Evaluation of a Patient-Centered Fall-Prevention Tool Kit to Reduce Falls and Injuries: A Nonrandomized Controlled Trial

• Patricia C. Dykes PhD, RN, FAAN, FACMI
• David W. Bates MSc, MD
• Maureen Scanlan MSN, RN, NEA-BC
• Jason Adelman MD, MS
• Zoe Burns MPH
Agenda

1. The importance of fall prevention in the field of patient safety
   • David W. Bates MD, MSc

2. AHRQ-funded Patient Safety Learning Lab study and findings
   • Patricia C. Dykes PhD, RN

3. Significance of this work for stakeholders
   • Maureen Scanlan MSN, RN, NEA-BC
   • Jason Adelman MD, MS

4. Moderated discussion
   • Zoe Burns MPH
The Importance of Fall Prevention in the Field of Patient Safety

• David W. Bates MD, MSc
  Medical Director of Clinical and Quality Analysis, Information Systems, Mass General Brigham Health
  Chief, Division of General Internal Medicine, Brigham and Women’s Hospital
  Professor of Medicine, Harvard Medical School
  Professor of Health Policy and Management, Harvard T.H. Chan School of Public Health
  Editor and Chief, Journal of Patient Safety
Background: Patient Falls in Hospitals

- Falls represent a leading cause of preventable injury
- Hospitalized patients are at an increased risk for falls, which may result in serious injuries
- Injurious falls are associated with increased hospital stays and costs
- Patient falls and related injuries are considered nursing-sensitive indicators because fall prevention depends on the quantity and quality of nursing care
- Most falls in hospitals are preventable and resultant injuries are not reimbursable by Medicare
- Multifactorial strategies can reduce rates of falls in hospitals, although the evidence for reducing fall-related injuries is inconclusive
The 3-Step Fall Prevention Process

1. Fall Risk Screening/Assessment
2. Tailored/Personalized Care Planning
3. Consistent Preventive Interventions

- Fall prevention is a 3-step process
- Fall TIPS* (Tailoring Interventions for Patient Safety) reduced falls by 25%, yet >90% of falls are preventable*
- Patients often fall because their prevention plan is not followed**
- How can we engage patients and family in the 3-step fall prevention process?


End-user Fall Prevention Toolkit Requirements

- Clinician and patient-facing tools
  - Integration with EHR
- Develop range of “low tech” to “high tech” tools
  - “Some patients (and staff) do not like technology!”
  - “Some hospitals do not have the IT funds or staff for EHR integration”
- Make it “easy” to engage patients and family in 3-step fall prevention process
  - Workflow integration
  - “Do not add additional time to clinician workflow!”
  - “All information and supplies at bedside”
The Fall TIPS Intervention Modalities: Low-tech to High-tech

Fall Prevention Solutions to engage patients and family in the 3-step fall prevention process

**Fall TIPS laminated paper poster**

**Fall TIPS EHR-generated paper poster**

**Fall TIPS e-Bedside display**


Methods: Study Sites and Timeline

• Medical units at three academic medical centers:
  1. Site 1 (Boston, Massachusetts): 12 Medical Units
  2. Site 2 (Bronx, New York): 1 Medical Unit
  3. Site 3 (New York, New York): 1 Medical Unit

Study Timeline:
November 1, 2015 - October 31, 2018
Methods: Non-randomized Stepped Wedge Design

2-month wash-in period
Methods: Implementation

- Engaged leadership at institutional and care-unit levels through presentations on the evidence supporting Fall TIPS
- Used peer-champion model of existing unit-based nursing staff for education and training
  - Completed competency training
  - Involved in continuous engagement of staff nurses, monitoring of fidelity, and reinforcement
- Peer champions measured adherence to the protocol with patient engagement audits consisting of 3 questions:
  1. Is the Fall TIPS poster updated with the correct patient information?
  2. Can the patient/family express their fall risk factors?
  3. Can the patient/family express their fall-prevention plan?
- Completed 5 random audits per month and provided peer feedback to the nurses caring for the audited patients
Outcome Measures

