

Detecting Medication Order Discrepancies in Nursing Homes: How RNs and LPNs Differ

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Medication order discrepancies pose safety risks when nursing home residents transition between health care settings. In nursing homes, both registered nurses (RNs) and licensed practical nurses (LPNs) frequently are assigned to detect medication order discrepancies, using the process of medication reconciliation. This study was undertaken to examine the extent to which licensure (RN, LPN), years of experience performing medication reconciliation, and the perceived Need for Closure were related to differences in the detection of medication order discrepancies. The Multiple Segment Factorial Vignette design was used to explore and compare nursing home nurses' detection of such discrepancies. RNs ($n = 32$) and LPNs ($n = 70$) from 12 Missouri nursing homes responded to four resident transfer vignettes embedded with medication order discrepancies. The study found that years of experience and the Need for Closure were not related to reports of discrepancies. However, RNs detected discrepancies involving orders for high-risk medications significantly more often than LPNs. No significant differences existed between RNs and LPNs when identifying discrepancies in orders for low-risk medications. These findings regarding the discrepancies detected in orders for high-risk medications and those detected in orders for low-risk medications have implications for resident safety.

In a recent report by the Office of the Inspector General, 37% of adverse events, including falls, bleeding, delirium, hallucinations, and hypoglycemic episodes, experienced by skilled nursing facility residents were related to medication use. Nearly 66% of these events were considered preventable in part because of inappropriate prescribing and/or lack of monitoring by nursing home nursing staff (Levinson, 2014). Preventable adverse drug events result from errors associated with prescribing, documenting, dispensing, administering, and monitoring medications (Aspden, Wolcott, Bootman, & Cronenwett, 2007). Improved assessment or safety practices, such as medication reconciliation to assure medication orders are appropriate, can mitigate harm associated with preventable adverse events (Aspden et al., 2007; Levinson, 2014). Medication reconciliation is a complex cognitive process designed to detect and resolve medication order discrepancies when patients transition between settings by comparing a patient's current medications with those ordered upon entry to a new setting (Agency for Healthcare Research and Quality, 2015; Institute for Healthcare Improvement, 2013; The Joint Commission, 2015).

Alarming, when transitioning from another health-care setting, 70% of nursing home residents have at least one discrepancy in their medication order, which can include drug omissions, duplications, contraindications, unclear information, and changes to medication orders that require clarification at the

time of transfer (Tjia et al., 2009; The Joint Commission, 2015). During transitions, fragmented communication and missed critical information are significant factors leading to adverse events (or compromised resident safety) (Desai, Williams, Greene, Pierson, & Hansen, 2011; Levinson, 2014; Popejoy, Galambos, & Vogelsmeier, 2014).

Previous Study on Medication Order Discrepancies

To better understand medication reconciliation in nursing homes, Vogelsmeier and colleagues completed a previous observational study in eight Missouri nursing homes. They conducted eight focus groups with 13 registered nurses (RNs) and 28 licensed practical nurses (LPNs) and conducted individual interviews with 17 RNs in management positions. In addition, they conducted 46 observations in the eight nursing homes while 18 RNs and 15 LPNs performed medication reconciliation during resident transfers. The findings indicated that the majority of nursing homes assigned both RNs and LPNs to perform medication reconciliation and that RNs and LPNs seemed to differ in how they detected discrepancies (Vogelsmeier, 2014; Vogelsmeier, Scott-Cawiezell, & Pepper, 2011). However, because each RN and LPN encountered different resident transfer records, study findings did not allow a comparison of the two

groups, suggesting the need for additional research. Therefore, to further understand differences between RNs and LPNs, the current study presented standardized resident transfer vignettes to allow a direct comparison of RNs and LPNs.

The purpose of this article is to present quantitative findings on the extent to which licensure (RN, LPN), years of experience performing medication reconciliation, and nurses' perceived Need for Closure were related to differences in their detection of medication order discrepancies. The specific research question is: To what extent do RN and LPN characteristics of licensure (RN, LPN), years of experience performing medication reconciliation (≤ 1 , 2 to 5, ≥ 6), and Need for Closure scores (high vs. low) account for differences in nurses' detection of medication order discrepancies? This study is part of a larger mixed-methods study conducted to explore and compare nursing home nurses' detection of medication order discrepancies when presented with resident transfer vignettes (scenarios). Nursing home nurses, RNs ($n = 32$) and LPNs ($n = 70$), responded to four resident transfer vignettes embedded with medication order discrepancies.

