Analysis on the High Risk Factors for Elderly Fall in Hospital Settings

Presenter: Serena Yau
Occupational Therapist, Caritas Medical Centre
Prevalence of Elderly Fall

- One of the major causes of morbidity and mortality in older people (Ching et al., 2013)
  - **Internationally:**
    ~1/3 community-dwelling older adults above age 65 fall every year (Ambrose, Paul & Hausdorff, 2013)
  - **Locally:**
    - 1-year prevalence of fall among Hong Kong community-living elderly
      - (Chu, Chi & Chiu, 2005) 19.3%
      - (Fong, Siu, Yeung, Cheung & Chan, 2011) 20%
      - Hospital Authority Head Office, 2015 18% - 29%
Consequences of Elderly Fall

Functional decline
- 35.3% Deterioration in functional state
- 16.7% Reduced social participation (Stel, Smit, Pluijm & Lips, 2004)
- Implied the need of rehabilitation
- Potentially increase length of stay

Physical
- 70-75% resulted in physical injuries (Centre for Disease Control and Prevention, 2016)
- ~1/5 sought medical attention (Gillespie et al., 2012)

Fatal

Early admission To LTC
## Methods

<table>
<thead>
<tr>
<th>Objective</th>
<th>To analyze fall risk factors from the fall assessment conducted by Occupational Therapists (OT).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Retrospective clinical review</td>
</tr>
<tr>
<td>Number of cases</td>
<td>6735</td>
</tr>
<tr>
<td>Time period</td>
<td>Jan 2015 - Sep 2016</td>
</tr>
<tr>
<td>Source of cases</td>
<td><img src="image" alt="Pie chart" /></td>
</tr>
<tr>
<td></td>
<td>- Acute wards 89%</td>
</tr>
<tr>
<td></td>
<td>- Rehabilitation wards 10%</td>
</tr>
<tr>
<td></td>
<td>- Geriatric day hospital 0.2%</td>
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</tbody>
</table>
Methods

<table>
<thead>
<tr>
<th>Assessment tool</th>
<th>- Fall assessment</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1. Environmental Barrier Checklist</td>
</tr>
<tr>
<td></td>
<td>A 20-items checklist that describe potential environmental hazards in hospital setting</td>
</tr>
<tr>
<td></td>
<td>2. Risky Behavior Checklist</td>
</tr>
<tr>
<td></td>
<td>A 20-items checklist that describe potential risky behavior when performing occupations</td>
</tr>
<tr>
<td></td>
<td>- Modified Barthel Index (MBI)</td>
</tr>
</tbody>
</table>
Cases Referral Flowchart

Case Intake by Nursing Staff Upon Admission

Conduct Johns Hopkins Falls Risk Assessment Tool

Scored >= 11

Clinical Referral to Occupational Therapist by Doctor

Fall and ADL assessment

Fall preventive Intervention
Gender and Age Distribution

Total number of cases: 6735

Gender Distribution:
- Female: 49.5%
- Male: 50.5%

Age Distribution:

<table>
<thead>
<tr>
<th>Age</th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>76.41</td>
<td>80</td>
<td>18 -107</td>
</tr>
<tr>
<td>Female</td>
<td>81.00</td>
<td>84</td>
<td></td>
</tr>
</tbody>
</table>
## Assessment Score Distribution

<table>
<thead>
<tr>
<th>Score Type</th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modified Barthel Index</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>51.05</td>
<td>52</td>
<td>0 - 100</td>
</tr>
<tr>
<td>Female</td>
<td>45.29</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental Barrier Checklist</strong></td>
<td>0.11</td>
<td>0</td>
<td>0 - 2</td>
</tr>
<tr>
<td><strong>Risky Behavior Checklist</strong></td>
<td>1.81</td>
<td>2</td>
<td>0 - 10</td>
</tr>
<tr>
<td><strong>Total Risk Factor</strong></td>
<td>1.92</td>
<td>2</td>
<td>0 - 10</td>
</tr>
</tbody>
</table>
Results

Factors that found to be related with high fall risk:

1. ADL performance
   - One-Way ANOVA:
   - Patients who scored \textbf{21-60} in MBI posed the highest fall risk than the other two groups (F = 403.421, p<0.001)

2. Gender
   - Independent t-test:
   - \textbf{Male} demonstrated significantly more risk-taking behavior than female (t=8.651, p<0.001)

3. Age
   - Pearsons’r Analysis:
   - A \textbf{positive} correlation between age and fall risk (r=0.03, p=0.013)
ADL Functioning and Fall Risk

1. MBI Score: 21 - 60
   - Moderate Assistance in ADL
   - Mean Total risk factor: 2.54

2. MBI Score: 61 - 100
   - Slight to total independency in ADL
   - Mean Total risk factor: 1.67

3. MBI Score: 0 - 20
   - Total dependency to maximal assistance in ADL
   - Mean Total risk factor: 1.32
Top 5 common risky behavior:

1. Not seeking for help when need (40.2%)
2. Unsafe transfer (39.2%)
3. Perform activities beyond abilities and limits (32.0%)
4. Sudden/hurry pace transfer (22.2%)
5. Not complying with staff’s safety advice and instructions (21.6%)
### Risky Behavior Analysis

