Predicting Fall Risk in Acute Inpatient Rehabilitation Facilities

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March 16, 2012

Objectives

• Current Falls Assessment Program for an IRF setting.
• Comparison of the Morse Falls Assessment Scale with 4 other fall assessment scales in an IRF setting.
• Casa Colina Falls Assessment Scale
• Effective fall prevention programs for IRF’s.

Total Number of Falls

Falls Per 1000 Patient Days
Why the concern?

- Unintentional falls continue to be the leading cause of injury deaths and non-fatal injuries in older adults (CDC, 2006)
- 33% of adults age 65 and over fall each year (CDC, 2008)
- Of those who fall, 20% to 30% suffer moderate to severe injuries (2008)

Fatal Fall Injury Rates

Age-Adjusted Fatal Fall Injury Rates Among Men and Women Aged 65 Years and Older, United States, 1994-2003 (CDC, 2006)

Hospital Falls

- Falls are responsible for 70% of hospital accidents
- 30% of these lead to injury (Krauss et al, 2003)
- Risk of hip fracture is 11 times higher in the hospital setting compared to the community (Papaloannou et al, 2004)

The Cost of Falling

- $19,440 = Average health care cost for 1 fall for person over 72 yrs of age
  - CMS no longer pays for injuries sustained during acute hospital admission
- Annual direct medical costs related to falls (CDC, 2012)
  - 2000: $19 billion
  - 2010: $28.2 billion
**IRF Challenges**

- Goal is to increase mobility through an interdisciplinary team
- Majority of patients admitted have significant cognitive and mobility deficits
- 3 hours per day may not be adequate for skill acquisition considering length of stays 17-28
- Falls Assessment needs to be quick and easy

**Patient Profile**

- 68-bed inpatient rehabilitation center
- Average Daily Census= 60
  - 30% CVA
  - 20% Brain Injury
  - 15% SCI

**Fall Prevention**

- Fall prevention program
  - Nursing completes Morse Fall Scale within 8 hours of admission
  - Patients place in high or low risk category

**LOW RISK INTERVENTIONS**

- Check (+) Standard Fall Risk on patient safety sheet
- Ensure Patient has all necessary items within reach
- Set bed at lowest level, except when providing care
- Assess environment/room for fall risk (clutter/cords)
- Encourage regular toileting
- Stow curtains in center of room for clear visibility
- Patient supervised in bathroom at all times

**HIGH RISK INTERVENTIONS**

- Check (+) High Fall Risk on patient safety sheet
- Place yellow fall risk leaf on door (red leaf if the patient has fallen), tag on wheelchair, sticker on kardex
- Regularly orient confused patient
- 3 side rails up
- Verbally review safety and fall precautions sheet with patient and or family

**High Fall Risk - Optional Interventions**

- Use of bed sensor at all times
- One to one supervision
- Implement use of enclosure bed
- Implement restraint use (4 side rails up, prone, etc.)
## Review of Current Literature

- Focused on
  - acute care
  - skilled nursing facilities
  - stroke-specific rehabilitation settings
  - community-dwelling older adults
- Systematic review of fall-risk assessment tools (Scott et al., 2007)
  - Thirty-eight tools identified
  - No single tool could be recommended for all settings or subpopulations within each setting

## Risk Factors for Falls Across Rehabilitation Settings

- Risk factors in all settings (IP, OP, Home)
  - Cognitive status (MMSE)
  - History of previous falls
- Risk factors that varied by setting
  - Balance performance
  - Diagnosis
  - Functional ability
  - Gender

(Morrison et al., 2011)

## Risk Factor for Falls During Inpatient Rehabilitation

- **High risk fallers**
  - Stroke
  - Amputation
  - Age 41-50
  - Lower cognitive FIM scores
  - ≥9 co-morbidities
  - Early fallers (<5 days) had FIM motor >25
  - Average FIM motor of those who fell = 31 (mod to min assist)

