

Development and Validation of a Fall Prevention Efficiency Scale

Patricia C. Dykes, PhD, RN,*† Srijesa Khasnabish, BA,* Zoe Burns, MPH,* Lesley E. Adkison, PhD, RN,* Lois Alfieri, MSN, RN,‡ Michael Bogaisky, MD,‡ Diane L. Carroll, PhD, RN,* Eileen J. Carter, PhD, RN,§|| Ann C. Hurley, DNSc, RN,* Emily Jackson, MBA, RN,|| Susan Kurian, EdD, MSN,‡ Mary Ellen Lindros, EdD, RN,‡ Virginia Ryan, MSN, RN,* Maureen Scanlan, MSN-BC, RN,‡ Kelly Sessler, MPH, RN,|| Alexandra Shelley, MS, FNP-BC, RN-BC,|| Linda B. Spivack, RN,‡ Mary-Ann Walsh, BSN, CPPS, RN,* David W. Bates, MD, MSc,*† and Jason S. Adelman, MD, MS||

Objectives: Fall TIPS (Tailoring Interventions for Patient Safety) is an evidence-based fall prevention program that led to a 25% reduction in falls in hospitalized adults. Because it would be helpful to assess nurses' perceptions of burdens imposed on them by using Fall TIPS or other fall prevention program, we conducted a study to learn benefits and burdens.

Methods: A 3-phase mixed-method study was conducted at 3 hospitals in Massachusetts and 3 in New York: (1) initial qualitative, elicited and categorized nurses' views of time spent implementing Fall TIPS; (2) second qualitative, used nurses' quotes to develop items, research team inputs for refinement and organization, and clinical nurses' evaluation and suggestions to develop the prototype scale; and (3) quantitative, evaluated psychometric properties.

Results: Four "time" themes emerged: (1) efficiency, (2) inefficiency, (3) balances out, and (4) valued. A 20-item prototype Fall Prevention Efficiency Scale was developed, administered to 383 clinical nurses, and reduced to 13 items. Individual items demonstrated robust stability with Pearson correlations of 0.349 to 0.550 and paired *t* tests of 0.155 to 1.636. Four factors explained 74.3% variance and provided empirical support for the scale's conceptual basis. The scale achieved excellent internal consistency values (0.82–0.92) when examined with the test, validation, and paired (both test and retest) samples

Conclusions: This new scale assess nurses' perceptions of how a fall prevention program affects their efficiency, which impacts the likelihood of use. Learning nurses' beliefs about time wasted when implementing new programs allows hospitals to correct problems that squander time.

Key Words: fall prevention, scale, nursing workflow, quality improvement, patient safety

(*J Patient Saf* 2021;00: 00–00)

Falls in hospitals are common,¹ and injurious falls are the most prevalent in-hospital adverse event² causing injuries ranging from minor abrasions to life-threatening fractures, head injuries,

and death. Injurious falls increase hospital stays and incur costs that in the United States may not be reimbursed.¹ The population is aging, and older adults fall more frequently when hospitalized than younger adults. The intervention, Fall TIPS (Tailoring Interventions for Patient Safety), examined in a randomized multisite-controlled trial resulting in an overall 25% reduction in falls, was most effective with hospitalized older adults.³ Fall TIPS involves a 3-step fall prevention process carried out in collaboration with the patient and family: (1) soon after admission, the nurse uses a reliable/valid screening scale to identify fall risks (Fall TIPS uses the 6-item Morse Fall Scale⁴); (2) using those data, the nurse develops a tailored fall prevention plan linking specific risks for falling with evidence-informed interventions; and (3) lastly, the plan is made visible and readily available to patients, families, and all staff.

Fall TIPS provides decision support based on each individual patient's risk profile to identify the fall prevention interventions most likely to prevent a fall. The nurse then tailors the plan based on knowledge of the individual patient, clinical judgment, and universal fall prevention actions, for example; call light within reach, supportive footwear, and clear path to bathroom. The original Fall TIPS is a health information technology (HIT) intervention incorporated within hospitals' electronic health records (EHRs).³ For hospitals without EHR capacity, a paper version was developed and redesigned with the application of human factors techniques⁵ and further refined on the basis of patient and nurse evaluations to generate the Fall TIPS laminated poster (Fig. 1).^{6,7} A bedside screensaver incorporating the patient's Fall TIPS poster information is the third Fall TIPS modality.⁸ Each modality (HIT, poster, screensaver) was found to be effective in promoting patient engagement in the 3-step fall prevention process, suggesting that each modality can integrate evidence-based fall prevention practices into clinical workflows.⁶

Nurses are on the frontline to prevent patients from falling while hospitalized. Hospitals should provide mechanisms to help nurses keep patients safe without adding any additional workflow burden to nurses' existing workflows. Learning nurses' views on time well spent or wasted when implementing new programs allows hospitals to correct for problems that squander time and enhance those components that boost effectiveness. Thus, to facilitate implementation and spread of Fall TIPS, we believed that it was essential to learn both burdens nurses believed were imposed on them by the intervention as well as benefits. Therefore, we developed a brief scale, the *Fall Prevention Efficiency Scale* (FPES) to assess nurses' perceptions of time used wisely or wasted while using Fall TIPS or other fall prevention programs.

