Title: Nurse Dose: Linking Staffing Variables to Adverse Patient Outcomes

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Background: Inconsistent findings in over 100 studies have made it difficult to explain how variation in nurse staffing affects patient outcomes. Nurse dose, defined as the level of nurses required to provide patient care in hospital settings, draws on variables used in staffing studies to describe the influence of many staffing variables on outcomes.

Objectives: The purpose of this study was to examine the construct validity of nurse dose by determining its association with MRSA infections and reported patient falls on a sample of inpatient adult acute care units.

Method: Staffing data came from 26 units in Ontario Canada and Michigan. Financial and human resource data were data sources for staffing variables. Sources of data for MRSA came from Infection Control departments. Incident reports were the data source for patient falls. Data analysis consisted of bivariate correlations and Poisson regression.

Results: Bivariate correlations revealed that nurse dose attributes (active ingredient and intensity) were significantly associated with both outcomes. Active ingredient (education, experience, skill mix), and intensity (FTE, RN-patient ratio, RN-HPPD) were significant predictors of MRSA. Coefficients for both attributes were negative and almost identical. Both attributes were significant predictors of reported patient falls and coefficients were again negative, but coefficient sizes differed.

Discussion: By conceptualizing nurse and staffing variables (education, experience, skill mix, FTEs, RN-patient ratio, RN-HPPD) as components of nurse dose, and by including these in the same analysis, we were able to determine their relative influence on MRSA infections and reported patient falls.

Key Words: Outcome assessment, personnel staffing, nursing theory

Introduction

It is unclear how nurse staffing contributes to good outcomes for hospitalized patients (Manojlovich & Sidani, 2008). A large research base has attempted to link nurse staffing variables to patient outcomes, using staffing variables as proxies for actual nursing care (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007). However, efforts to accumulate and synthesize evidence of the influence of nurse staffing on patient outcomes have been hampered on several fronts. Most staffing research to date has been atheoretical (Mark, Hughes, & Jones, 2004), results across staffing studies have been inconsistent and sometimes contradictory (Jiang, Stocks, & Wong, 2006), and staffing definitions - even for the same term - vary conceptually and operationally. These conceptual and methodological issues have hindered efforts to find a consistent link between nurse staffing and patient outcomes which is needed to guide staffing decisions and demonstrate the influence of nursing on patient outcomes. Until such a link is found, the wrong number or type of nurse can be assigned to a unit with the potential for adverse consequences for patient care (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002; Mark et al., 2007) and increased healthcare costs (Cho, Ketefian, Barkauskas, & Smith, 2003).

We embarked on a program of research to address some of the deficits mentioned above, beginning by conceptualizing various staffing variables as elements of nurse dose (Manojlovich & Sidani, 2008). Then, we refined the nurse dose concept through a concept validation study and exploration of the factorial structure of nurse dose (Sidani, Manojlovich, & Covell, 2010). In this paper we report on the next step of our program of research involving nurse dose. We are not the first researchers to use the term nurse dose (Brooten & Naylor, 1995; Brooten & Youngblut, 2006). In our version, nurse dose is a unit level variable that reflects the contribution of registered nurses (RNs) to patient outcomes.

Literature Review

Nurse staffing research has been plagued by several conceptual and methodological issues, leading to inconsistent and even contradictory findings being reported in the literature (Jiang et al., 2006; Mark et al., 2004). A paucity of theory to guide ongoing research, and lack of conceptual coherence around staffing terms (Mark et al., 2004) represent two pressing conceptual challenges. Despite a robust body of empirical research involving staffing variables, a corresponding body of theory to explain how and why staffing variables affect patient outcomes has not developed (Mark et al., 2004). Theory has the ability to answer the "how" and "why" questions about the relationship between staffing and patient outcomes facilitating the accumulation of knowledge and moving the science in this area forward (Hearld, Alexander, Fraser, & Jiang, 2008). In over 100 studies attempting to link staffing variables to outcomes (Kane et al., 2007) little knowledge has been generated, in part because of the lack of theory development to guide further work in this area.

The majority of staffing studies has given little explanation for why one specific staffing variable was chosen over others. Mark and colleagues provide an elegant example of why theoretical distinction is needed between the proportion of RNs to all nursing staff (skill mix) and the number of hours of care delivered by RNs (RN-HPPD) in examining the relationship between staffing and communication with physicians (Mark et al., 2004). Moreover, many studies have assumed that a specific staffing variable may be equally associated with all outcomes, when such an assumption may not be justified. For instance, Needleman and colleagues found a relationship only between HPPD and pressure ulcers although other adverse outcomes used in analyses included longer length of stay, urinary tract infection, upper gastrointestinal bleeding, and hospital-acquired pneumonia (Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002).