- **Characteristics of falls**
  - 85% during the daytime
  - 90% in a patient room
  - 74% unobserved.
  - 50% occurred during the first week of the
  - 6.7 falls per 1000 patient days

[Lee et. al., 2008]

## Limitations to Current Assessment Tools

- 90% – 100% of patients are high risk, but not all patients fall
- Very few assessment tools have been validated in an IRF
- Few studies identify what a fall prevention program should include based on assessment tool findings
## Retrospective study

Study objective: To retrospectively compare characteristics between patients who did and did not fall while admitted to a 68-bed IRF in 2007

## Definition of a Fall

“Unintentionally coming to rest on the ground, floor, or other lower level”  
(Gilewski et al, 2007)  
Including attended and unattended falls

## Morse Fall Scale

<table>
<thead>
<tr>
<th>Variables</th>
<th>Numeric Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. History of falling</td>
<td>No 0, Yes 25</td>
</tr>
<tr>
<td>2. Secondary diagnosis</td>
<td>No 25, Yes 10</td>
</tr>
<tr>
<td>3. Ambulatory aid</td>
<td>None/bed rest/nurse assist 0, Crutches/cane/walker 30, Furniture 60</td>
</tr>
<tr>
<td>4. Intravenous therapy/heparin lock</td>
<td>No 0, Yes 20</td>
</tr>
<tr>
<td>5. Gait</td>
<td>Normal/bed rest/wheelchair 0, Weak 10, Impaired 20</td>
</tr>
<tr>
<td>6. Mental status</td>
<td>Oriented to own ability 0, Overestimates/forgets limitations 15</td>
</tr>
</tbody>
</table>

Total = 0-125  
High Risk ≥ 45  
Medium Risk 25-40  
Low Risk < 25  

Morse Fall Scale

- Prospective analysis of 147 falls  
- Validated in combination of acute care, long-term care and IRF settings  
- Interrater reliability, $r = 0.96$

(Morse, 1989)
Methods: Subjects

- **Fallers**
  - 108 patients who fell during 2007 stay
  - 35 subjects (18 males, 17 females)

- **Non-fallers**
  - 1194 patients who did not fall
  - 35 subjects (17 males, 18 females)

Methods: Data collected

- Age at admission
- Gender
- Diagnosis
- Morse Fall Scale score at Admission
- 3 Functional Independence Measure (FIM) scores at admission
  - Motor
  - Cognitive
  - Total (Motor + Cognitive)

FIM Scores

- ADL
  - Self-care
  - Eating
  - Bathing
  - Grooming
  - Dressing
  - toileting
  - Bowel and bladder control
- IADL
  - Home management
  - Housekeeping
  - Shopping
  - Finances
- MOTOR
  - Self-care
  - Eating
  - Bathing
  - Grooming
  - Dressing
  - Toileting
  - Bowel and bladder control
- COGNITIVE
  - Communication
  - Understanding
  - Expression
  - Social cognition
  - Problem solving
  - Memory

Results: Falls

- 35 fallers
  - 41 falls
- Patients with 2 falls: 4
- Patients with 3 falls: 1
- Negative consequences: 9 (26%)
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Results: Type of Falls

<table>
<thead>
<tr>
<th>Type of Fall</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertain</td>
<td>22</td>
</tr>
<tr>
<td>Abnormal activity by staff</td>
<td>7</td>
</tr>
<tr>
<td>Abnormal activity by resident</td>
<td>6</td>
</tr>
<tr>
<td>Reported by patient/family</td>
<td>4</td>
</tr>
</tbody>
</table>

Results: Falls by Diagnosis

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Fallers</th>
<th>Non-Fallers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BI SCI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ortho</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amputee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulmonary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results: Morse Falls Scale

<table>
<thead>
<tr>
<th></th>
<th>Fallers Mean ± SD</th>
<th>Non-Fallers Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of females</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Mean age (yrs)</td>
<td>63.3 ± 20.4</td>
<td>66.7 ± 19.1</td>
</tr>
<tr>
<td>Morse % high fall risk</td>
<td>86%</td>
<td>91%</td>
</tr>
</tbody>
</table>

