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**

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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?*

***Dykes PC**, Carroll DL, Hurley A, Lipsitz S, Benoit A, Chang F, Meltzer S, Tsurikova R, Zuyov L, Middleton B. Fall prevention in acute care hospitals: A randomized trial. <u>JAMA</u>. 2010; 304(17):1912-8.
***Dykes PC**, I-Ching EH, Soukup JR, Chang F, Lipsitz S. A case control study to improve accuracy of an electronic fall prevention toolkit. <u>AMIA Annu Symp Proc</u>. 2012; 2012:170-9.

Focus groups, interviews, and workflow observations

1. **Problem analysis:** learn about the needs and preferences of patients and providers and other social-technical factors that relate to fall prevention

Participatory design, icon validation with patients and families, usability testing, rapid prototyping, and piloting prototype refinement

2. **Design and 3. Development:** implement content, display, and workflow integration strategies most likely to address requirements and overcome barriers [1-2]

Laminated paper poster

EHR toolkit

e-Bedside display

6-mo Pilot test on patient care units and compliance audits

4. **Implementation:** conduct a pilot test of fall TIPS and compare for effectiveness in engaging patients and families in the 3-step fall prevention process [3-4]

Patient activation survey and efficacy analysis 21 mo before and after intervention

5. **Evaluation:** evaluate the toolkit's efficacy on patient activation, falls, and injurious falls [5]

Iterative

Brigham and Women's Patient Safety Learning Lab:

A Five-Phase Intervention Development and Evaluation

1Katsulis Z, Ergai A, Leung WY, et al. Iterative user centered design for development of a patient-centered fall prevention toolkit. *Appl Ergon*. 2016;56:117-126.
2. Leung WY, Adelman J, Bates DW, et al. Validating fall prevention icons to support patient-centered education. *J Patient Saf*. 2017.
3. Dykes PC, Duckworth M, Cunningham S, et al. Pilot testing Fall Trends Pharmacol Sci (Tailoring Interventions for Patient Safety): a patient-centered fall prevention toolkit. *Jt Comm J Qual Patient Saf.* 2017;43(8):403-413
4. Duckworth M, Adelman J, Belategui K, et al. Assessing the effectiveness of engaging patients and their families in the three-step fall prevention process across modalities of an evidence-based fall prevention toolkit: an implementation science study.*J Med internet Res*. 2019;21(1):e10008.
5. Christiansen TL, Lipsitz S, Scanlan M, et al. Patient activation related to fall prevention: a multisite study. *Jt Comm J Qual Patient Saf.* 2020;46(3):129-135.

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

Duckworth M, **Adelman J,** Belategui K, Feliciano Z, Jackson E, Khasnabish S, Lehman IS, Lindros ME, Mortimer H, Ryan K, **Scanlan M,** Berger Spivack L, Yu SP, **Bates DW, Dykes PC**. Assessing the Effectiveness of Engaging Patients and Their Families in the Three-Step Fall Prevention Process Across Modalities of an Evidence-Based Fall Prevention Toolkit: An Implementation Science Study. *J Med Internet Res.* 2019 01 21; 21(1):e10008.

Christiansen TL, Lipsitz S, **Scanlan M**, Yu SP, Lindros ME, Leung WY, **Adelman J, Bates DW, Dykes PC**. Patient Activation Related to Fall Prevention: A Multisite Study. *Jt Comm J Qual Patient Saf.* 2020 03; 46(3):129-135.
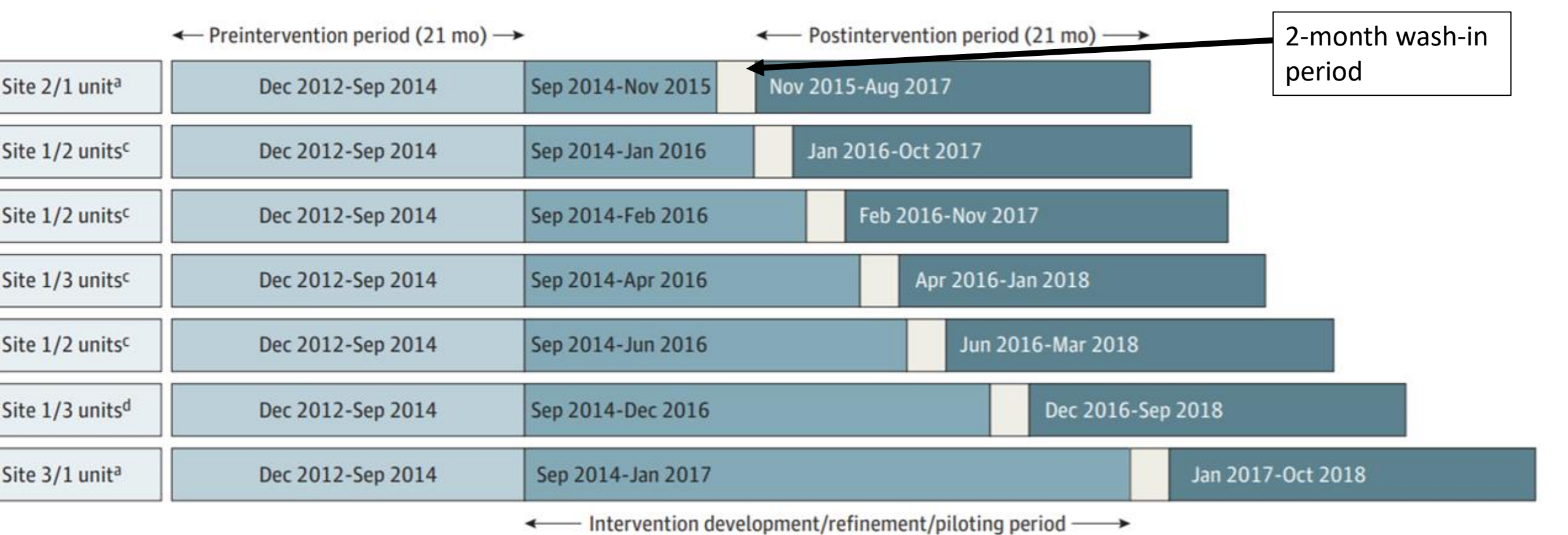
Methods: Study Sites and Timeline