Study Design

The study used the Multiple Segment Factorial Vignette (MSFV) design to explore nurses' detection of medication order discrepancies. The MSFV method employs experimental design logic and quantitative and qualitative approaches to allow researchers to draw conclusions about how independent vignette variables affect outcome variables, such as attitudes, beliefs, judgments, and related phenomena (Ganong & Coleman, 2006). In the MSFV method, participants respond to vignettes about a hypothetical situation or a set of characters in a situation. Unlike the traditional factorial survey design method in which participants respond to single vignettes (Rossie & Nock, 1982), the MSFV method continues the same vignette (or story) over two or more segments, which allows researchers to add variables within the context of the story. Variables of interest are embedded in each vignette segment and vary systematically, which allows analysis of responses using logistic regression and other statistical procedures. In the MSFV method, the unit of analysis is based on the number of vignette segments rather than the number of participants. At the end of each segment, participants respond to a list of forced-choice questions to elicit how they would act to the situation described (Ganong & Coleman, 2006).

Vignette Development for Reliability and Validity

A pilot study was conducted to develop six resident transfer vignettes for this study. The six vignettes were developed using qualitative data from a previous observational study in which actual medication order discrepancies were identified during resident transfers to eight Missouri nursing homes (Vogelsmeier et

al., 2011). Consistent with the MSFV design, each vignette contained two segments with medication order discrepancies. In the first segment of every vignette, the medication was a high-risk medication, and the type of discrepancy was either an omission (medication not continued on the nursing home transfer orders), an addition (new medication added to the nursing home transfer orders), or a dosage change (dosage differed between settings). In the second segment, the medication was a low-risk medication, and the type of discrepancy was either an omission, an addition, or a dosage change. The patient's living setting before transfer (home or a nursing home) was introduced in the vignette background.

Figure 1 describes the first vignette, in which Mrs. A transitions to the nursing home after surgical repair of a fractured hip. In the first segment, metformin (Glucophage), a high-risk medication, was not continued (omission) on her nursing home transfer orders, although it was taken at home and in the hospital before transfer. In the second segment, psyllium (Metamucil), a low-risk medication, was added (addition) to her transfer orders as a new medication. Mrs. A lived at home before her hospital admission. The remaining five vignettes varied accordingly. Table 1 provides an overview of the distribution of discrepancies in each segment as well as variations on previous living settings.

After each vignette segment, three forced-choice questions were posed:

- A. Do you think a medication order discrepancy is present at transfer? (yes or no)
- B. How confident are you in your response? (1-not confident at all to 5-completely confident)
- C. Would you seek additional information to resolve the discrepancy? (yes or no)

Open-ended questions were used in the pilot to elicit the participants' insight into their responses and to assess the clarity and adequacy of the content in each vignette. Sample participant interview questions included the following:

- Do you have any additional questions about these vignettes?
- Were the questions at the end of vignette segments clear?
- What do you understand these questions to mean?
- Why did you think a discrepancy (was/was not) present in each segment?

Content validity was established by members of the research team for the six vignettes, including the vignette segments and the forced-choice questions. The six vignettes were then field-tested with three RNs and seven LPNs from four nursing homes. Through an iterative process of participant feedback from the interview questions, the six vignettes were modified to clarify content about prior settings and to add an anchor (somewhat confident) to the Likert scale for the question, "How confident are you in your response?" The vignettes were then tested for reliability using a test-retest approach with four RNs and eight LPNs from three different nursing homes. Test-retest reliability testing for the first question, "Do you think a discrepancy is present? (yes or no)" yielded high agreement ($r = 0.81$). Test-

FIGURE 1

Sample of Resident Transfer Vignette

Prior Setting

Mrs. A is a 76-year-old woman who was living at home with her husband when she fell and sustained a fractured left hip. Mrs. A's medical history includes heart failure, hypothyroidism, hypertension, diabetes, high cholesterol levels, and depression. Mrs. A was taking the following medications at home:

