DETERMINANTS OF HOSPITAL FALL RATE TRAJECTORY GROUPS: A LONGITUDINAL ASSESSMENT OF NURSE STAFFING AND ORGANIZATIONAL CHARACTERISTICS

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Background
Falls – A Growing Public Health Concern

- Most commonly reported adverse event in hospitals
  - Estimated over one million inpatient falls per year

- Falls are important in acute care settings:
  1. **Quality** - Injuries from falls (e.g. hip fractures)
  2. **Cost** - Approximately $16-19 billion per year
     - Projected costs of $50 billion per year by 2030
  3. **Patient Burden** - Emotional and psychological stress on patient, family and care providers

- 2008 Centers for Medicare and Medicaid Services (CMS) non-reimbursement policy

Currie, 2008; Centers for Disease Control, 2011; Stevens et al., 2006
Background
Previous Staffing and Falls Research

- Conflicting evidence in the nurse staffing and patient falls literature

- Fall risk assessment tools
  - Identification of patients at risk for falling

- Majority of research to date used cross-sectional study designs and focus on single patient-level factors (e.g. bed alarms, armbands)
Research Objectives

**Aim 1**: Determine whether hospitals can be categorized into fall rate trajectory groups over time.

**Aim 2**: Identify nurse staffing and organizational characteristics associated with hospital fall rate trajectory groups.
Population Studied
National Database for Nursing Quality Indicators (NDNQI)

- National dataset collected for the American Nurses Association (ANA)
  - Voluntary hospital participation

- Sample of 1,592 hospitals nationwide

- Data for this study from 2006 to 2010
  - Monthly data (54 total time points)
  - Level of analysis at the hospital-level
Study Variables

- Patient falls per 1,000 inpatient days
- **Explanatory Variables:**
  - **Nurse Staffing**
    - Total nursing hours per patient day (TNHPPD)
    - RN Skill Mix (%)
  - **Organizational Characteristics**
    - Magnet status, bed size, geographic location, teaching status, and metropolitan area
- **Control Variables:**
  - Fall prevention protocol in place on unit
Study Design: Aim #1
Trajectories of acute care hospital patient fall outcomes

- Latent class growth model (LCGM) using PROC TRAJ in SAS® to determine latent trajectory groups of hospital fall rates over time

- Uses repeated measures of data to assess patterns of change in fall rates and classifies these into trajectory groups (generates categories of change)
  - PROC TRAJ model fit statistics using probability distributions

Nagin, 2005; Jones et al., 2001
Aim 1: Principal Findings Summary

- Findings revealed three hospital fall rate trajectory groups:
  - ‘Consistently High’ (mean fall rate = 4.96 falls per 1000 patient days)
  - “Consistently Medium/Low” (mean fall rate at or below 3.65 falls per 1000 patient days)
- Trajectory model used in Aim 2 to identify nurse staffing and organizational characteristics associated with hospital fall rate trajectories
Study Design: Aim 2
Nurse Staffing and Organizational Predictors of Hospital Fall Trajectories

- Logistic regression (PROC LOGISTIC in SAS®) used to determine predictors of membership in the ‘consistently high’ fall rate trajectory group

- **Dependent Variable:** Membership in ‘consistently high’ trajectory group
  - Compared to membership in ‘medium and low’ fall rate trajectory groups

- **Independent Variables:**
  1. Nurse staffing
     - Total nursing hours per patient day (TNHPPD)
     - RN Skill Mix (%)
  2. Organizational factors
     - Magnet status, bed size, geographic location, teaching status, and metropolitan area
## Aim 2 Principal Findings

<table>
<thead>
<tr>
<th>Hospital-level Variable</th>
<th>High (n=348)</th>
<th>Medium (n=840)</th>
<th>Low (n=341)</th>
<th>OR (95% CI)‡</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bed Size (&gt;=300)</strong></td>
<td>41.22</td>
<td>53.73</td>
<td>51.80</td>
<td>0.70 (0.51-0.94)</td>
</tr>
<tr>
<td><strong>Magnet</strong></td>
<td>16.13</td>
<td>31.46</td>
<td>30.82</td>
<td>0.49 (0.34-0.70)**</td>
</tr>
<tr>
<td><strong>Teaching</strong></td>
<td>53.31</td>
<td>58.53</td>
<td>46.23</td>
<td>1.16 (0.86-1.56)</td>
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<tr>
<td><strong>Metropolitan (Urban/Suburban)</strong></td>
<td>91.76</td>
<td>93.97</td>
<td>94.16</td>
<td>0.81 (0.48-1.37)</td>
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<tr>
<td><strong>Region</strong></td>
<td></td>
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<tr>
<td><strong>Northeast</strong></td>
<td>27.96</td>
<td>23.49</td>
<td>26.56</td>
<td>1.07 (0.66-1.74)</td>
</tr>
<tr>
<td><strong>Midwest</strong></td>
<td>20.07</td>
<td>14.79</td>
<td>7.14</td>
<td>1.55 (0.93-2.58)</td>
</tr>
<tr>
<td><strong>South</strong></td>
<td>39.79</td>
<td>48.75</td>
<td>45.83</td>
<td>0.81 (0.51-1.28)</td>
</tr>
<tr>
<td><strong>West</strong></td>
<td>10.92</td>
<td>11.29</td>
<td>13.69</td>
<td>REFERENT</td>
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<tr>
<td><strong>Hospital Nurse Staffing</strong></td>
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<tr>
<td><strong>Total Nursing Hours Per Patient Day</strong></td>
<td>8.01</td>
<td>8.36</td>
<td>8.39</td>
<td>0.92 (0.85-0.99)*</td>
</tr>
<tr>
<td><strong>Skill mix (mean RN %)</strong></td>
<td>64.91</td>
<td>66.00</td>
<td>65.45</td>
<td>0.99 (0.98-1.01)</td>
</tr>
<tr>
<td><strong>Process of Care Variables</strong></td>
<td></td>
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<tr>
<td><strong>Fall Prevention Protocol</strong></td>
<td>0.76</td>
<td>0.74</td>
<td>0.75</td>
<td>1.45 (0.67-3.18)</td>
</tr>
</tbody>
</table>

‡Comparing hospitals in high fall group to all other hospitals in medium and low fall groups, controlling for the proportion of medical unit observations per hospital

*Denotes significance at p<0.05

**Denotes significance at p<0.01
Greater number of total hours per patient day (TNHPPD) resulted in decreased odds of membership in the ‘consistently high’ fall rate trajectory group (OR=0.92)

Magnet status hospitals were significantly less likely than non-Magnet hospitals to be in the ‘consistently high’ fall rate trajectory group (OR=0.49)

When compared to smaller hospitals, hospitals with bed size over 300 beds were less likely to be in the ‘consistently high’ fall rate trajectory (OR=0.70)
Implications for Policy and Practice

- Despite the 2008 CMS policy, fall rates have not systematically declined and some hospitals performed better than others.
- Hospital administrators should focus on retaining nurses, but also consider organizational factors associated with falls.
- Policymakers and hospital management should focus on key aspects of Magnet status.
  - Need to understand contextual factors that lead to consistently lower fall rates in hospitals.
Study Considerations

- **Limitations**
  - Self-selected sample
    - NDNQI hospitals responding have increased resources
  - Risk adjustment
  - Aggregated nurse staffing measures
Thank You! Any Questions?

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  - Dr. Ron Shorr