• Primary Outcome: Rate of patient falls per 1000 patient-days
• Secondary Outcome: Rate of falls with injury per 1000 patient-days

Data on falls and resulting injury levels are routinely recorded in an event reporting system at participating hospitals.
Methods: Statistical Analysis

• Tested association between the intervention and patient falls (primary) and falls with injury (secondary) per 1000 patient-days

• Poisson regression (for rates) estimated with overdispersion via generalized estimating equations (GEE) to account for clustering within unit.
  • Fit segmented lines for before/after intervention to test for statistical significance of observed changes in the fall rates in the interrupted time series associated with the intervention

• Adjusted for patient-level characteristics: sex, race/ethnicity, insurance, age, and Charlson Comorbidity Index score

• Sub-analysis: Assessed whether observed changes differed by age group and site
Results: Participants

The study included 37,231 patients and 277,655 patient-days.

- 17,948 patients were included in the preintervention period and 19,283 in the postintervention period.
- Patient demographics were well balanced over periods.

### Table: Participant Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Before the intervention, No.</th>
<th>After the intervention, No.</th>
<th>Standardized difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient-days, No.</td>
<td>135,163</td>
<td>142,492</td>
<td>NA</td>
</tr>
<tr>
<td>Patients, No.</td>
<td>17,948</td>
<td>19,283</td>
<td>NA</td>
</tr>
<tr>
<td>Hospital length of stay, mean (SD)</td>
<td>7.53 (9.04)</td>
<td>7.39 (10.03)</td>
<td>1.47</td>
</tr>
<tr>
<td>Unit length of stay, mean (SD)</td>
<td>5.86 (6.07)</td>
<td>5.88 (7.45)</td>
<td>-0.29</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>60.56 (18.30)</td>
<td>60.92 (18.10)</td>
<td>-1.98</td>
</tr>
<tr>
<td>Women, No. (%)</td>
<td>9,723 (54.17)</td>
<td>10,325 (53.54)</td>
<td>1.26</td>
</tr>
<tr>
<td>Race/ethnicity, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>9,760 (62.57)</td>
<td>10,521 (60.17)</td>
<td>4.93</td>
</tr>
<tr>
<td>Otherb</td>
<td>5,843 (37.46)</td>
<td>6,971 (39.87)</td>
<td>-4.93</td>
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<tr>
<td>Missing</td>
<td>2,349</td>
<td>1,797</td>
<td>NA</td>
</tr>
<tr>
<td>Primary insurance, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>12,455 (70.84)</td>
<td>12,754 (70.14)</td>
<td>1.53</td>
</tr>
<tr>
<td>Private</td>
<td>5,126 (29.16)</td>
<td>5,429 (29.86)</td>
<td>-1.53</td>
</tr>
<tr>
<td>Missing</td>
<td>285</td>
<td>1,797</td>
<td>NA</td>
</tr>
<tr>
<td>Total Charlson Comorbidity Index score at admission, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1</td>
<td>8,039 (44.79)</td>
<td>7,953 (41.25)</td>
<td>7.15</td>
</tr>
<tr>
<td>≥2</td>
<td>9,909 (55.21)</td>
<td>11,328 (58.75)</td>
<td>-7.15</td>
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</tbody>
</table>
Results: Patient Falls

<table>
<thead>
<tr>
<th>Adjusted Rate Ratio (95% CI)</th>
<th>Favors Fall TIPS</th>
<th>Favors Usual Care</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>0.85 (0.75-0.96)</td>
<td></td>
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<tr>
<td>Site 1</td>
<td></td>
<td></td>
<td>0.16</td>
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<tr>
<td>0.88 (0.74-1.05)</td>
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<tr>
<td>Site 2</td>
<td></td>
<td></td>
<td>0.13</td>
</tr>
<tr>
<td>0.81 (0.62-1.06)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site 3</td>
<td></td>
<td></td>
<td>0.21</td>
</tr>
<tr>
<td>0.83 (0.63-1.11)</td>
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### Results: Injurious Falls