Besides staffing variables, certain characteristics of RNs themselves may be important in achieving excellent patient outcomes (Aiken, Clarke, Cheung, Sloane, & Silber, 2003) and represent another area for conceptual development. Some researchers have reported a positive relationship between education and outcomes while others have been unable to demonstrate a link between these variables (Aiken et al., 2003; Blegen, Vaughn, & Goode, 2001). The little that is known about the relationship of nurse experience to outcomes suggests that experienced nurses contribute to positive outcomes (Blegen et al., 2001). No study has reported the combined effect of education, experience, and skill mix although collectively these three variables represent the concentration of nursing knowledge on a unit, which can be applied to improve the quality of patient care (Manojlovich & Sidani, 2008).

Several methodological challenges have been identified in staffing studies as well. Most studies have examined various permutations of one (Aiken et al., 2002) or a few of the following variables (Jiang et al., 2006): nurse-patient ratio, the number of full-time equivalents (FTEs), hours per patient day (HPPD), and skill mix: the ratio of registered nurses (RNs) to licensed practical nurses (LPNs) and unlicensed health care personnel. No study has included all of them. Moreover, there has not been a concerted effort to understand the relationship between a specific staffing variable and outcome, with studies using the same *outcome* variable but different *staffing* variables.

While Cho and colleagues found no significant relationship between HPPD and patient falls (Cho et al., 2003), Blegen and Vaughn found a significant inverse relationship between skill mix and falls (Blegen & Vaughn, 1998), and Unruh found a significant positive relationship between skill mix and falls (Unruh, 2003). It may not be surprising to find differences in studies where different staffing variables have been associated with the same outcome, however even studies using the same staffing variable have operationalized the concept differently. For example, FTEs have been operationalized as simply the number of full-time equivalents, FTEs per adjusted day, and FTEs per bed (Hearld et al., 2008). Thus a putative link between full-time equivalents (FTEs) and the adverse outcome of urinary tract infections (UTIs) has not emerged, perhaps as the result of differences in operationalization of the FTE variable in two recent studies (Cho et al., 2003; Kovner & Gergen, 1998). Similar variation in operationalization of hours per patient day (HPPD) and the related RN-HPPD (to isolate the registered nurse component only) may account for contradictory or inconsistent findings in other studies (Cho et al., 2003; Needleman et al., 2002). Inconsistent operationalization of the same term hampers consistency in the observed relationship between a specific staffing variable and outcome.

The level at which data are collected and analyzed has varied in staffing studies and represents another methodological issue which may also account for inconsistent findings across studies. In a unit-level study, Blegen and colleagues found no relationship between RN-HPPD and outcomes such as mortality and pressure ulcers (Blegen, Goode, & Reed, 1998), while both Cho and Needleman, in separate hospital-level studies, found an inverse relationship between RN-HPPD and pneumonia. A skill mix characterized by a high proportion of RNs was associated with fewer pressure ulcers in Blegen's unit-level study (Blegen et al., 1998), but not in Needleman's hospital-level study (Needleman et al., 2002).

The relationship of nurse staffing to reported patient falls and/or MRSA has not been studied as extensively as adverse outcomes described above. Yet, adverse outcomes such as these are considered sensitive to nursing care (Doran et al., 2006). In fact, we could find no other published study of a relationship exclusively between staffing and MRSA. In a review of the literature examining the relationship of staffing to patient falls (and pressure ulcers), findings were mixed; the authors concluded that substantial methodological differences across studies contributed to the inability to definitively link staffing to falls (Lake & Cheung, 2006).

In summary, a review of the staffing literature reveals that conceptual and methodological issues may be responsible for the lack of progress in our understanding of the relationship of nurse staffing to adverse patient outcomes. We agree with Mark and colleagues who assert that creative thinking is needed to identify constructs that capture the complexities associated with nursing practice (Mark et al., 2004).

The Development and Evolution of the Nurse Dose Concept

In developing a theory to explain nursing's influence on outcomes, we posit the concept of nurse dose as a structural variable that influences the processes and outcomes of nursing care. Nurse dose is defined as the level of nurses needed to provide patient care in hospital settings. Nurse dose draws on variables used in staffing studies and provides a unified approach to describe the influence of various staffing variables on patient outcomes. By combining staffing variables under the conceptual umbrella of nurse dose, we encompass the critical attributes needed to prescribe the number and type of nurses contributing to outcomes.