METHODS

The development of the FPES consisted of 3 phases. (1) Phase 1: initial qualitative. We elicited nurses' views of time spent

From the *Partners HealthCare; †Harvard Medical School, Boston, Massachusetts; ‡Montefiore Medical Center Hospitals; §Columbia University School of Nursing; and ||NewYork-Presbyterian Hospital, New York, New York.

Correspondence: Patricia C. Dykes, PhD, RN, Center for Patient Safety, Research and Practice, Division General and Internal Medicine and Primary Care, Brigham & Women's Hospital, 1620 Tremont St, 3rd Floor, Boston, MA 02120 (e-mail: pdykes@bwh.harvard.edu).

This work was supported by the Agency for Healthcare Research Quality (grant number 1R18HS025128-01).

D.W.B. consults for EarlySense, which makes patient safety monitoring systems. He receives cash compensation from CDI (Negev), Ltd, which is a not-for-profit incubator for health IT startups. He receives equity from ValeraHealth, which makes software to help patients with chronic diseases. He receives equity from Clew, which makes software to support clinical decision making in intensive care. He receives equity from MDClone, which takes clinical data and produces deidentified versions of it. He receives equity from AESOP, which makes software to reduce medication error rates. He receives research funding from IBM Watson Health. His financial interests have been reviewed by Brigham and Women's Hospital and Mass General Brigham in accordance with their institutional policies. All other authors disclose no conflict of interest.

Copyright © 2021 Wolters Kluwer Health, Inc. All rights reserved.

Patient Name: _____		Date: _____	
Increased Risk of Harm If You Fall <input type="checkbox"/>		Fall Interventions (Circle selection based on color)	
Fall Risks (Check all that apply)		Communicate Recent Fall and/or Risk of Harm	
History of Falls <input type="checkbox"/>		Crutches	Cane
Medication Side Effects <input type="checkbox"/>		Walker	
Walking Aid <input type="checkbox"/>		Toileting Schedule: Every _____ hours	
IV Pole or Equipment <input type="checkbox"/>		Bed Pan	Assist to Bathroom
Unsteady Walk <input type="checkbox"/>		Assist to Commode	
May Forget or Choose Not to Call <input type="checkbox"/>		Bed Alarm On	
			Assistance Out of Bed
		Bed Rest	1 person
			2 people

Fall TIPS ©Brigham & Women's Hospital 2016; do not alter without written permission.

FIGURE 1. Fall TIPS poster.⁶

implementing Fall TIPS to inform FPES content and identify salient quotes about saving or wasting time. (2) Phase 2: second qualitative. We carried out a series of steps to refine, organize, and examine individual items and to develop a prototype scale. (3) Phase 3: psychometric evaluation. We conducted a quantitative examination to generate and evaluate a parsimonious FPES.

We followed accepted qualitative procedures^{9,10} and standard methods of instrument development¹¹ and evaluation^{12,13} we (P. C.D., A.C.H., D.L.C.) had previously used to build and evaluate scales derived from qualitative data to assess discomfort,¹⁴ measure resistiveness to care,¹⁵ recover medical errors,¹⁶ and quantify fall prevention self-efficacy.¹⁷ Institutional review board’s approval was granted for all sites.

Phase 1: Initial Qualitative

Semistructured interview guides were used to facilitate group discussions to learn nurses’ opinions about Fall TIPS. There were 2 iterations of data collection. The first set of group discussions used an open-ended process to elicit initial information by asking questions about Fall TIPS’ implementation, use, barriers, facilitators, benefits, and consequences. The second set of group discussions followed a structured format to validate provisional themes by asking specific questions, for example, “Back to time: We’ve covered a lot of ground here, but I would like to go back to the time it takes you to use Fall TIPS. Which do you think is more efficient, your previous fall prevention processes or Fall TIPS? Please elaborate on... Please tell me more about...”