- Norvasc (amlodipine) 5 mg daily by mouth
- Aspirin 81 mg daily by mouth
- Apresoline (hydralazine) 25 mg twice daily by mouth
- Glucophage (metformin) 500 mg twice daily by mouth
- Lantus (insulin) 20 units daily subcutaneously
- Synthroid (levothyroxine) 125 mcg daily by mouth
- Lasix (furosemide) 40 mg daily by mouth
- K-Lor (potassium) 20 mEq daily by mouth
- Zocor (simvastatin) 20 mg at bedtime by mouth
- Zoloft (sertraline) 100 mg daily by mouth

Hospital Information

Mrs. A was admitted to the hospital and underwent a surgical repair of her fractured left hip. She was hospitalized for 5 days and is now ready for transfer to the nursing home. According to the hospital medication administration record, Mrs. A was taking the following medications at the time of hospital discharge:

- Norvasc (amlodipine) 5 mg daily by mouth
- Aspirin 81 mg daily by mouth
- Apresoline (hydralazine) 25 mg twice daily by mouth
- Lantus (insulin) 20 units daily subcutaneously
- Glucophage (metformin) 500 mg twice daily by mouth
- Synthroid (levothyroxine) 125 mcg daily by mouth
- Lasix (furosemide) 40 mg daily by mouth
- K-Lor (potassium) 20 mEq daily by mouth
- Lovenox (enoxaparin injection) 30 mg every 12 hours subcutaneously
- Zocor (simvastatin) 20 mg at bedtime by mouth
- Morphine IV PRN for pain 2 mg every 4 hours as needed for pain
- Docusate-S 1 tablet daily by mouth

Nursing Home Transfer Information

Mrs. A has now been transferred to the nursing home. Her nursing home transfer record includes the following medication orders:

- Norvasc (amlodipine) 5 mg daily by mouth
- Apresoline (hydralazine) 25 mg twice daily by mouth
- Lantus (insulin) 20 units daily subcutaneously
- Synthroid (levothyroxine) 125 mcg by mouth
- Lasix (furosemide) 40 mg daily by mouth
- K-Lor (potassium) 20 mEq daily by mouth
- Coumadin (warfarin) 2.5 mg daily by mouth
- Zocor (simvastatin) 20 mg daily by mouth
- Zoloft (sertraline) 100 mg daily by mouth
- Metamucil (psyllium) 1 tablespoon daily (in water) by mouth
- Ultram (tramadol) 50 mg every 6 hours by mouth as needed for pain

Segment 1

The hospital medication administration record indicates Mrs. A had been taking Glucophage 500 mg twice daily in the hospital.

Please answer each of the following questions and base each response on the information above:

A. Do you think a medication order discrepancy is present at transfer?

Yes _____ No _____

B. How confident are you in your response?

Not confident at all		Somewhat confident		Completely confident
1	2	3	4	5

C. Would you seek additional information to resolve the discrepancy?

Yes _____ No _____

Segment 2

The nursing home transfer orders indicate Mrs. A has a medication order for Metamucil (psyllium) daily.

Please answer each of the following questions and base each response on the information above:

A. Do you think a medication order discrepancy is present at transfer?

Yes _____ No _____

B. How confident are you in your response?

Not confident at all		Somewhat confident		Completely confident
1	2	3	4	5

C. Would you seek additional information to resolve the discrepancy?

Yes _____ No _____

retest reliability for the second question, “How confident are you in your response? (scaled 1 to 5)” and the third question, “Would you seek additional information to resolve the discrepancy? (yes or no)” yielded lower correlations ($r = 0.50$ and $r = 0.54$, respectively). Based on participant feedback during the open-ended interview, many commented that their responses changed after the second session, thus suggesting lower test-retest corrections were a result of the second exposure to the same vignettes. In light of this, the team agreed to use the vignettes as they were originally developed.

Outcome Measures

Outcomes were measured by participant responses to the three forced-choice questions included in each vignette segment. Independent variables included medication type (high-risk, low-risk), discrepancy type (omission, addition, dosage change), and the resident’s prior living setting (home, nursing home).