- 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

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*
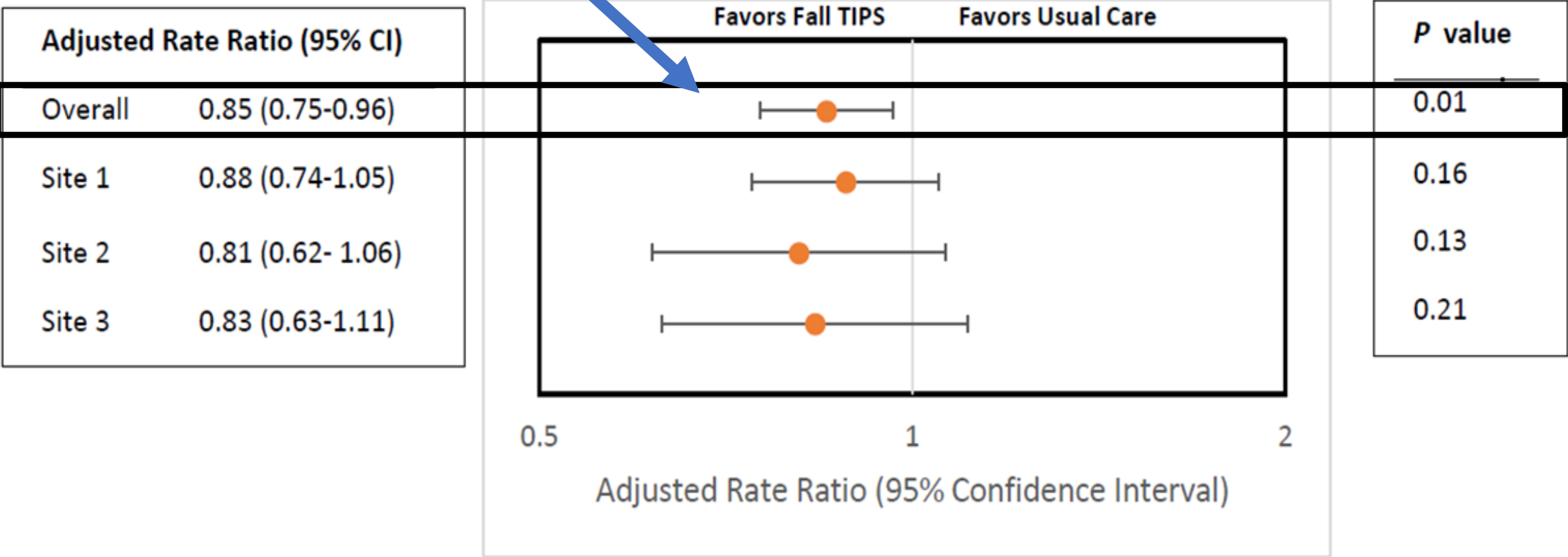
Results: Participants