Seventy-two nurses participated in 2 phases of group interviews; initial (n = 53, 8 groups) and validation (n = 19, 3 groups). Some participants did not respond to all demographic questions; percentages reflect the denominator of respondents. The typical respondent was a female (92%), non-Hispanic (89%), well-educated (bachelor’s degree, 74%; master’s degree, 22%; doctorate, 1%) nurse who worked full time and had 13 years of nursing experience, of which 10 years were at the current hospital. The sample was racially diverse (White, 39%; African American, 34%; Asian, 20%; and >1 race, 6%). When participants were asked to rate themselves, as compared with their peers, in their ability to help prevent patients from falling, 41 (61.2%) of 67 respondents replied above average and none replied below average. Overwhelmingly, participants (57/58) preferred Fall TIPS over their hospital’s previous fall prevention program.

Interviews were transcribed using Trint transcription software,¹⁸ exported into MS Word,¹⁹ reviewed for completeness and removal of identifiable information, and uploaded to the qualitative software program, NVivo.²⁰ Basic content analysis methods¹⁰ using a 2-phase/2-person consensus were followed for identifying/coding text related to “time.” The 4 team members (P.C.D., A.C.H., S.K., and Z.B.) responsible for coding and interpreting data established consistency by independently reviewing/coding the first 4 group interviews and discussing agreements, disagreements, and preliminary codes until consensus was achieved. We then used the 2-phase, 2-person consensus for confirmation of codes and themes. Two reviewers (S.K. and Z.B.) conducted the initial coding, and those decisions were evaluated by 2 additional reviewers (A.C.H. and P.C.D.) for confirmation and/or consensus-approved refinement. This 2-phase, 2-person approach was followed for all interviews. Text segments were open coded and organized around themes. Salient quotes related to themes were identified and suggested to inform scale items.

Phase 2: Second Qualitative

Themes were used to structure the prototype FPES, and quotes that had been organized under themes were used as the basis for writing FPES items. Draft scale items were reviewed and refined by the research team during 3 iterations of item modification in which the items were improved, deleted, or combined. The scale format was determined and administration instructions were written. Then 10 nurses at one Academic Medical Center (AMC) in Massachusetts participated in a group discussion to review the items and instructions and provide suggestions for improvement. Nurses were well educated (1 associate degree, 5 bachelor of science, and 4 master of science), mostly female (8), all non-Hispanic, mostly White (8), with an average of 10 years’ experience, of which 6 years were on units using Fall TIPS. Lastly, research team interdisciplinary researchers/clinicians (see author credentials) confirmed the FPES items and prototype using a 4-point Likert scale (1, strongly disagree; 2, disagree; 3, agree; 4, strongly agree). The final prototype FPES with requested demographic information and administration instructions, including a self-created linking code to enable retest examination, was uploaded to Research Electronic Data CAPture.²¹

TABLE 1. Demographic Characteristics of 383 FPES Respondents

	Sample			
	Test (n = 156)	Validation (n = 156)	Paired (n = 71)	Total (n = 383)
Age				
No. responding	110	123	58	291
Mean	37.65	38.57	38.36	38.18
Median	34.00	36.00	36.00	36.00
SD	11.286	11.941	11.340	11.546
Years of nursing experience				
No. responding	131	133	61	325
Mean	11.95	12.01	12.08	12.00
Median	8.00	9.00	8.00	8.00
SD	11.012	10.565	10.860	10.769
Years at current hospital				
No. responding	133	136	58	327
Mean	10.32	9.65	10.28	10.03
Median	6.00	6.00	7.50	6.00
SD	10.294	9.359	8.991	9.665
Years on current unit				
No. responding	128	131	58	317
Mean	7.45	8.05	9.28	8.03
Median	3.50	6.00	7.00	5.00
SD	7.845	7.990	7.818	7.902
Years using Fall TIPS				
No. responding	144	141	66	351
Mean	2.06	2.12	2.05	2.08
Median	2.00	2.00	2.00	2.00
SD	0.727	0.722	0.773	0.732
Confidence to prevent falling (0–10 scale)				
No. responding	119	117	52	288
Mean	8.50	8.62	8.83	8.61
Median	9.00	9.00	9.00	9.00
SD	1.687	1.675	1.133	1.595
Sex				
Male	10	13	7	30
Female	127	129	57	313
Fall TIPS modality used				
Laminated paper	77	63	41	181
EHR-generated printout	55	66	18	139
Screen saver	3	2		5
Both laminated paper and screen saver	18	23	12	53
Highest education				
Diploma	3	7	3	13
AD/AS	5	8	2	15
BS/BA	119	106	49	274
MA/MS	14	20	10	44
DNP/PhD/DNSc	3			3
Ethnic group				
Hispanic	6	16	7	29
Non-Hispanic	125	113	51	289

TABLE 1. (Continued)

Race				
American Indian/ Alaskan Native	4	2	2	8
Asian	22	19	5	46
Native Hawaiian/ Pacific Islander	1	1	1	3
Black or African American	28	30	12	70
White	64	59	40	163

