Turning for Ulcer ReductioN: A Multisite Randomized Clinical Trial in Nursing Homes

Nancy Bergstrom, PhD, RN, Susan D. Horn, PhD,†‡ Mary Pat Rapp, PhD, RN,* Anita Stern, PhD, RN,§ Ryan Barrett, BS,†‡ and Michael Watkiss, BFA†‡*

OBJECTIVES: To determine optimal repositioning frequency of nursing home (NH) residents at risk for pressure ulcers (PrUs) when cared for on high-density foam mattresses.

DESIGN: Multisite, randomized, clinical trial, known as Turning for Ulcer ReductioN (TURN Study).

SETTINGS: NHs in the United States (n = 20) and Canada (n = 7) using high-density foam mattresses.

PARTICIPANTS: Consenting residents (N = 942) aged 65 and older without PrUs at moderate (scores 13–14) or high (scores 10–12) risk of PrUs according to the Braden Scale.

INTERVENTION: Participants were randomly allocated using risk stratification (moderate vs high) to a repositioning schedule (2, 3, or 4 hour) for 3 weeks. Blinded assessors assessed skin weekly.

MEASUREMENTS: PrU incidence (coccyx or sacrum, trochanter, heels).

RESULTS: Participants were mostly female (77.6%) and Caucasian (80.5%) and had a mean age of 85.1 ± 7.7. The most common diagnoses were cardiovascular (76.9%) and dementia (72.5%). Nineteen (2.0%) participants developed superficial PrUs. There was no significant difference (Wilcoxon test for ordered categories) in PrU incidence ($P = .68$) according to repositioning group (2 hour, 8/321, 2.5%; 3 hour, 2/326, 0.6%; 4 hour, 9/295, 3.1%), nor was there a statistically significant difference in the incidence of PrU between the high and moderate-risk groups ($P = .79$). Also, PrU incidence was not statistically significantly different between high-risk participants based on repositioning schedule (6/325, 1.8%, $P = .90$) or between moderate-risk participants based on repositioning schedule (13/617, 2.1%, $P = .68$).

CONCLUSION: There was no difference in PrU incidence over 3 weeks of observation between those turned at 2-, 3-, or 4-hour intervals in this population of residents using high-density foam mattresses at moderate and high risk of developing PrUs when they were repositioned consistently and skin was monitored. This finding has major implications for use of nursing staff and cost of NH care. J Am Geriatr Soc 61:1705–1713, 2013.

Key words: pressure ulcer prevention; nursing home; repositioning; Turning for Ulcer ReductioN Study

Pressure ulcers (PrUs) are a common problem in nursing home (NH) residents; the prevalence of PrUs in residents at high risk of developing PrUs at the outset of the study was 11.6% according to Nursing Home Compare;[1] other studies have reported a 14% to 24% PrU incidence on standard mattresses or foam overlays.[2,3] Economic evaluation of the cost of prevention is emerging and variable, with support surfaces and repositioning identified as more costly elements of prevention.[4–6] Pressure at the interface between bony prominences and support surfaces sufficient to occlude or reduce blood flow to tissues is thought to cause PrUs.[7,8] Redistributing (through properties of support surfaces) and relieving (through repositioning) pressure to reduce length of exposure to pressure prevents PrUs. High-density foam mattresses distribute pressure more evenly and are replacing spring form mattresses.[9,10] In practice, repositioning is done less frequently than the recommended every 2 hours,[11,12] and questions remain about appropriate repositioning intervals.[13,14]

Three previous studies of support surfaces and repositioning schedules have been reported.[2,3,15] Methodological challenges of these studies include that participants at all risk levels were studied despite the likelihood that low-risk subjects do not require repositioning and may have skewed the results; properties of support surfaces differ, with powered overlays and mattresses being more advanced in

From the *School of Nursing, University of Texas Health Science Center at, Houston, Houston, Texas; †International Severity Information Systems, Inc., Salt Lake City; ‡Institute for Clinical Outcomes Research, Salt Lake City, Utah; and §Toronto Health Economics and Technology Assessment Collaborative, University of Toronto, Toronto, Ontario, Canada.