<table>
<thead>
<tr>
<th></th>
<th>Adjusted Rate Ratio (95% CI)</th>
<th>Favors Fall TIPS</th>
<th>Favors Usual Care</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>0.66 (0.49-0.89)</td>
<td></td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Site 1</td>
<td>0.58 (0.38-0.89)</td>
<td></td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Site 2</td>
<td>0.69 (0.36-1.31)</td>
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<td></td>
<td>0.25</td>
</tr>
<tr>
<td>Site 3</td>
<td>0.97 (0.44-2.18)</td>
<td></td>
<td></td>
<td>0.96</td>
</tr>
</tbody>
</table>
Results: Reduced Falls and Injurious Falls

Fall rates decreased 15% from 2.92 to 2.49 falls/1000 patient days

Fall injury rates decreased 34% from .73 to .48 injuries/1000 patient days

Patients younger than 65 had greatest reduction in falls (18%) versus patients 65 or older (10%)

Patient aged 65 or older had greatest reduction in injury (48%) vs. patient younger than 65 (19%)
Discussion

- Fall TIPS was iteratively refined for over a year with end-users and then implemented and evaluated using a stepped wedge design.

- Associated with overall reduced rates of falls and fall-related injuries.
  - Patient engagement in the 3-step fall-prevention process is a key component of the Fall TIPS toolkit intervention
    - Fewer falls especially among younger patients
    - Fewer fall-related injuries especially among older patients (those at greatest risk of harm)

- Conducting pragmatic studies that engage stakeholders in intervention development in clinical settings is challenging
  - Strengthens intervention
  - Makes quantifying the association between the intervention and outcomes more difficult

- Extensive clinician and patient involvement in developing, refining, and pilot testing the Fall TIPS tool kit
  - Attention to clinician “readiness” and “logistical” skills are key to success
  - Iteratively changing processes can impact practice and outcomes.
  - Need to account for participant interaction in study design
Study Conclusions

• The Fall TIPS toolkit links patient-specific risk factors to interventions most likely to prevent falls
• Multidisciplinary collaboration including clinical, informatics, and systems engineering expertise increased rigor around evaluation of user’s relationship and interface with the environment, the technology, and system as a whole
• Various tool kit modalities allow for integration into diverse clinical workflows
• Implementation is not without real-world challenges
  • True stakeholder involvement in designing the data, information and workflows is needed
  • Recognition of the value of patient/consumer use of intervention and impact on workflow is needed
• The Fall TIPS Toolkit addresses the gaps among nursing assessment of fall risk, tailored fall prevention interventions, and engagement of patients throughout the fall-prevention process

Fall TIPS Toolkit is available for all to use at www.FallTIPS.org
Significance of This Work for Stakeholders

• Maureen Scanlan MSN, RN, NEA-BC
  Vice President, Nursing and Patient Care Services, Montefiore Health System

• Jason Adelman MD, MS
  Chief Patient Safety Officer, Columbia University Irving Medical Center/NewYork-Presbyterian
Evaluation of a Patient-Centered Fall-Prevention Tool Kit to Reduce Falls and Injuries: Co-authors and Funding Support

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- Zoe Burns, MPH
- Jason Adelman, MD, MS
- James Benneyan, PhD
- Michael Bogaisky, MD
- Eileen Carter, PhD, RN
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- Mary Ellen Lindros, EdD, RN
- Stuart R. Lipsitz, ScD
- Maureen Scanlan, MSN, RN
- Shimon Shaykevich, MS
- David Westfall Bates, MD, MSc
Questions/Discussion

Fall TIPS Toolkit and resources available at www.FallTIPS.org