loss to follow-up

• Self-report physical activity
Recommendations

• Consider more than just the physical health of older adults who have had a long hospital stay
  – They have recently had a potentially life-changing event which can lead to depressive symptoms
  – Once established, higher levels of depressive symptoms can lead to falls in this population