Phase 3: Psychometric Evaluation

Quantitative data were collected from a convenience sample of nurses located at 5 AMCs and 1 community hospital where Fall TIPS had been used for at least 2 years. Three hospitals were in Massachusetts and 3 were in New York. Nurse directors sent e-mails to staff with the Research Electronic Data CAPture link explaining the project and requested staff to respond anonymously to the FPES. Two weeks later, nurses were requested to complete the FPES a second time. The data set was divided into subjects who responded to an initial test as well as retest (median duration of 16 days later) and subjects who responded only once who were randomly split into test and validation samples. The plan was to examine the test sample’s frequency distributions for possible deletion of items if $\geq 25\%$ subjects did not respond to an item or $>75\%$ selected the same response. Paired *t* tests were used to identify potential items lacking retest stability (low/statistically non-significant Pearson correlation and high/statistically significant *t* test). Retained items were examined by principal components analysis to identify potential subscales that were examined in the 4 samples: test, validation, initial paired, and retest paired groups. Analyses were conducted using SPSS.²²

RESULTS

Phase 1: Initial Qualitative

There were 47 data segments identified that related to time and were categorized into 42 open codes, sorted into clusters, and combined to form themes. Four themes captured the time construct: efficiency, inefficiency, balances out, and valued.

Efficiency encapsulated the overall perception that “Fall TIPS conserves time.” Nurses told us they spent less time having to find another nurse when assisting a patient that was not theirs (because patients’ tailored personal fall prevention plan was displayed in the room showing how to ambulate, toilet, etc), liked having pictorial displays (icons) of specific risks and interventions in patients’ rooms, and preferred the specific information provided by Fall TIPS versus a sign with a generic rating of “high fall risk.”

In contrast, *inefficiency* captured the perceptions that Fall TIPS took extra time or caused time delays associated with technical glitches (if using EHR Fall TIPS) or finding markers/erasers, checking to be sure poster is correct (if using paper Fall TIPS). Nurses at hospitals with EHR had to cope with computer and printer limitations.

The third theme, *balances out*, offset the plusses and minuses of Fall TIPS, ultimately making Fall TIPS “worth it.” Although it took time to learn Fall TIPS, nurses told us that once they were oriented and comfortable with using Fall TIPS, it saved time and brought the conversation of fall prevention to the forefront. One nurse succinctly affirmed that fall prevention is worth the time investment by stating that “way more people work if a patient falls.”

The final theme, *valued*, indicated that nurses reflected on time spent using Fall TIPS and considering positive outcomes, and

appreciated and highly regarded Fall TIPS. Nurses credited Fall TIPS with enhancing communication with ancillary staff to improve awareness of patients' needs and that placing the Fall TIPS plan in the patient's room became a catalyst for family communication.

Phase 2: Second Qualitative

Quotes from the data segments were initially worded into 40 scale items. After 3 phases of research team members' independent reviews followed by group discussions during conference calls, the number of items was reduced to 20. This draft FPES was then examined by 10 clinical nurses. Some changes in wording and administration instructions were made. During a fourth conference call, the research team approved this final FPES prototype by consensus. The 20 items were organized into 4 components, "Our fall prevention program: 1) conserves our time (5 items), 2) wastes our time (3 items), and 3) is worth the time it takes (5 items). 4) My opinion about ... (7 items)."

Phase 3: Psychometric Evaluation

A total of 383 nurses completed the prototype FPES (Table 1). Examination of the test sample's frequency distributions revealed that no items should be deleted based on our a priori criteria of low item response rates or poor discrimination. After independent reviews of the 20 items to reconsider redundancy, research team consensus was obtained to delete 7 items, generating the final 13-item FPES (Table 2). Paired *t* test values revealed that all items had adequate retest stability (Table 2), with statistically significant Pearson correlations ranging from 0.349 to 0.550 and statistically not significant paired *t* tests ranging from 0.155 to 1.636. A scree test leveled out with 4 factors. Principal components analysis

confirmed the 4 themes identified in phase 1, which explained 74.3% of FPES variance (Table 3). Descriptive analyses (Table 4) revealed that the mean (38.87 ± 5.6) and median FPES scores (38) were similar, with a skew value of -0.380, indicative of symmetrical data allowing for the use of parametric statistics. Respondents used the full range of scores (13–52), and α coefficients were adequate (0.82–0.92), well above the minimum of 0.7 suggested for a new scale.¹² An examination of variables that might have influenced FPES scores (Table 5) revealed no impact of age, experience at the hospital or unit, time using Fall TIPS, or hospital type or location. Because no hospital had relied on the screensaver modality for Fall TIPS, only 2 modalities, Fall TIPS HIT or Fall TIPS laminated poster versions, were examined. There were no differences in FPES scores between nurses using the Fall TIPS HIT or Fall TIPS laminated poster version.