Covariates

Covariates included licensure (RN, LPN), years of experience performing medication reconciliation (≤ 1 , 2 to 5, ≥ 6), and each participant’s Need for Closure score (high, medium, low) as measured by the Need for Closure Scale (Kruglanski & Webster, 1996; Kruglanski, Webster, & Klem, 1993). The Need for Closure Scale is a 42-item questionnaire scored on a 6-point Likert scale (1-strongly disagree to 6-strongly agree) to measure a person’s motivated tendency to come to a conclusion about a specific issue. Those with a high Need for Closure seek answers more quickly, more often coming to a conclusion without processing information thoroughly. Those with a low Need for Closure seek additional or clarifying information and consider alternative solutions before coming to a conclusion (Webster & Kruglanski, 1994). Exploratory and confirmatory factor analyses have been established for the Need for Closure Scale as well as for internal consistency (Cronbach’s $\alpha = .84$) and test-retest reliability ($r = .8611$) (Webster, 1993).

Institutional Review Board

Before the study, institutional review board (IRB) approval was received from the University of Missouri Health Sciences IRB. Verbal permission was obtained to conduct the study from each nursing home administrator and director of nursing. A waiver of documentation of consent was obtained from nurse participants because the level of risk to participants was low. Participation was voluntary for the nursing home sites and the participants from each site.

TABLE 1
Distribution of Variables in Vignettes and Vignette Segments

Vignettes and Segments	Medication Type		Type of Medication Order Discrepancy			Previous Living Setting	
	High-Risk	Low-Risk	Omission	Addition	Dose	Home	Nursing Home
Vignette 1						X	
Segment 1	X		X				
Segment 2		X		X			
Vignette 2							X
Segment 1	X				X		
Segment 2		X	X				
Vignette 3						X	
Segment 1	X			X			
Segment 2		X			X		
Vignette 4							X
Segment 1	X		X				
Segment 2		X		X			
Vignette 5						X	
Segment 1	X				X		
Segment 2		X	X				
Vignette 6							X
Segment 1	X			X			
Segment 2		X			X		

Sample, Setting, and Recruitment

Because the focus of the study was on estimating parameters rather than testing hypotheses, the sample size justification was based on obtaining reliable parameter estimates in regression analyses rather than on power considerations. The number of parameters used in the analysis and the effect of having multiple responses from each nurse were taken into consideration. The unit of analysis was based on the number of vignette segments rather than the number of nurses, and a sample size of 100 nurses each responding to four vignettes yielded 400 responses for analysis, which was determined to be adequate. Criteria for nurse participants included being an RN or LPN who self-reported performing medication reconciliation at resident transfer and who worked 8 hours or more per week in a nursing home. The researchers anticipated that 25 to 30 RNs and 65 to 70 LPNs would be recruited based on the average skill mix of RNs and LPNs reported in the recruitment sample.

The authors point out that, in planning this study, it was assumed that there would be dependencies in responses to multiple vignettes by the same nurse as reflected by the intraclass correlation (ICC). It was assumed that the ICC would be no

TABLE 2

Participant Demographics

Demographic Variables	Overall n = 102	RN n = 32 (31%)	LPN n = 70 (69%)
<i>RN education</i>			
Associate's degree		23 (72%)	NA
Diploma		2 (6%)	
Baccalaureate or higher degree		7 (22%)	
<i>Nursing home experience</i>			
1 year or less	8 (8%)	2 (6%)	6 (9%)
2–5 years	26 (25%)	11 (34%)	15 (21%)
6–10 years	32 (31%)	8 (25%)	24 (34%)
11–15 years	11 (11%)	4 (13%)	7 (10%)
16–20 years	8 (8%)	4 (13%)	4 (6%)
21 years or more	17 (17%)	3 (9%)	14 (20%)
<i>Medication reconciliation experience</i>			
1 year or less	8 (8%)	2 (6%)	6 (9%)
2–5 years	24 (24%)	6 (19%)	18 (26%)
6 or more years	70 (69%)	24 (75%)	46 (66%)
<i>Need for Closure scores</i>			
Low (score < 150)	16 (16%)	7 (22%)	9 (13%)
Medium (score 151–180)	55 (54%)	16 (50%)	39 (56%)
High (score > 180)	31 (30%)	9 (28%)	22 (31%)

greater than 0.25. Calculation of ICC using the latent variable method (Goldstein, Browne, & Rasbash, 2002) for different outcome measures showed ICC values in the range of 0.04 to 0.07. These values are well below the estimate of 0.25, implying that our sample size estimates were conservative.