Results: Level of Risk
Results: FIM data

- No significant differences for Morse scores
- Significant differences between fallers and non-fallers for FIM motor, cognitive, and total scores
- Total FIM score accounts for approximately 11% of the in common variance separating the groups

<table>
<thead>
<tr>
<th></th>
<th>Mann-Whitney U</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morse #1</td>
<td>560.0</td>
<td>0.45</td>
</tr>
<tr>
<td>Morse #2</td>
<td>577.5</td>
<td>0.62</td>
</tr>
<tr>
<td>Morse #3</td>
<td>578.5</td>
<td>0.65</td>
</tr>
<tr>
<td>Morse #4</td>
<td>595.0</td>
<td>0.81</td>
</tr>
<tr>
<td>Morse #5</td>
<td>560.5</td>
<td>0.50</td>
</tr>
<tr>
<td>Morse #6</td>
<td>612.6</td>
<td>1.0</td>
</tr>
<tr>
<td>Morse total</td>
<td>537.0</td>
<td>0.37</td>
</tr>
<tr>
<td>FIM motor</td>
<td>438.0</td>
<td>0.04</td>
</tr>
<tr>
<td>FIM cognitive</td>
<td>414.5</td>
<td>0.02</td>
</tr>
<tr>
<td>FIM total</td>
<td>381.0</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Next Step- Prospective Study

- 4 falls assessment tools within 24 hours of admission
- Followed 35 subjects for fall(s) during their hospital stay
- Goal: determine the most appropriate falls assessment tool to identify patients at increased fall risk that can be performed by nursing staff

Falls Risk Assessment Tools

- Morse Fall Scale
- Revised Assessment for Designation of High Fall Risk on the Inpatient Rehabilitation Unit (Gilewski)
- Modified STRATIFY
- Hendrich II
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Results

• 14% of subjects fell
• 3 of 4 tools exhibited high sensitivity (correct positives) but low specificity (correct negatives)
  • 100% of falls were accurately predicted
  • nearly 100% of patients were assessed as high risk
• The Gilewski method had low sensitivity and high specificity
  • only identified one patient as high risk
  • It failed to identify any of the patients who did fall as high risk.

<table>
<thead>
<tr>
<th>Tool</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morse</td>
<td>0.03</td>
<td>0.53</td>
</tr>
<tr>
<td>Modified S</td>
<td>1.00</td>
<td>0.39</td>
</tr>
<tr>
<td>Gilewski</td>
<td>0.75</td>
<td>0.97</td>
</tr>
<tr>
<td>Hendrich</td>
<td>0.00</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Summary

• Morse Fall Scale may not be the most appropriate tool for assessing fall risk in a general IRF
  • 86-91% scored as high fall risk
• Consider admission FIM scores and diagnosis
• Results agree with other published studies
  • Morse Fall Scale identified 75-90% of patients as high risk (cutoff score of 45) (Gilewski et al, 2007)
  • Fallers had lower cognitive, motor, and total FIM scores at admission (Saverino et al, 2006; Gilewski et al, 2007)

Developing a tool for IRFs

Recap

• Falls present a huge health risk and expense
• Patient population in rehabilitation at increased risk to fall
• Morse Scale identifies 90% – 100% of patients at high risk in IRFs

Solution

• A risk assessment tool sensitive to our high-risk population
• Focus efforts on individuals at highest risk to prevent falls

What factors predict falls in an acute rehab population?