The copyright line for this article was changed on July 31, 2015 after original online publication.

Address correspondence to Nancy Bergstrom, School of Nursing, University of Texas Health Science Center at Houston, 6901 Bertner Blvd. 5th Floor, Houston, TX 77030. E-mail: nancy.bergstrom@uth.tmc.edu

DOI: 10.1111/jgs.12440

0002-8614/15/$15.00

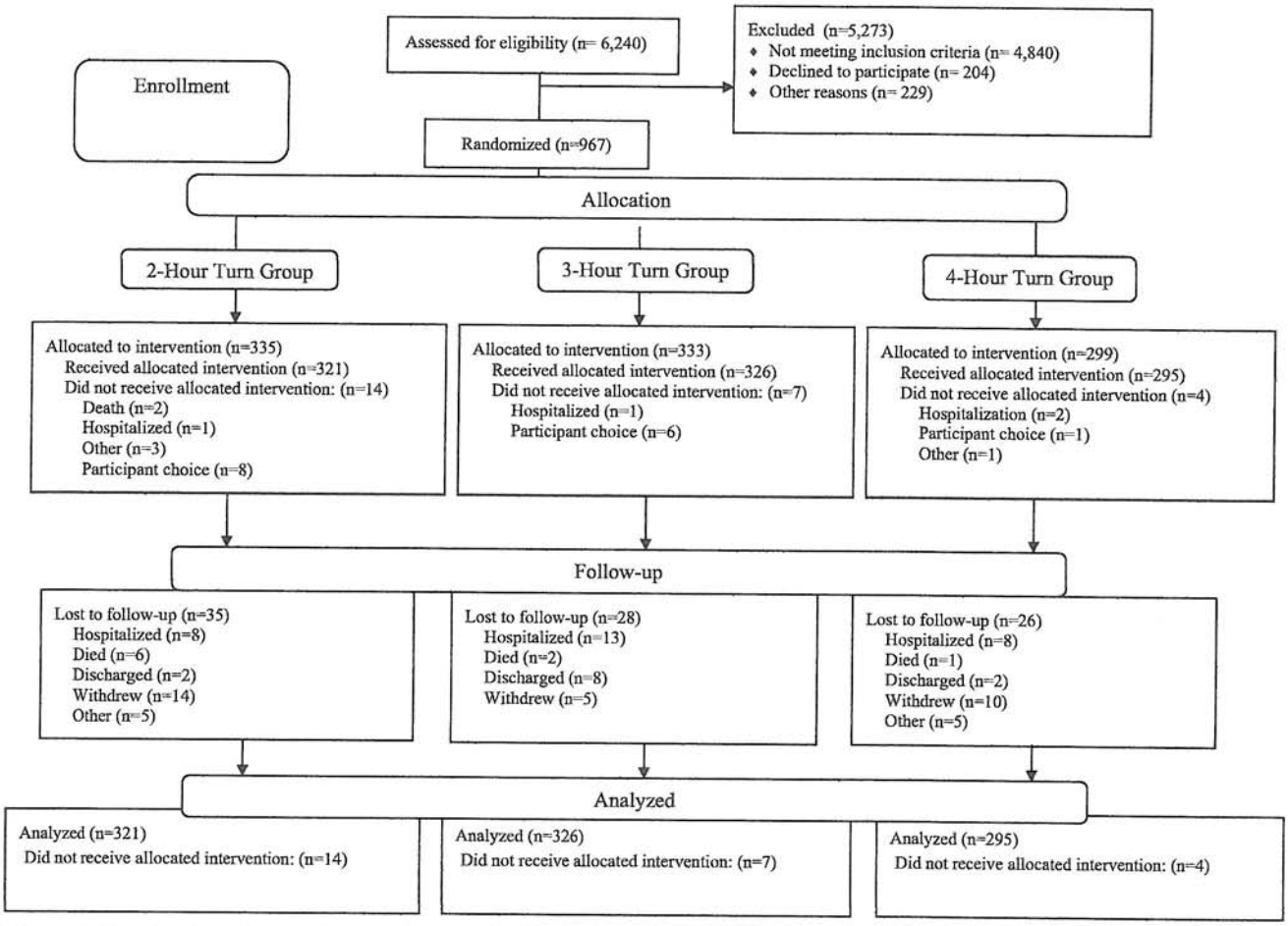

Figure 1. Turning for Ulcer ReductioN Study flow diagram.

Incidence of PrUs in the TURN Study was low (2.0%) in moderate- and high-risk participants allocated to three repositioning intervals, unlike in previous studies. Only superficial (Stage 2) and no Stage 3 or 4 ulcers developed. There were no significant differences in PrU development between the high- and moderate risk-groups or within the high- and moderate-risk groups allocated to 2-, 3-, or 4-hour repositioning. The 2.0% incidence was consistent in moderate- and high-risk participants in the TURN Study and is comparable with the 2007 prevalence of PrUs in low-risk, long-stay residents (2%) in U.S. NHs.[1]

PrU incidence in the TURN Study was lower than expected, possibly because of the combination of high-density foam mattresses, repositioning, and documentation. Many assume that the incidence of ulcers will increase with less-frequent turning, as some studies have found.[2,15] When high-density foam mattresses effectively redistribute pressure, less-frequent repositioning may be possible without increasing PrU incidence.