Recruiting occurred in 20 random sites from a sampling pool of 120 nursing homes to ensure that at least 100 nurses could be recruited from a variety of nursing homes. Nursing home names were obtained from the publicly accessible Medicare.gov list of U.S. nursing homes. Selection criteria for the sampling pool included location within a 150-mile radius of the project site, bed size of 60 or more, and certification by Medicare and Medicaid. Nursing home sites that participated in the pilot study for validity and reliability testing were excluded from participation.

Nursing home administrators were individually contacted by the principal investigator (PI) by phone to determine their interest in study participation. When an administrator expressed an interest, a site visit followed to further explain the study procedures and obtain verbal permission from the administrator and director of nursing to proceed. Of the 20 nursing homes selected, leaders from 12 agreed to participate, 6 declined, and 2 were not contacted because the recruitment goals were met. The PI or research nurse conducted informational meetings with staff members in each of the 12 sites to explain the study and recruit volunteer participants.

Data Collection

Prior to any data collection activities, four of the six vignettes were randomly placed into individual packets along with a demographic profile and a Need for Closure Scale. All materials in the packet were paper copies. The packets were distributed to and completed by each participant individually in a private setting located on site in each nursing home, such as an office or conference room. During data collection, each participant was first asked to complete the demographic profile and the Need for Closure Scale, and then respond in writing to the four vignettes. Participants were not timed and completed all data collection activities on their own without any assistance from other nursing home staff or study staff. All documents were assigned a participant code. Study staff were present during each data collection session. When each participant completed data collection activities, their individual documents were placed into a secured envelope and transported to the project site by study staff.

Analysis

The effects of the vignette variables of medication type, discrepancy type, and prior setting on the participants' responses to the forced-choice questions were analyzed using generalized linear mixed models that included interaction terms. Post hoc pairwise comparisons were done using least squares means. Adjustment for multiple testing was done by controlling the False Discovery Rate at a 0.05 level (Benjamini & Hochberg, 1995). Then, individual nurse characteristics (licensure, years of experience performing medication reconciliation, and Need for Closure) were correlated with each of the forced-choice responses using logistic regression, taking into account that there were multiple nurses in the same nursing home and each participant responded to multiple vignettes. Specifically, both the individual nurse and the nursing home were included in the mixed model as random effects. Logistic regression was used since the responses are dichotomous rather than continuous. Dichotomous responses preclude the use of the usual within-subjects analyses where normality of the responses is assumed.

Results

The 12 nursing homes from where the participant nurses worked varied by bed size (42% had 60 to 99 beds, 33% had 100 to 149 beds, and 25% had more than 150 beds), payer status (50% were for-profit and 50% were not-for-profit), and location (33% were rural and 67% were urban). From the 12 sites, 102 nurses participated: 32 RNs and 70 LPNs. Table 2 displays the participant demographics. Among RN participants, 72% had an associate's degree, 22% had a baccalaureate or higher degree, and 6% had diplomas. The majority of RNs and LPNs had more than 6 years of experience performing medication reconciliation (75% and 66%, respectively). Regarding the Need for Closure scores, 16%

TABLE 3

Percentages of “Yes” Responses to the Question “Is a Discrepancy Present?”

Percent (%) Yes, A Discrepancy Is Present	Licensure			Years of Medication Reconciliation Experience			Need for Closure Scores		
	Overall	RN	LPN	≤ 1	2–5	≥ 6	Low	Medium	High
Overall	54	62	50	58	54	53	61	53	52
High-risk medication	56	72	49	50	51	58	66	61	50
Low-risk medication	51	52	51	66	56	48	57	45	53
Omission	71	83	66	85	65	72	76	72	70
Addition	43	54	38	42	55	39	57	43	39
Dosage change	46	51	44	48	39	48	53	44	46
Home as prior setting	53	59	51	50	56	53	56	55	52
Nursing home as prior setting	54	65	48	66	51	53	66	50	52

of the participants had a low score, 54% had a medium score, and 30% had a high score.