• Literature suggests
  • Diagnosis
  • Cognitive status
  • co-morbidities
  • Functional Ability

Determining predictors for falls in an acute rehab population

• Clinicians and past research guided the creation of a tracking tool
  1. Diagnosis
  2. Pre-morbid history
  3. Symptoms / Behaviors

Physiatrists completed these for all new admits for 5 months

FIM data and Fall information were completed following discharge

Tracking variables for fall risk

179 patients were included in the analysis
29 falls occurred during this time
T-tests and Chi-sq analysis were used to identify potential predictors for falling

<table>
<thead>
<tr>
<th>DIAGNOSIS</th>
<th>Falls (n = 29)</th>
<th>Non-Falls (n = 150)</th>
<th>ChiSq</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVA R</td>
<td>7</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>SVA L</td>
<td>0</td>
<td>13</td>
<td>0.74</td>
</tr>
<tr>
<td>Bil Temporal / parietal</td>
<td>1</td>
<td>2</td>
<td>0.45</td>
</tr>
<tr>
<td>Bil other</td>
<td>1</td>
<td>7</td>
<td>0.0001</td>
</tr>
<tr>
<td>Ortho Hip PK</td>
<td>1</td>
<td>11</td>
<td>0.4</td>
</tr>
<tr>
<td>Ortho TDK</td>
<td>4</td>
<td>4</td>
<td>0.7</td>
</tr>
<tr>
<td>Ortho TH</td>
<td>0</td>
<td>3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

* denotes significant effect, p < 0.05
FIM scores predict falls

- All FIM scores were evaluated using T test and Chi-Sq
- Logistical regression was done to bin FIM scores

Casa Colina Falls Risk Assessment

- Relative risk was determined and used to develop a new risk assessment

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>If yes, patient receives the following score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>20</td>
</tr>
<tr>
<td>TBI</td>
<td>50</td>
</tr>
<tr>
<td>CHD or other (e.g., TIA, HIV, or TBI)</td>
<td>40</td>
</tr>
<tr>
<td>FIM score:</td>
<td></td>
</tr>
<tr>
<td>Totaling score:</td>
<td></td>
</tr>
<tr>
<td>Bed transfer:</td>
<td></td>
</tr>
<tr>
<td>Tub/shower transfer</td>
<td></td>
</tr>
<tr>
<td>Stairs</td>
<td></td>
</tr>
</tbody>
</table>

- High Risk set at 80 and above
- 20 – 35% of patient population at any given time identified as High Risk

Evaluation of the CCFAS

- Sensitivity and Specificity
  - 60 patients (100% new population)
  - 22 identified as High Risk (37%)
  - 8 falls (13%)
  - 7 or 8 fallers were high risk (87.5%) – good sensitivity
  - Of non-fallers 71% were identified as low risk – good specificity
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High Falls Risk Interventions

Interventions for all HR patients:
1. receive yellow wrist band and yellow star on door
2. Hourly rounding
3. Assure bedside table, phone, call light and TV are within reach

Potential interventions:
1. Discuss time voiding
2. Discuss restraints
3. Issue reacher
4. Set wheelchair and bed alarms

CCFAS Pilot Results

At any given time we have between 20 – 60% of patients monitored as High Risk with an average = 45% (this includes those with score of 80 or above and new admits)

CCFAS reduces patient falls

Number of falls were reduced by 38% during the initial 6mo pilot study

Increased awareness, changes in nursing staff may also be contributing to this large reduction in falls.

Clinical issues and Lessons learned

- Clinician buy in
- Repeat fallers not at high risk
  - This was addressed by changing the falls form to include a previous fall while in hospital = 80
- Delay in scoring
  - No major change in timing of falls, primary concern is the increase in patients monitored as high risk
- Follow through with interventions
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CCFAS reduces patient falls
Currently we still show a 20% reduction in falls

Conclusions
Moving from retrospective to prospective studies to solve a clinical problem

- Identified clinical problem
- Retrospective study reinforced clinical problem and suggested predictors for falling
- Prospective assessment for risk factors identified predictive variables that supported creation of a new assessment tool
- Pilot study supported the clinical use of this tool to
  - predict individuals at high risk for falling
  - reduce falls

Research + clinical interventions = solutions to clinical problems