Considering only 2-, 3-, 4-, or 6-hour repositioning intervals in previous randomized studies of repositioning (Table 3), the low incidence of PrUs in the TURN Study is similar to the 3% (2 ulcers/66 participants) incidence reported previously[2] for a 4-hour repositioning group on viscoelastic mattresses (the only group equivalent to the current study) and similar to that of another study[15] that reported a 3% (3 ulcers/99 participants) incidence for those on powered mattresses repositioned every 3 hours. Incidence of PrU Stages 2 to 4 reported previously ranged from 14.3% to 24.1% without high-density foam mattresses.[2,3,15]

No Stage 3 or 4 PrUs were reported in the TURN Study or in the 4-hour repositioning groups of a previous study using high-density foam mattresses,[2] but Stage 3 or 4 ulcers developed in other groups in other studies,[3,15] suggesting that longer (≥4 hours) repositioning intervals, powered beds, spring mattresses, and overlays did not protect against PrUs. Finding few superficial and no deeper ulcers is consistent with the 4-hour repositioning result in a previous study.[2]

Participants at high risk were significantly different from those at moderate risk with regard to percentage eaten and brief changes, expected predictors of PrUs, yet there was no difference in PrU incidence between moderate- and high-risk participants. Data suggest that the combination of support surface, repositioning, and documentation were successful in preventing ulcers in the moderate- and high-risk groups.

Consideration should be given to the possibility that the documentation, a consistent part of the protocol, added a measure of safety by reminding CNAs to elevate heels, observe and report skin changes, and document and report continence care. Documentation may have been an effective reminder of preventive care and

Table 1. (Contd.)

