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RESEARCH BRIEF

Validation of Patient and Nurse Short Forms of the Readiness for Hospital Discharge Scale and Their Relationship to Return to the Hospital

Marianne E. Weiss, Linda L. Costa, Olga Yakusheva, and Kathleen L. Bobay

Objective. To validate patient and nurse short forms for discharge readiness assessment and their associations with 30-day readmissions and emergency department (ED) visits.

Data Sources/Study Setting. A total of 254 adult medical-surgical patients and their discharging nurses from an Eastern US tertiary hospital between May and November, 2011.

Study Design. Prospective longitudinal design, multinomial logistic regression analysis.

Data Collection/Extraction Methods. Nurses and patients independently completed an eight-item Readiness for Hospital Discharge Scale on the day of discharge. Patient characteristics, readmissions, and ED visits were electronically abstracted.

Principal Findings. Nurse assessment of low discharge readiness was associated with a six- to nine-fold increase in readmission risk. Patient self-assessment was not associated with readmission; neither was associated with ED visits.

Conclusions. Nurse discharge readiness assessment should be added to existing strategies for identifying readmission risk.

Key Words. Discharge readiness, readmissions, emergency visits

Improving hospital discharge processes and reducing readmissions and emergency department (ED) visits in the first 30 days after discharge are on the national agenda for health care reform, payment restructuring, and hospital-based quality improvement initiatives (Goldfield et al. 2008; Jack et al. 2009; Nielsen, Rutherford, and Taylor 2009; Guterman and Drake 2010; Institute for Healthcare Improvement n.d.). Poor discharge preparation contributes to hospital readmissions (Mistiaen, Francke, and Poot 2007; Jack et al. 2009). In most

hospitals, the staff nurse remains the front-line patient care manager and discharge coordinator, providing the last opportunity to correct inadequacies before discharge (Rhudy, Holland, and Bowles 2010; Nosbusch, Weiss, and Bobay 2011). Incorporating the patient perspective and discharging nurse's perspective into risk assessment for readmissions or ED use may add additional patient-specific information not captured by demographic or disease categories. A prospective mechanism for identification of factors associated with readiness to self-manage at home could be used to trigger anticipatory initiation of transitional support services to avert unplanned postdischarge utilization.

The 21-item Readiness for Hospital Discharge Scale (RHDS) was developed and tested as a patient self-report measure, with results providing evidence of an association with postdischarge utilization (Weiss and Piacentine 2006; Weiss et al. 2007; Weiss, Yakusheva, and Bobay 2011). In an earlier study of patient and nurse assessments of discharge readiness, nurse assessments were more predictive of combined readmission/ED use postdischarge than patient self-assessment (Weiss, Yakusheva, and Bobay 2010).

The aim of this study was to examine the association of patient and nurse ratings on an eight-item short-form RHDS to subsequent utilization of ED visits and readmissions in the first 30 days postdischarge.

METHODS

Study Design and Sample

The study used a prospective longitudinal design. Data were collected from adult medical-surgical patients and their discharging nurses on the day of discharge. Patients and nurses independently completed parallel forms of the Readiness for Hospital Discharge Scale/Short Form (PT-RHDS/SF and RN-RHDS/SF). Patient characteristics and postdischarge occurrences of ED visits and readmissions were obtained from electronic records. All research procedures were approved by Institutional Review Boards at the researchers' university and the hospital study site.

Address correspondence to Marianne E. Weiss, D.N.Sc., R.N., Associate Professor and Wheaton Franciscan Healthcare, St. Joseph/Sister, Rosalie Klein Professor of Women's Health, Marquette University College of Nursing, Milwaukee, WI 53201-1881; e-mail: marianne.weiss@marquette.edu. Linda L. Costa, Ph.D., R.N., N.E.A.-B.C., is with the University of Maryland School of Nursing and The Johns Hopkins Hospital, Baltimore, MD. Olga Yakusheva, Ph.D., is with the Department of Economics, Marquette University College of Business Administration and Graduate School of Management L. Bobay, Ph.D., R.N., N.E.A.-B.C., is with the Marquette University College of Nursing, Milwaukee, WI.

The convenience sample included adult medical-surgical patients and nurses from three units (two medical units serving patients with multiple chronic conditions and one gynecologic/gynecologic oncology surgery unit) of an academic medical center in the eastern United States. Patients were consented if they were at least 18 years of age, English speaking, and the planned discharge destination was home. Exclusion criteria included discharge with hospice care and major cognitive impairment that precluded informed consent and completion of the PT-RHDS/SF.