DISCUSSION

Commentary on Qualitative Phases

In phase 1 of this project, several nurses revealed that they found Fall TIPS to be efficient and "worth it." These beliefs were endorsed by the nurses who completed the demographic form in which they overwhelmingly asserted they would not want to give up Fall TIPS (95% of nurses interviewed in phase 1 would not prefer going back to their pre-Fall TIPS system for preventing falls). Our findings in both this study and the Fall TIPS randomized trial³ disagree with the Teh team's conclusion, "Electronic medical records have not so far demonstrated a reduction in falls, with ongoing staff concerns about their usability."^{23(p213)}

TABLE 2. Individual Items' Responses (Test Sample, n = 156)/Paired *t* Test Values (n = 71)

Item	No.	Mean (SD)	No.	Pearson	t Test	
				R (P)	x Diff	t (P)
Our fall prevention program conserves our time because						
1. No extra work is required since components of our fall prevention program are integrated within our work flow	153	2.62 (0.73)	71	0.466 (0.000)	0.014	0.155 (0.877)
2. The resources we need to carry out the program are readily available	154	2.94 (0.65)	71	0.571 (0.000)	0.042	0.520 (0.605)
3. We know if a patient needs to have a bed alarm activated or not	152	3.16 (0.67)	70	0.498 (0.000)	0.129	1.636 (0.106)
4. We know a patient's ambulation status	154	3.10 (0.63)	71	0.578 (0.000)	0.070	1.043 (0.300)
Our fall prevention program wastes our time because						
5. Of not being sure the plan in the patient's room is current	152	2.47 (0.83)	70	0.590 (0.000)	0.014	0.155 (0.877)
6. Of the steps needed to update the plan in the patient's room	152	2.22 (0.81)	69	0.573 (0.000)	0.029	0.351 (0.726)
Fall TIPS is worth the time it takes because we						
7. Do not have to check toileting procedures, since patients' fall prevention plans are visible in their rooms	150	2.63 (0.76)	71	0.501 (0.000)	0.028	0.314 (0.754)
8. Found Fall TIPS easy to use once learned	152	2.95 (0.68)	69	0.517 (0.000)	0.029	0.390 (0.698)
My opinion about Fall TIPS is that						
9. Involving the patient and asking questions while conducting the fall risk assessment is helpful	151	3.23 (0.60)	70	0.425 (0.000)	0.057	0.728 (0.469)
10. Observing patients' capacity to ambulate during the fall risk assessment is helpful	149	3.28 (0.614)	71	0.396 (0.001)	0.085	1.229 (0.223)
11. Planning fall prevention interventions with the patient is helpful	150	3.27 (0.55)	69	0.435 (0.000)	0.043	0.554 (0.581)
12. Involving thee family with the patient's fall prevention plan is helpful	152	3.26 (0.62)	70	0.491 (0.000)	0.057	0.782 (0.437)
13. Having patient specific fall prevention interventions versus knowing "low, medium, high fall risk" is helpful	151	3.18 (0.71)	71	0.349 (0.003)	0.085	0.948 (0.346)

Values that denote a statistically significant are set in italic.

TABLE 3. Factor Structure

	Factor No.			
	1*	2 [†]	3 [‡]	4 [§]
	% Variance Explained			
	30.71	17.10	13.91	12.58
Factor Structure: Test Sample (n = 156)	Rotated Factor Loadings			
Opinion: planning fall prevention interventions with the patient is helpful	0.881	0.170	0.007	0.193
Opinion: involving thee family with the patient’s fall prevention plan is helpful	0.866	0.186	0.036	0.122
Opinion: observing patients’ capacity to ambulate during the fall risk assessment is helpful	0.840	0.224	0.036	0.037
Opinion: involving the patient and asking questions while conducting the fall risk assessment is helpful	0.838	0.160	0.066	0.215
Opinion: having patient specific interventions versus knowing “low, medium, high fall risk” is helpful	0.657	0.092	0.357	0.069
Worth the time: found Fall TIPS easy to use once learned	0.573	0.352	0.367	0.006
Conserves time: we know a patient’s ambulation status	0.302	0.845	0.077	0.202
Conserves time: we know if a patient needs to have a bed alarm activated or not	0.303	0.822	0.126	0.192
Conserves time: the resources we need to carry out the program are readily available	0.137	0.603	0.480	0.064
Worth the time: do not have to check toileting procedures, since patients’ fall prevention plans are visible in their rooms	0.129	0.005	0.858	0.126
Conserves time: no extra work is required since components of our fall prevention program are integrated within our work flow	0.031	0.278	0.713	0.104
Wastes time because: of the steps needed to update the plan in the patient’s room	0.270	0.037	0.192	0.854
Wastes time because: of not being sure the plan in the patient’s room is current	0.081	0.347	0.072	0.832

*Valued.