Characteristic	Moderate-Risk Participants					High-Risk Participants						
	Total, n = 617	2 Hours, n = 210	3 Hours, n = 209	4 Hours, n = 198	P-Value (Random Group Comparison)	Total, n = 325	2 Hours, n = 111	3 Hours, n = 117	4 Hours, n = 97	P-Value (Random Group Comparison)	Overall, N = 942	P-Value (High vs Moderate)
Thyroid disorder	111 (18.2)	39 (18.7)	36 (17.5)	36 (18.4)	.94	56 (17.7)	23 (21.5)	15 (13.2)	18 (18.7)	.25	167 (18.0)	.86
Nutritional	5 (0.8)	2 (1.0)	1 (0.5)	2 (1.0)	.81	13 (4.1)	7 (6.5)	2 (1.7)	4 (4.2)	.20	18 (1.9)	.001
Admission eligibility, n (%)					.83					.19		.23
Long stay	527 (85.4)	181 (86.2)	176 (84.2)	170 (85.9)		287 (88.3)	94 (84.7)	103 (88.0)	90 (92.8)		814 (86.4)	
Short stay	90 (14.59)	29 (13.8)	33 (15.8)	28 (14.1)		38 (11.7)	17 (15.3)	14 (12.0)	7 (7.2)		128 (13.6)	
Country, n (%)					.92					.01		.49
Canada	336 (54.5)	114 (54.3)	112 (53.6)	110 (55.6)		169 (52.0)	49 (44.1)	58 (49.6)	62 (63.9)		505 (53.6)	
United States	281 (45.5)	96 (45.7)	97 (46.4)	88 (44.4)		156 (48.0)	62 (55.9)	59 (50.4)	35 (36.1)		437 (46.4)	

Analysis of variance or *t*-test used for age, body mass index (BMI), Braden total and subscale scores, percentage eaten, and wet times per day. Chi-square or Fisher exact test used for all other variables.
SD = standard deviation.

observations, as reported in previous studies of CNA documentation.[26,27]

Limitations of the study are related to the many challenges studying NH residents using NH staff. Explicit detailed protocols, onsite training, specific documentation, fidelity measures, and systematic communication with the research team were designed to reduce the limitations. Data must be interpreted with these limitations in mind. The study may offer protocols, procedures, and tools to promote translational and quality improvement studies.

Implementation of these findings should consider the protocols of TURN and replacing older, spring type mattresses with high-density foam mattresses; these are prerequisites for repositioning at 3- or 4-hours rather than traditional 2-hour. Participants in the TURN Study were at moderate and high risk on the Braden Scale, suggesting that the findings of this study might be limited to residents at these risk levels. It is likely that vigilant assessment and documentation of factors related to PrU prevention cued staff and helped to reduce the incidence of ulcers. Overall care in studies of repositioning was identified as "facility application of best practices." As guidelines are developed in which repositioning recommendations are made, documentation may ensure that early signs of PrUs are noted.

There was no difference in PrU incidence over 3 weeks of observations between those turned at 2-, 3-, or 4-hour intervals in this population of NH residents at moderate and high risk of developing PrUs using high-density foam mattresses when repositioning was done consistently and skin was monitored. These finding have potential to influence translational and quality improvement studies and implications for use of nursing staff and cost of NH care.

ACKNOWLEDGMENT

Conflict of Interest: This work was funded by National Institutes of Health, National Institute of Nursing Research, and National Institute on Aging Research Grant NCT00665535 and by the Ontario Ministry of Health and Long Term Care and the Toronto Health Economic Technology Assessment collaborative.

Bergstrom is co-owner of Prevention Plus, a website dedicated to dissemination, education, and training related to the Braden Scale for Predicting Pressure Sore Risk and pressure ulcer prevention and receives royalties.

Author Contributions: Bergstrom N and Horn SD: had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Bergstrom N, Horn SD, Rapp MP: study concept and design. Bergstrom N, Rapp MP, Stern A: acquisition of data. Bergstrom N, Horn SD, Barrett R, Watkiss M: analysis and interpretation of data. Bergstrom N, Horn SD: drafting of the manuscript. Bergstrom N, Horn SD, Rapp MP, Stern A, Barrett R, Watkiss M: critical revision of the manuscript for important intellectual content. Bergstrom N: obtained funding. Bergstrom N, Horn SD: supervision.

Sponsor's Role: The funding sources had no role in the design or conduct of the study; collection, management, analysis, or interpretation of the data; or preparation, review, or approval of the manuscript.