The estimated sample size for .80 power at .05 significance to detect expected odds ratios of 0.78 for the patient form and 0.55 for the nurse form (derived from a prior study [Weiss, Yakusheva, and Bobay 2010]), with average clustering of five patients per nurse, was estimated to be 50 nurses and 250 patients (PinT 2.12 program, Snijders 2005). Data on the PT-RHDS/SF and RN-RHDS/SF were received from 298 patients and 60 nurses. A total of 39 patients and 5 nurses submitted incomplete forms resulting in the elimination of 44 patient–nurse pairs. The final study sample was 254 patients and 54 nurses, with each nurse paired with an average of 4.7 patients (ranging 1–22 patients).

Measures

The primary independent variables were patient perceptions and nurse assessments of discharge readiness measured with the PT-RHDS/SF and RN-RHDS/SF, respectively. The PT-RHDS/SF and RN-RHDS/SF are parallel 8-item reduced forms of a 21-item Readiness for Hospital Discharge Scale (Weiss and Piacentine 2006; Weiss, Yakusheva, and Bobay 2010) that use a 0–10 point summated rating scale. Scores are reported as item means to ease comparison across study populations, long and short forms, and subscales. The 21-item PT-RHDS scale has been used in prior studies with adult medical-surgical patients, postpartum mothers, and parents of hospitalized children (Weiss and Piacentine 2006; Weiss et al. 2007, 2008; Weiss and Lokken 2009; Weiss, Yakusheva, and Bobay 2011). In a study comparing nurse assessment and patient perception of discharge readiness with the 21-item RHDS, a one point decrease in the RN-RHDS item mean was associated with a 45 percent increase (OR = .55) in likelihood of postdischarge utilization (Readmission + ED). PT-RHDS (OR = .78) was not significantly associated (Weiss, Yakusheva, and Bobay 2010).

The eight-item forms of the scale were derived by selecting two items from each subscale (Personal Status, Knowledge, Perceived Coping Ability,

Expected Support) based on the highest item-subscale correlations. Using the sample from a prior study (Weiss, Yakusheva, and Bobay 2011), initial estimates of reliability were .83 for RN-RHDS/SF and .82 for PT-RHDS/SF. The short forms explained 93 percent of scale variance for both versions of the scale. Reliability for the current study sample was .75 for RN-RHDS/SF and .79 for PT/RHDS/SF.

In addition to using the continuous measures of PT-RHDS/SF and RN-RHDS/SF, we categorized each measure into four categories representing very high (9–10), high (8–8.9), moderate (7–7.9), and low (<7) levels of discharge readiness, respectively. The “low readiness” cut-off score of less than seven was based on a previous study using the 21-item scale (Weiss, Yakusheva, and Bobay 2010).

The outcome measure in this study was a categorical variable for the occurrence of same-hospital readmissions, ED visits without readmission, or neither (the reference category), within 30 days postdischarge.

Control variables included patient characteristics associated with variation in postdischarge utilization: age, sex, marital status, race (white, black, or other), APR-DRGs (converted to Medical Diagnostic Category), type of admission (medical or surgical), APR-DRG severity, and mortality risk scores (minor, moderate, major, extreme), length of stay, discharge coordination (expeditor or planner), and number of routine prescription medications ordered at discharge (McCusker et al. 2000; Anderson et al. 2006; Billings, Dixon, and Wennberg 2006; Corbett et al. 2010; Hasan et al. 2010; Van Walraven et al. 2010; Feldman et al. 2012).

Data Analysis

Sample characteristics were examined using standard frequency analysis and descriptive statistics. A multinomial logistic regression approach was used to examine the associations of PT-RHDS/SF and RN-RHDS/SF to 30-day utilization of ED visits and readmissions, using odds ratios as measures of association and a threshold of $p < .05$. Odds ratios were estimated for a unit-change (1 point on the 0–10 scale) in the continuous readiness measures, and for each of the readiness categories (8–8.9, 7–7.9, and < 7) relative to the highest category (9–10). Unadjusted odds ratios were estimated first and then adjusted for patient characteristics. The standard errors were adjusted for clustering at the nurse level and for uneven cluster sizes (Korn and Graubard 1990).