[†]Efficiency.

[‡]Balances out.

[§]Inefficiency.

We did find that there were technical glitches as well as looking for necessary supplies, which agrees with the literature in which nurses’ self-reported spending significant time in wasteful activities of searching, gathering, waiting, and traveling.²⁴ A nurse in our study was frustrated at not having an eraser and a marker when wanting to update a poster. It is regrettable that not having those supplies that only cost a few dollars can sabotage the only known fall prevention program found to be effective in acute care hospitals.³

The notion that knowing a patient’s risk for falling in terms of high <-> low is meaningless without knowing specific risks and how to ameliorate them emerged. Although the meaninglessness of rating fall risks without identifying specific risks and interventions has long been observed as a theme in our team’s program of fall research,²⁵ this wasteful rating scheme persists. Rating fall risks without identifying specific risks and suggesting interventions wastes time and does not lead to fewer falls.

The second qualitative phase was the operational link between nurses’ quotes that constituted the basis for the FPES items and 4 iterations of FPES prototypes. Both interdisciplinary experts in fall prevention and research and clinical nurses participated. The interdisciplinary team discussed and critiqued the original 40 items, and after refining, combining, clarifying, and deleting items, 20 were approved for review by clinical nurses. This process required 4 conference calls, which were necessary to distil the essence of a large amount of qualitative data into 20 statements that would be psychometrically evaluated.

Psychometric Properties

The fact that the scree plot leveled off to identify 4 factors (explaining 74.3% variance) that were congruent with the 4

themes identified in phase 1 provided conceptual support for the FPES. We examined the factorially derived subscales and found them to be psychometrically adequate. This exam was to assess reliability to provide empirical support (or not) for the FPES, not to suggest that these factorially derived subscales be used as subscales. The FPES was developed to be used as a 13-item scale and is suitable for use with parametric statistics. In addition, individual items can illuminate fall prevention issues. For example, knowing responses to item 13 (Table 6), “Having patient specific fall prevention interventions versus knowing “low, medium, high fall risk” is helpful,” can help hospitals who are considering changing from such a generic fall prevention program to one that identifies specific fall risks so that interventions can be individually tailored to patients.

The α coefficients of the FPES in all 4 samples were well over the 0.7 considered adequate for a new scale.¹² Two-item subscales rarely achieve 0.7, and the values of 0.5 were considered acceptable for those 2-item subscales. The participants used 2 different Fall TIPS modalities, but there were no differences in FPES scores related to modality used, providing additional empirical support that it is not the modality but the 3-step fall prevention process that is important.⁶

Strengths and Limitations

We obtained rich information on positive and negative issues experienced by nurses who used Fall TIPS. That information, specifically nurses’ quotes when describing their experiences, became the content domain from which scale items were written, yielding an empirically grounded scale. We were able to develop a new scale to assess nurses’ assessment of how a fall prevention

TABLE 4. Subscales Items' Descriptions and Internal Consistency

Factorially Derived Subscales					
	Factor 1 Valued (6 Items)	Factor 2 Efficiency (3 Items)	Factor 3 Balances Out (2 Items)	Factor 4 Inefficiency (2 Items)	FPES-Total (13 Items)
Descriptive data (test sample, 156 subjects)					
n	147	152	149	141	141
Mean	19.1769	9.1974	5.2416	5.3245	38.8723
SEM	0.24982	0.13657	0.10330	0.11644	0.47178
Median	18.00	9.00	5.00	5.00	38.00
Mode	18.00	9.00	6.00	6.00	37.00
SD	3.02886	1.68373	1.26090	1.43085	5.60211
Variance	9.174	2.835	1.590	2.047	31.384
Skewness	-0.339	-0.729	-0.508	-0.312	-0.380
SES	0.200	0.197	0.199	0.197	0.204
Kurtosis	1.501	2.443	0.927	0.301	2.904
SEK	0.397	0.391	0.395	0.392	0.406
Range	18.00	9.00	6.00	6.00	39.00
Min	6.00	3.00	2.00	2.00	13.00
Max	24.00	12.00	8.00	8.00	52.00
Sum	2819.00	1398.00	781.00	804.00	5481.00
Sample	Cronbach's α				
Test sample (n = 156)	0.90	0.82	0.63	0.71	0.88
Validation sample (n = 156)	0.93	0.79	0.54	0.70	0.88
Paired-sample initial test (n = 71)	0.89	0.72	0.63	0.65	0.82
Paired-sample retest (n = 71)	0.93	0.84	0.53	0.70	0.92