A total of 816 vignette segments were completed by the 102 participants (four vignettes with two segments each × 102 nurses = 816). Each of the 102 participants were categorized according to three covariate groups: licensure, years of experience, and Need for Closure score. The number of vignettes completed within each covariate group were as follows: 1) Licensure (RN, LPN): The RN group completed 256 vignette segments and the LPN group included 560; 2) Years of experience (≤1, 2 to 5, ≥6): Those with 1 year or less of experience completed 64 vignette segments; those with 2 to 5 years of experience were 192; and those with more than 6 years of experience were 560; and 3) Need for Closure scores (low, medium, high): Those with a low Need for Closure score completed 112 vignette segments; those with a medium score were 272; and those with a high score were 432.

Table 3 displays the percentages of “yes” responses to the question, “Do you think a discrepancy is present?” Every vignette segment had some type of discrepancy. RNs thought there was a discrepancy in 62.11% of the vignette segments, whereas LPNs thought there was a discrepancy in 49.64%. RNs responded “yes” significantly more often than LPNs when the discrepancies involved high-risk medications (71.88% vs. 48.57%, $p < .0001$). However, the proportions of RNs and LPNs who thought there were discrepancies involving low-risk medications were very close (RNs = 52.34% vs. LPNs = 50.71%), and the difference was not significant ($p = .79$). No significant differences were noted based on years of medication reconciliation experience or the Need for Closure scores. For example, participants with less than 1 year of experience responded “yes” 58% of the time a discrepancy was present, which was similar to participants with 2 to 5 years of experience (54%) and those with more than 6 years of experience (53%). Likewise, participants with a low Need for Closure responded “yes” 61% of the time a discrepancy was present, which was similar to participants with medium scores (53%) and those with high scores (52%).

There were no significant differences in how confident respondents were about identifying discrepancies in the vignettes. Neither interaction terms nor main effects were significantly different. Thus, there is no evidence to suggest that the level of confidence differed for any of the three covariate groups — licensure, experience, or the Need for Closure scores.

Table 4 displays the percentages of “yes” responses to the question, “Would you seek additional information to resolve the discrepancy?” Significant differences were found between RNs and LPNs. RNs would seek additional information more often than LPNs (72% vs. 60%), specifically when high-risk medications are involved (82% vs. 60%, $p = .0002$). For participant years of medication reconciliation experience and the Need for Closure scores, no significant differences were noted. For example, participants with less than 1 year of experience would seek additional information 75% of the time; participants with 2 to 5 years of experience would seek additional information 63% of the time; and those with more than 6 years of experience would seek additional information 68% of the time. Participants with a low Need for Closure responded “yes” 77% of the time; those with a medium Need for Closure score responded “yes” 69% of the time; and those with a high score responded “yes” 63% of the time.

Discussion

This study provides evidence that medication reconciliation is a cognitive process that requires careful assessment to identify risk, a process that is executed differently by RNs and LPNs as suggested by a prior study (Vogelsmeier et al., 2011). Yet, medication reconciliation is performed in nursing homes by RNs and LPNs who are used interchangeably for this important safety process (Vogelsmeier et al., 2011). Findings from this study add to our knowledge that differences exist between RNs and LPNs in detecting the number and types of medication order discrepancies. Acknowledging RN and LPN differences is particularly important given the complexity of care requirements for frail nursing

TABLE 4

Percentages of “Yes” Responses to the Question “Would You Seek Additional Information to Resolve the Discrepancy?”

<i>Percent (%) Yes, I Would Seek Additional Information</i>	Licensure			Years of Medication Reconciliation Experience			Need for Closure Scores		
	<i>Overall</i>	<i>RN</i>	<i>LPN</i>	<i>≤ 1</i>	<i>2–5</i>	<i>≥ 6</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>
Overall	64	72	60	75	63	68	77	69	63
High-risk medication	67	82	60	72	59	60	70	57	62
Low-risk medication	61	62	60	72	60	60	70	57	62
Omission	79	87	76	80	72	82	84	79	78
Addition	55	66	50	74	60	52	70	52	53
Dosage change	57	64	54	68	49	59	66	57	55
Home as prior setting	66	71	63	66	64	67	72	67	64
Nursing home as prior setting	62	73	57	81	58	61	74	58	61

home residents (Werner, 2011), the heightened risk of harm during health care transitions (Desai et al., 2011), and the incidence of adverse events related to medication use (Levinson, 2014).