Absent a unified approach, it will not be possible to determine which staffing variable(s) contribute the most to patient outcomes (Manojlovich & Sidani, 2008).

We first conducted a concept analysis and concept derivation exercise, identifying 4 critical attributes of nurse dose: purity, amount, frequency, and duration. Next, we validated the 4 attributes of nurse dose with a panel of experts in nurse staffing research, resulting in changes to the attributes and indicators of nurse dose (Sidani et al., 2010). Based on feedback from the experts, the combination of education, experience, and skill mix was renamed "active ingredient" instead of purity. This change was consistent with dose terminology in other healthcare disciplines. The attributes of amount and frequency of nurse dose were both validated by the experts, but duration was not. Accordingly the conceptualization of nurse dose was revised to encompass three attributes: active ingredient, amount, and frequency.

We then explored the factorial structure of nurse dose using staffing data from 26 medical, surgical, and mixed medical/surgical inpatient units. The results of principal axis factoring analysis indicated two distinct factors, where the empirical indicators of the attributes loaded highly on one but not the other factor. We applied the rule of having a difference of 0.2 as the cut-off in loadings between the 2 factors. One factor, active ingredient, consisted of three empirical indicators: nurse education, experience and unit skill mix (factor loadings: 0.37, 0.36, 0.84, respectively). The second factor, a combination of amount and frequency, also consisted of three empirical indicators: FTEs, nurse-patient ratio, and RN-HPPD (factor loadings: 0.63, -0.66, 0.75, respectively) (Sidani et al., 2010). The factor pattern created by these three indicators suggest that when FTEs and RN-HPPD are high, the number of patients that a nurse cares for is low, as is often observed on nursing units where patients are more acutely ill, such as intensive care. We called this second factor intensity, which is consistent with dose terminology, and reflects the interaction between amount and frequency.

At the present time nurse dose consists of two attributes, active ingredient (education, experience, skill mix) and intensity (FTEs, nurse-patient ratio, RN-HPPD). We maintain that nurse dose is a unit level variable because nurse staffing varies by unit (Mark et al., 2004) and thus unit level analysis is needed to account for across unit differences in nurse staffing observed in actual practice settings (Sidani et al., 2010). The purpose of this study was to explore the validity of the nurse dose concept by determining its association with MRSA infections and reported patient falls on a sample of inpatient acute care units.

Methods

Sample and Data Sources

Two acute care hospitals provided data for the study. Both hospitals were academic teaching facilities in urban settings with over 750 beds. Within each hospital a subset of inpatient adult medical and surgical units that had an average length of stay greater than 24 hours and reported a nurse-to-patient ratio greater than one were selected (Sidani et al., 2010). Data were obtained from 14 units in a health system in Ontario, Canada and 12 units from a health system in Michigan. In a comparison of characteristics of the participatory hospitals, there were no statistically significant differences, which justified pooling the data from the 26 units for analysis.

Sources for constructing staffing variables came from financial and human resource data. Nurse staffing data came from licensed and non-licensed nursing personnel with direct patient care responsibilities assigned to adult medical, surgical, and mixed medical-surgical units. Staffing variables were annualized and came from fiscal year 2007. To standardize the operationalization of the empirical indicators and to promote data uniformity we provided respective departments with clear definitions as presented in Table 1. Institutional review boards of respective institutions in both countries granted approval to conduct the study.

Conversion of all staffing variables to attributes of nurse dose. Several steps were necessary before we could determine if nurse dose was associated with MRSA infections and reported patient falls. We constructed the variables of FTEs, nurse-patient ratio, skill mix, and RN-HPPD as delineated in Table 1: Empirical indicator column. While constructing the FTE variable, we had to account for differences in labor laws between the United States and Canada to derive productive hours. We used a standard of 1768 productive hours/year for the US nurses, and 1527 worked hours/year for the Canadian nurses. Others have reported 2080 hours as a standard year (40 hours/week for 52 weeks) (Needleman et al., 2002), which over counts productive time because it includes benefits such as sick and vacation hours.