TABLE 5. ANOVA Potential Influence of Variables on FPES Scores

ANOVA Table						
Variable		Sum of Squares	df	Mean Square	F	Sig.
Fall TIPS modality (HIT: EHR versus laminated poster)	Between groups	5.044	23	0.219	0.879	0.625
	Within groups	23.948	96	0.249		
	Total	28.992	119			
Age (low ← median versus high > median)	Between groups	5.628	21	0.268	1.146	0.323
	Within groups	18.008	77	0.234		
	Total	23.636	98			
Years of nursing experience (low ← median versus high > median)	Between groups	6.200	22	0.282	1.152	0.309
	Within groups	24.227	99	0.245		
	Total	30.426	121			
Years working at that hospital (low ← median versus high > median)	Between groups	4.505	22	0.205	0.783	0.739
	Within groups	25.644	98	0.262		
	Total	30.149	120			
Years working on that unit (low ← median versus high > median)	Between groups	3.962	22	0.180	0.682	0.847
	Within groups	25.629	97	0.264		
	Total	29.592	119			
Type of hospital: academic medical center versus community hospital	Between groups	1.675	22	0.076	1.060	0.402
	Within groups	7.544	105	0.072		
	Total	9.219	127			
Location: Massachusetts versus New York	Between groups	6.413	22	0.292	1.220	0.248
	Within groups	25.087	105	0.239		
	Total	31.500	127			

TABLE 6. Fall Prevention Efficiency Scale

	Response			
	SD	D	A	SA
Our fall prevention program conserves our time because:				
1. No extra work is required since components of our fall prevention program are integrated within our work flow				
2. The resources we need to carry out the program are readily available				
3. We know if a patient needs to have a bed alarm activated or not				
4. We know a patient's ambulation status				
Our fall prevention program wastes our time because: [†]	SD	D	A	SA
5. Of not being sure the plan in the patient's room is current				
6. Of the steps needed to update the plan in the patient's room				
Fall TIPS [‡] is worth the time it takes because we:	SD	D	A	SA
7. Do not have to check toileting procedures, since patients' fall prevention plans are visible in their rooms				
8. Found Fall TIPS easy to use once learned				
9. Involving the patient and asking questions while conducting the fall risk assessment is helpful				
My opinion about Fall TIPS [‡] is that:	SD	D	A	SA
10. Observing patients' capacity to ambulate during the fall risk assessment is helpful				
11. Planning fall prevention interventions with the patient is helpful				
12. Involving the family with the patient's fall prevention plan is helpful				
13. Having patient specific fall prevention interventions versus knowing "low, medium, high fall risk" is helpful				

Thank you in advance for responding to the items below to help us understand your beliefs about using your hospital's fall prevention program. Responding to items indicates that you know you are participating in a research project*. This is an anonymous survey. Please read each item below and check the degree with which you agree or disagree with each item: SD, strongly disagree; D, disagree; A, agree; SA, strongly agree.

*For quality improvement projects, remove the statement about "research project."

[†]Reverse code.

[‡]For sites not using Fall TIPS, substitute either the name of the fall prevention program used or "our fall prevention program."

tool affects their efficiency, which has a major impact on how likely nurses are to use it. Before the FPES was developed, there was no standard tool to evaluate nurses' perceptions of using any fall prevention program. Although we assessed nurses experienced with using Fall TIPS, the FPES can and should be used to evaluate the use of other fall prevention programs.

This study had several limitations. It was done at 5 AMCs and 1 medical school-affiliated community hospital, which may not be representative of hospitals at large. In the first qualitative phase, the nurse users of Fall TIPS interviewed for this study used 2 different Fall TIPS modalities—the laminated poster or the EHR version—and we did not account for nurses' views potentially contrasting one modality with the other. However, in the psychometric evaluation phase when we examined variables that could potentially influence FPES scores, we found no difference relative to Fall TIPS modality used (Table 5). We included only hospitals where Fall TIPS was used. Although nurses using other fall prevention programs were not included, the FPES should be adapted (Table 6) for use with other programs. Sites not using Fall TIPS should substitute the name of the fall prevention program used or "our fall prevention program."

CONCLUSIONS

We found that nurses in both qualitative and quantitative phases rated their confidence to prevent falls as high (Table 1). Although this agrees with a recent assessment of self-efficacy for preventing patients from falling obtained when testing a Fall Prevention Knowledge Test,²⁶ despite nurses' confidence, patients continue

to fall. Patients fall when individual fall prevention plans are not tailored to address specific actionable risk factors and/or are not carried out consistently by stakeholders.²⁷ Patients who are active partners in their care²⁸ and are engaged with nurses tend to have better health outcomes in general and fewer falls in particular,²⁹ which provided additional evidence to support FPES items that engage patients in the fall prevention process. Displaying the patient's risk factors and fall prevention plan at the bedside supports participation of all professional and assistive staff in the fall prevention process: by helping the patient carry out and reinforce the agreed-upon plan.