Perhaps one of the most important findings from this study is differences between RNs and LPNs when encountering high-risk medications. RNs more often identified discrepancies in medication orders involving high-risk medications, suggesting that RNs assess orders for discrepancies based on the potential risk to resident safety. In contrast, LPN responses were similar regardless of the medication risk level, suggesting that LPNs are following rote instructions to complete the task of medication reconciliation rather than engaging in cognitive behavior regarding risk. These differing cognitive behaviors support earlier findings that LPNs are more focused on tasks and getting the job done, whereas RNs are more focused on comprehensive assessment and resident safety (Vogelsmeier, 2014; Vogelsmeier et al., 2011).

Evidence clearly indicates that RNs have a positive effect on nursing home outcomes (Corazzini, Anderson, Mueller, Hunt-McKinney, et al., 2013; Corazzini, Anderson, Mueller, Thorpe, & McConnell, 2013; Vogelsmeier et al., 2011); however, little is known about how RNs and LPNs actually differ in practice. In an integrative review of the literature, Dellefield, Castle, McGilton, and Spilsbury (2015) identified the RN role as a key contributor to improved nursing home quality, yet gaps exist in our understanding of the unique contributions that the RN makes to achieve higher quality. This study contributes to our understanding about RN and LPN differences when detecting medication order discrepancies. Specifically, our findings indicate that RNs are more likely than LPNs to identify high-risk medications as discrepancies, suggesting RNs may have a greater clinical focus on assessment and problem identification, including risk to resident safety.

Despite evidence supporting the contribution of RNs to positive resident outcomes, many nursing homes have scarce RN resources (Seblega et al., 2010) and rely on greater numbers of LPNs to assess and manage resident safety. Moreover, even though RN and LPN educational preparations and scopes of practice differ (The National Council of State Boards of Nursing, 2012), RNs are often used interchangeably with LPNs in clinical roles, thus contributing to the variability in care provided to nursing home residents (Corazzini, Anderson, Mueller, Thorpe, & McConnell, 2012; Vogelsmeier et al., 2011).

The interchangeability of RNs and LPNs is particularly concerning because of the rising acuity of resident care (Werner, 2011). RNs and LPNs both serve important roles; however, nursing home leaders must understand the distinct contributions of the RN role, so RN and LPN resources are aligned appropriately. Future research should include an emphasis on differentiating RN and LPN roles during processes such as medication reconciliation so the contributions of each role can be better understood and more appropriately utilized. This differentiation of roles is particularly important given the scarce RN resources that exist in our nation's nursing homes.

Limitations

The study has limitations. First, because the vignettes represent hypothetical situations, they can vary somewhat from practice. To minimize this limitation, researchers developed each vignette from actual resident transfer data collected in previous observational work; therefore, each vignette reflected actual medication order discrepancies that working nurses had encountered. Second, scenarios may either underestimate or overestimate how a nurse may behave in a clinical situation, thus limiting these findings. Finally, this study did not take into account organiza-

tional factors or RN and LPN skill mix in each of the 12 nursing home study sites. Leadership style, organizational culture of safety, skill mix ratios, and RN and LPN roles in each nursing home site as well as scopes of practice as defined by the state nurse practice act could certainly influence findings and should be considered in future studies.

Conclusion

RNs and LPNs contribute to resident safety in different ways. Despite these differences, the current nursing home paradigm is to use RNs and LPNs interchangeably. RNs provide a distinct contribution to resident care, including performing assessments and identifying risks of harm, such as high-risk medication order discrepancies during medication reconciliation. However, because RN resources are scarce in most nursing homes, future studies should include an emphasis on maximizing the contribution of the RN and LPN roles during processes such as medication reconciliation. This research could lead to the identification of education and training needs for both RNs and LPNs with an emphasis on collaboration as a means to reduce the risk of harm. Strengthening the skills of RNs and LPNs in this way could go a long way toward improving resident safety.

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