RESULTS

Characteristics of the sample are presented in Table 1. Female patients comprised more than 70 percent of the sample, due to the inclusion of a gynecologic surgical unit as one of the three study units. Seventy-one percent of the sample was admitted for a nonsurgical diagnosis; one-quarter of the sample had surgical diagnoses in the female reproductive system major diagnostic category (MDC 13). The sample spanned a broad age range (18–97, mean = 52) and was predominantly black (58 percent). Mean scores for PT-RHDS/SF and RN-RHDS/SF were the same (8.4). Correlation between PT-RHDS/SF and RN-RHDS/SF was .32 ($p < .01$) for both continuous and categorical measures. Fifteen percent of PT-RHDS/SF scores fell in the “low readiness” category, compared to 12.6 percent of RN-RHDS/SF ratings. In 24 percent of cases, PT-RHDS/SF, RN-RHDS/SF, or both were rated within the parameters of the “low readiness” category (Table 1) (See Table S1 in supplemental electronic appendix for cross-tabulation of paired RN-RHDS/SF and PT-RHDS/SF scores.) To explore the weak correlation and discrepancies in the categorical measure, paired t -tests for each item were performed. Patients rated the items on physical readiness ($t = -2.78$, $p = .006$) and energy level ($t = -6.39$, $p < .001$) significantly lower than nurses. Nurses rated the item on help with personal care at home higher than patients ($t = 2.50$, $p = .01$).

Results of the multinomial logistic regression models are presented in Table 2 (continuous readiness measure) and Table 3 (categorical readiness measure). Using readmission as the outcome category, the unadjusted and adjusted odd ratios for the continuous RN-RHDS/SF measure were .61 ($p = .05$) and .53 ($p = .02$). For every one point increase in RN-RHDS/SF, there would be a reduction in 30-day readmission risk of 39–47 percent, corresponding to a 5.5–6.6 percentage point reduction in the likelihood of readmission from 14.2 percent (the total sample rate) to 7.6–8.7 percent. There was no significant association between PT-RHDS/SF and readmission (unadjusted odds ratio: .83, $p = .34$; adjusted odds ratio: .76, $p = .12$) and association between RN-RHDS/SF and readmission only slightly changed when PT-RHDS/SF was included in the model (adjusted OR = .56) (See Table S2 in supplemental electronic appendix for analysis of low RN-RHDS/SF conditional on PT-RHDS/SF.) Neither PT-RHDS/SF nor RN-RHDS/SF was significantly associated with ED visits.

When the analyses were conducted with RN-RHDS/SF and PT-RHDS/SF categories, odds ratios for the association of RN-RHDS/SF

Table 1: Sample Characteristics ($N = 254$)

Variable	N (%)
<i>Readiness for hospital discharge scale</i>	
PT-RHDS/SF (range 4.3–10)	
9–10	116 (45.7)
8–8.9	61 (24)
7–7.9	39 (15.4)
<7	38 (15)
Mean (SD)	8.4 (1.2)
RN-RHDS/SF (range 1.8–10)	
9–10	103 (40.6)
8–8.9	60 (23.6)
7–7.9	59 (23.2)
<7	32 (12.6)
Mean (SD)	8.4 (1.4)
PT-RHDS/SF and RN-RHDS agreement	
PT-RHDS/SF and RN-RHDS/SF ≥ 7	193 (76)
PT-RHDS/SF <7, RN-RHDS/SF >7	29 (11.4)
PT-RHDS/SF ≥ 7 , RN-RHDS/SF <7	23 (9.1)
PT-RHDS/SF and RN-RHDS/SF ≤ 7	9 (3.5)
<i>Patient controls</i>	
Age (range 18–97): Mean (SD)	52.4 (17.5)
Length of stay (range 1–33): Mean (SD)	3.9 (3.8)
Sex	
Male	71 (28)
Female	183 (72)
Race	
White	94 (37)
Black	146 (57.6)
Other	14 (5.5)
Marital status	
Single	110 (43.3)
Married	87 (34.3)
Separated/divorced/widowed/other	57 (22.4)
Medical diagnostic category	
MDC 4: Respiratory system	22 (8.7)
MDC 5: Circulatory system	55 (21.7)
MDC 6: Digestive system	25 (9.8)
MDC 13: Female reproductive system	61 (24)
MDC—other (16 MDCs $\geq 5\%$ of sample)	91 (35.8)
Severity of illness score	
1 (minor)	41 (16.1)
2 (moderate)	103 (40.6)
3 (major)	93 (36.6)
4 (extreme)	17 (6.7)