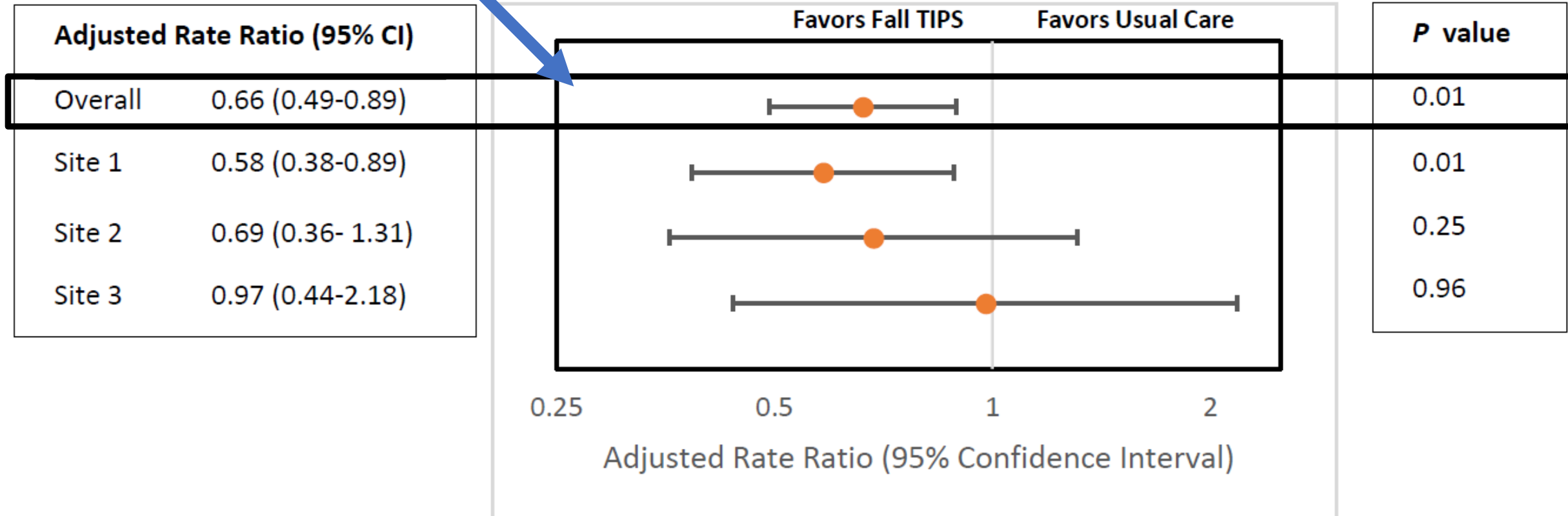| Characteristics	Before the intervention, No.	After the intervention, No.	Standardized difference (%)[a]
Patient-days, No.	135 163	142 492	NA
Patients, No.	17 948	19 283	NA
Hospital length of stay, mean (SD)	7.53 (9.04)	7.39 (10.03)	1.47
Unit length of stay, mean (SD)	5.86 (6.07)	5.88 (7.45)	-0.29
Age, mean (SD)	60.56 (18.30)	60.92 (18.10)	-1.98
Women, No. (%)	9723 (54.17)	10 325 (53.54)	1.26
Race/ethnicity, No. (%)			
White	9760 (62.57)	10 521 (60.17)	4.93
Other[b]	5843 (37.46)	6971 (39.87)	-4.93
Missing	2349	1797	NA
Primary insurance, No. (%)			
Public	12 455 (70.84)	12 754 (70.14)	1.53
Private	5126 (29.16)	5429 (29.86)	-1.53
Missing	285	1797	NA
Total Charlson Comorbidity Index score at admission, No. (%)			
0-1	8039 (44.79)	7953 (41.25)	7.15
≥2	9909 (55.21)	11 328 (58.75)	-7.15

- 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

Primary Outcome

Adjusted Rate Ratio (95% CI)		P value
Overall	0.85 (0.75-0.96)	0.01
Site 1	0.88 (0.74-1.05)	0.16
Site 2	0.81 (0.62- 1.06)	0.13
Site 3	0.83 (0.63-1.11)	0.21

Favors Fall TIPS   Favors Usual Care

0.5   1   2

Adjusted Rate Ratio (95% Confidence Interval)

Results: Patient Falls

Secondary Outcome

Adjusted Rate Ratio (95% CI)		*P* value
Overall	0.66 (0.49-0.89)	0.01
Site 1	0.58 (0.38-0.89)	0.01
Site 2	0.69 (0.36- 1.31)	0.25
Site 3	0.97 (0.44-2.18)	0.96

Favors Fall TIPS   Favors Usual Care

Adjusted Rate Ratio (95% Confidence Interval)

0.25   0.5   1   2
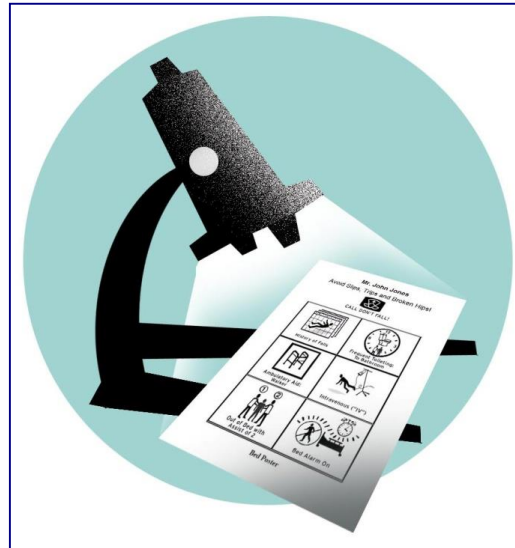
Results: Injurious Falls

Results: Reduced Falls and Injurious Falls

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

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

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

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

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Questions/Discussion

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