The FPES addresses a critical area: how nurses believe a fall prevention program affects their time. This will have a major impact on willingness to adopt programs like this. As stated by others, we agree with the notion that, because nurses are the primary hospital caregivers, the efficient use of their time and energy is critical to the future of hospitals.³⁰

REFERENCES

- Inouye SK, Brown CJ, Tinetti ME. Medicare nonpayment, hospital falls, and unintended consequences. *N Engl J Med.* 2009;360:2390–2393.
- Tzeng HM, Yin CY. Patient engagement in hospital fall prevention. *Nurs Econ.* 2015;33:326–334.
- Dykes PC, Carroll DL, Hurley AC, et al. Fall prevention in acute care hospitals: a randomized trial. *JAMA.* 2010;304:1912–1918.
- Morse JM, Morse RM, Tylko SJ. Development of a scale to identify the fall-prone patient. *Can J Aging.* 1989;8:366–377.

5. Katsulis 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.
6. 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:e10008.
7. Leung WY, Adelman J, Bates DW, et al. Validating fall prevention icons to support patient-centered education. *J Patient Saf*. 2017.
8. Duckworth M, Leung E, Fuller T, et al. Nurse, patient, and care partner perceptions of a personalized safety plan screensaver. *J Gerontol Nurs*. 2017;43:15–22.
9. Denzin NK, Lincoln YS. *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage; 1994.
10. Miles MB, Huberman AM. *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Thousand Oaks: Sage; 1994.
11. Waltz CF, Strickland OL, Lenz ER. *Measurement in Nursing and Health Research*. 4th ed. New York: Springer; 2010.
12. Nunnally JC, Bernstein IH. *Psychometric Theory*. 3rd ed. New York: McGraw Hill Book Company, Inc.; 1994.
13. Knapp TR, Brown JK. Ten measurement commandments that often should be broken. *Res Nurs Health*. 1995;18:465–469.
14. Hurley AC, Volicer BJ, Hanrahan PA, et al. Assessment of discomfort in advanced Alzheimer patients. *Res Nurs Health*. 1992;15:369–377.
15. Mahoney EK, Hurley AC, Volicer L, et al. Development and testing of the resistiveness to care scale. *Res Nurs Health*. 1999;22:27–38.
16. Dykes PC, Rothschild JM, Hurley AC. Recovered medical error inventory. *J Nurs Scholarsh*. 2010;42:314–318.
17. Dykes PC, Carroll DL, McColgan K, et al. Scales for assessing self-efficacy of nurses and assistants for preventing falls. *J Adv Nurs*. 2011; 67:438–449.
18. *Trint: Automated Transcription of Audio and Video*. London, United Kingdom: Trint Software Company; 2018.
19. *Microsoft Word*. Redman, WA: Microsoft; 2016.
20. *NVivo Qualitative Data Analysis Software*. Doncaster, Australia: QSR International Pty Ltd.; 2002.
21. Harris PA, Taylor R, Thiekle R. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2008;42:377–381.
22. *SPSS-IBM*. New York: SPSS-IBM; 2017.
23. Teh RC, Mahajan N, Visvanathan R, et al. Clinical effectiveness of and attitudes and beliefs of health professionals towards the use of health technology in falls prevention among older adults. *Int J Evid Based Healthc*. 2015;13:213–223.
24. Higgins LW, Shovel JA, Bilderback AL, et al. Hospital Nurses' work activity in a technology-rich environment: a triangulated quality improvement assessment. *J Nurs Care Qual*. 2017;32:208–217.
25. Dykes PC, Carroll DL, Hurley AC, et al. Why do patients in acute care hospitals fall? Can falls be prevented? *J Nurs Adm*. 2009; 39:299–304.
26. Dykes PC, Bogaisky M, Carter EJ, et al. Development and validation of a fall prevention knowledge test. *J Am Geriatr Soc*. 2019; 67:133–138.
27. Dykes PC. In: Dykes PC, ed. *A Patient-Centered Fall Prevention Toolkit* (www.falltips.org). Boston, MA: Brigham and Women's Hospital; 2020. Accessed August 4, 2020).
28. Carman KL, Dardess P, Maurer M, et al. Patient and family engagement: a framework for understanding the elements and developing interventions and policies. *Health Aff (Millwood)*. 2013;32:223–231.
29. Opsahl AG, Ebright P, Cangany M, et al. Outcomes of adding patient and family engagement education to fall prevention bundled interventions. *J Nurs Care Qual*. 2017;32:252–258.
30. Hendrich A, Chow MP, Skierczynski BA, et al. A 36-hospital time and motion study: how do medical-surgical nurses spend their time? *Perm J*. 2008;12:25–34.