Continued

Table 1 *Continued*

<i>Variable</i>	<i>N (%)</i>
Risk of mortality score	
1 (minor)	128 (50.4)
2 (moderate)	79 (31.1)
3 (major)	39 (15.4)
4 (extreme)	8 (3.1)
Type of admission	
Medical	181 (71.3)
Surgical	73 (28.7)
Discharge coordination (discharge planner or expeditor)	61 (24)
Number of non-PRN medications at discharge	
0–3	79 (31.1)
4+	54 (64.2)
Missing	12 (4.7)
Outcome variables	
ED visits without readmission	20 (7.9)
Readmission	36 (14.2)

and readmission for the “low readiness” category (<7) were 6.3 (unadjusted) and 9.0 (adjusted) compared to the “very high readiness” category (scores of 9–10). No other categories were significantly different from the highest category.

None of the control variables included in the regression models were significantly associated with readmission. Number of medications (4 or more) on discharge was strongly associated with ED use, with odds ratios of 4.8–5.0 ($p < .05$) across the adjusted models for PT-RHDS/SF, RN-RHDS/SF, and PT-RHDS/SF+RN-RHDS/SF, and for the “low readiness” category of RN-RHDS/SF.

DISCUSSION

The sample for this study had a high proportion of persons who were black, female, and hospitalized for nonsurgical diagnoses. This sample’s racial composition was similar to the composition of the city in which the study site was located (64 percent black [US Census Bureau 2010]). Women and nonsurgical patients were disproportionately sampled due to the selection of study units, two of which were general medical units and one was a gynecologic surgery. Sample mean scores for PT-RHDS/SF and RN-RHDS/SF were negatively skewed, falling within the “high readiness” category; however, one in eight

Table 3: Analysis of Cut-Off Score for Low Nurse Assessment of Discharge Readiness (RN-RHDS): Odds Ratios for Thirty-Day Readmission and ED Visits ($N = 254$)[†]

Variables	Dependent Variable = ED or Readmission within 30 Days			
	Unadjusted Models		Adjusted Models [§]	
	ED	R	ED	R
RN-RHDS/SF categories [‡]				
8–8.9	0.691 (0.654)	2.118 (0.364)	0.925 (0.920)	2.191 (0.194)
7–7.9	1.044 (0.960)	1.398 (0.645)	2.162 (0.337)	2.023 (0.344)
<7	0.137 (0.081)*	6.293 (0.030)**	0.092 (0.271)	9.030 (0.009)***
Patient controls [¶]				
Length of stay (days)			1.212 (0.092)*	0.869 (0.305)
4+ Discharge meds			5.408 (0.010)**	1.349 (0.574)

p value in parentheses, *** $p < .01$, ** $p < .05$, * $p < .1$.

[†]The results do not change substantially when PT-RHDS/SF is added to the models as a continuous score or a categorical variable; they are available in the online supplement and/or from the authors upon request.

[‡]Reference category = RN-RHDS (9–10).

[§]Adjusted for: age (years), sex (Male/Female), race (White/Black/Other), marital status (Single/Married/Widowed, divorced, separated, other), discharge coordination services (Yes/No), 4+ discharge meds (Yes/No), type of admission (Medical/Surgical), severity of illness score (1/2/3/4), mortality risk score (1/2/3/4), and unit and diagnosis fixed effects.

[¶]Unit and diagnosis fixed effects and controls with $p > .1$ not shown.

^{||}4+ Discharge medications: four or more routine prescription medications ordered at discharge; reference category is fewer than four discharge meds or missing.

ED, emergency department visit(s) without readmission; R, readmitted.

patients were not ready for discharge by nurse assessment and nearly one in seven patients rated their readiness in the “low” category despite having a discharge order.