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Mean MBI</th>
<th>T- Value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform activities beyond abilities and limits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>51.0</td>
<td>-3.565</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No</td>
<td>48.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sudden/ hurry pace transfer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>61.2</td>
<td>-18.126</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No</td>
<td>45.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For those who performed the above behaviors, their mean MBI were significantly higher than those who did not.
Risky Behavior Analysis

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<th>Mean MBI</th>
<th>T-value</th>
<th>P-value</th>
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</thead>
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<tr>
<td>Not seeking for help when need</td>
<td>Yes: 47.6</td>
<td>3.632</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>No: 50.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsafe transfer</td>
<td>Yes: 45.9</td>
<td>7.255</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>No: 51.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not complying with staff’s safety advice</td>
<td>Yes: 40.5</td>
<td>12.718</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>No: 51.4</td>
<td></td>
<td></td>
</tr>
</tbody>
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For those who demonstrated the above malpractice, their mean MBI were significantly lower than those who did not.
Higher ADL performance correlates with higher self-efficacy
- Higher degree of confidence in performing ADLs without falling
- Tended to be hypo-vigilance on environmental hazards
  (de Leon, Seeman, Baker, Richardson & Tinetti, 1996)

Lower ADL performance was associated with poor global cognition
- Executive dysfunction was found to be a predictor of functional difficulty
  - Eg. Planning, decision-making and self-awareness
  (Johnson, Lui & Yaffe, 2007)

- Not seeking for help when need
- Not complying with staff’s safety advice

- Perform activities beyond abilities and limits
- Sudden/ hurry pace transfer
Environmental Barrier Analysis

Most Significant Environment Barrier:

- Presence of obstacles (eg. drip-stand)

Others:
- Inappropriate bed /seat/ toilet height
- Slippery floor
- Electric cords on path
- Soft and sagging mattress
- Narrow pathway
Discussion

1. ADL Functioning & Fall Risk

**MBI score 21-60 : Moderate assistance**
- Most of them were bed to chair bound
- Able to perform in some parts of a functional activity
  - Eg. Bedside transfer
- Needed assistance to perform the whole activity safely

*Higher fall risk due to unsafe attempt of occupations*
Discussion

1. ADL Functioning & Fall Risk

**MBI 0 : Total dependency**
- Lack of mental capability to perform any part of activity
- Unable to initiate activity on their own due to non-functioning limbs

**MBI 1-20 : Maximal assistance**
- Correlated with poor limbs function, contributed a little in executing activity
- Mostly bedridden, failed to perform functional transfer on their own

*Lower fall risk due to incapability in taking part in occupations*

**MBI score 61-100 : Slight assistance to Independency**
- Related with better mentality and physical functions
- Require less assistance in completing activity

*Lower fall risk as compensated by higher capability in performing occupation*
Male was found to have a higher fall risk than female

- Possible confronting factors:

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• Male tends to perform more risk taking behaviour & occupations with hazards (WHO, 2016)
Discussion
2. Gender & Fall Risk

The result was agreed with:

- Men demonstrated a higher probability of falling when the values for co-morbidities, lean and fat body mass and balance were similar (Pereira, Baptista & Infante, 2013)
- Men also have a higher fatal fall rate than female

![Figure 1. Fatal falls rate by age and sex group](image)

In the U.S.A. 2001

Source: National Council on Ageing, 2005 (31)
3. Age & Fall Risk

- Fall rate increase with age (WHO, 2007)
  - Due to normal age related deterioration and presence of more co-
    morbidities
  - E.g. cognitive function, sensation, reaction time, muscle strength, 
    mobility
    (Grundstrom, Guse & Layde, 2012)

- Fall-related hospital admission rate increased with age
  (Australian Institute of Health and Welfare, 2012)
Conclusion and Implication

Factors that are of higher fall risk:

- MBI score between 21-60 (Moderate assistance in ADL)
- Male
- Advancing age

Implication to Occupational Therapy practice that may favor the reduction of frequency of fall in elderly

- Intensive and tailor-made training for the higher fall risk group
- ADL training that target on risky behaviors
Occupational Therapy on Fall Prevention

- Physical capability
- Cognitive function
- Psychological factor

Person

- Risky behavior in occupations
- Occupations with high functional demand
- Habit
- Life routine

Occupation

- Physical environment
- Social and carer support

Environment
Occupational Therapy on Fall Prevention

Person

Occupation

Environment
Intervention on Environmental Factors

- Home visit and modification
  - To ensure safety and enhance accessibility
  - To educate carer and patient on home safety

- A randomized controlled trial in 3 HK acute care hospitals

- Elderly aged >65 who had fallen (N=311) were recruited

- OT home visit post fall episode was found to be effective in reducing future fall (Chu et al., 2016)


Pereira, C. L., Baptista, F., & Infante, P. (2013). Men older than 50 yrs are more likely to fall than women under similar conditions of health, body composition, and balance. American Journal of Physical Medicine & Rehabilitation, 92(12), 1095-1103