RN-RHDS/SF was a significant predictor of readmission when entered without and with PT-RHDS/SF in logistic regression models that included patient characteristics. While patients’ perceptions of readiness for discharge are an important window into their experience of care, including the patient perspective on discharge readiness did not in this study add to the explanation of readmission beyond that explained by the nurse’s assessment of discharge readiness. These findings are similar to a previous study using the long forms of the RN-RHDS and PT-RHDS, where the odds ratios for RN-RHDS to a combined measure of readmission or ED use was .55, and PT-RHDS was not a significant contributor in either unadjusted or adjusted models (Weiss, Yakusheva, and Bobay 2010). The finding of a robust association between RN-RHDS/SF across different model specifications and patient populations

supports the potential usefulness of the scale within real-time clinical practice situations where information about factors associated with risk of readmission may be incomplete as well as in analytic models where adjustments for contributing factors can be made. RN-RHDS assessments could be integrated with reasonable ease into discharge care processes and electronic documentation. The findings provide support for the validity and importance of nursing assessments in identification of risk for adverse patient outcomes after discharge. Aggregated at the hospital level, nurses' reports of quality of care have been associated with 30 days mortality (McHugh and Stimpfel 2012). In this study, patient–nurse data are linked at the individual patient level.

The models with nurse assessments of discharge readiness categorized as “very high,” “high,” “moderate,” and “low” validated the use of a cut-off score of <7 for low readiness. Compared to other readiness for discharge categories, patients with “low readiness” for discharge by nurse assessment experienced as much as a nine-fold increase in the risk of readmission. This finding suggests that nurse assessment of discharge readiness could augment current strategies for the identification of patients at risk for readmission at a time when discharge decisions could be modified, and discharge transition interventions could be implemented to avert readmission.

The PT-RHDS/SF was not predictive of readmission in this analysis and the results of the categorical model did not support a cut-off score for “low readiness” on the PT-RHDS/SF. Although the odds ratio was indicative of the hypothesized negative association, the estimated effect size may have been smaller than the study was powered to detect. Despite not being predictive of readmission in this analysis, patient assessment of discharge readiness can still be useful as a patient-centered outcome measure of the hospitalization phase of care.

The relatively small differences between unadjusted and adjusted models are a reflection of the nonsignificant contributions of the selected patient characteristic variables. This limited contribution of patient characteristics to readmission prediction is consistent with the poor performance of the existing readmission risk models, most of which rely on retrospectively abstracted patient characteristic and disease condition data (Kansagara et al. 2011).

Discharge on multiple medications was the only risk factor associated ($p < .05$) with the risk of ED visits within 30 days. Previous studies have found that medication discrepancies in recently discharged patients are not unusual (Costa, Poe, and Lee 2011) and place patients at risk for readmission (Coleman et al. 2005). The five-fold risk of ED use not resulting in readmission adds to

the body of knowledge about the impact of the complexity of patient experience with medication management and highlights the need for enhanced pre-discharge assessment, education, and follow-up into the post-hospitalization period.

Limitations

The study sample was a convenience sample obtained at a single hospital and the sample characteristics reflected the types of patients assigned to the three units selected for the study.

While the sample may not have been typical for other hospitals and units, the results indicate that there was no significant contribution of age, sex, marital status, or race to the study models and the odds ratios for readmission and ED visits did not change significantly after adjusting for these and other patient characteristics. The outcome variable included same hospital readmissions and ED visits, resulting in underestimation and the potential for bias if patients readmitted to nonstudy facilities had systematically higher or lower readiness for discharge than in-sample readmissions. We identified two readmissions and two ED visits to nonstudy facilities in postdischarge telephone follow-up calls to 37 percent ($n = 94$) of the sample. Despite the small numbers, the data were not significantly different from our sample ($p > .40$) and suggested an estimated capture rate of 87 and 79 percent for readmissions and ED visits. The readmission undercapture rate is similar to that reported by Nasir et al. (2010). ED visits included only those not resulting in readmissions; therefore, the rate of ED visits in the 30 days period was small (8 percent), underpowering the analysis for the association of the risk of ED use with discharge readiness and patient characteristics.

CONCLUSIONS AND IMPLICATIONS

The short-form RN-RHDS has the potential to improve identification of an elevated readmission risk. The RN-RHDS/SF screens for four areas of discharge readiness (personal status, knowledge, perceived coping ability, and expected support) that can be addressed before discharge or in the immediate postdischarge period to better prepare for self-management at home. Future readmission risk assessment models should include a measure of discharge readiness and other measures of patient's ability to successfully transition from hospital to home.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Table S1: Cross-Tabulation of Paired PT-RHDS and RN-RHDS Scores.

Table S2: Analysis of Cut-Off Score for Low Nurse Assessment of Discharge Readiness (RN-RHDS), Conditional on Patient Assessment: Odds Ratios for Thirty Days Readmission and ED Visits ($N = 254$).