We had to create new variables to represent the two attributes of nurse dose. The new variables consisted of the combination of the respective empirical indicators (i.e., active ingredient = education, experience, skill mix; intensity = FTE, nurse-patient ratio, RN-HPPD). Composite measures generally reduce error by providing more breadth and depth of measurement of a particular concept, and can reduce measurement error through cancelling of random error. Whereas factors scores could have been used, we opted to apply the steps described next for three reasons. First, the distribution of scores on some indicators was moderately skewed with the potential to affect the distribution of factor scores. Second, with the small sample size and the exploratory nature of this study, weighting was deemed inappropriate. Third, we wanted to use a simple formula for combining empirical indicators for future application by nurse managers planning unit staffing patterns. We began by generating scatter plots to examine the nature of relationships between outcomes and the independent variables (education, experience, skill mix, FTE, RN-patient ratio, RN-HPPD). This step was necessary to make sure that in categorizing nurse dose variables, we did not alter their relationships with the outcomes. Next we examined histograms and, based on the distribution of cases within each variable, 4 categories (i.e., quartiles) for each variable score were generated. This categorization was comparable to that used by Kane who arranged staffing variables in quartiles in his systematic review and meta-analysis of staffing studies (Kane et al., 2007). Scores (range: 1 – 4) were assigned to the four categories so that low scores corresponded to the lower end of the distribution on the respective nurse dose indicator and indicated lower levels on: education, experience, skill mix, FTE, and RN-patient ratio. We reverse scored RN-HPPD because its association with both outcomes was positive.

Construction of active ingredient. Since active ingredient is a combination of 3 variables (education, experience, skill mix), we summed and averaged categorized scores (range of 1 – 4) for education, experience, and skill mix to create a composite score reflective of the active ingredient attribute of nurse dose.

Construction of intensity. Similarly we summed and averaged categorized scores (range of 1 – 4) for amount (FTE), frequency (RN-patient ratio), and RN-HPPD to create a composite score reflecting the intensity of nurse dose.

Outcome measures. Sources of data for MRSA came from Infection Control departments in participating hospitals. MRSA was calculated as the rate of MRSA infection per

1000 patient days. Data for patient falls both with and without injury came from incident reports submitted to the Risk Management department. Reported patient falls were calculated as the rate of reported patient falls per 1000 patient days. Both outcomes' distributions clustered around zero with low frequencies at higher values and a positive skew.

Data Analysis

Data analyses consisted of bivariate correlations using the Pearson's r coefficient and Poisson regression, to account for the skewed distribution of outcome variables. Infrequently occurring random events such as adverse outcomes produce data that tend to cluster around the values of zero to one and are consistent with a Poisson distribution (Hutchinson, 2005). Poisson regression was an appropriate alternative to ordinary least squares because it assumes a Poisson distribution and does not violate the assumption of normality (Hutchinson, 2005). We generated a correlation matrix to determine if there were significant associations between each nurse dose attribute (i.e., active ingredient and intensity) and patient outcomes. Then we tested two Poisson regression models, one with MRSA infections as the dependent variable, and another with reported patient falls as the dependent variable. Nurse dose attributes were independent variables in both models.

Results

Ten units were classified as "adult medical", eight as "adult surgical", and another eight as combined "adult medical-surgical". Total number of beds per unit ranged from 12 – 64; nine units had 32 beds. Two units had less than one reported patient fall/1000 patient days; nine units had no MRSA cases. Other descriptive statistics are summarized in Table 2. Bivariate correlations revealed that the two nurse dose attributes were significantly associated with both outcomes. Active ingredient was significantly correlated with MRSA infections (r = -0.43, p = .03) and reported patient falls (r = -0.44, p = .03), as was intensity: MRSA (r = -0.70; p = .001) and reported falls (r = -0.44, p = .03).

In the regression model with MRSA as the outcome, active ingredient (education, experience, skill mix), and intensity (FTE, RN-patient ratio, RN-HPPD) were significant predictors. Coefficients for both attributes were negative, as would be expected, and almost identical. In the second regression model, both attributes were significant predictors of reported patient falls; coefficients were again negative, but coefficient sizes differed. Table 3 provides results of Poisson regression analyses.

Discussion

The long term objective of this program of research is to improve patient safety by using nurse dose as a prescriptive tool, identifying the nurse staffing required to prevent pressure ulcers, urinary tract infections, and other adverse patient outcomes. The findings provide preliminary evidence supporting the validity of the nurse dose concept. Our results are significant for several reasons.

We were able to demonstrate strong inverse associations between nurse dose attributes and both outcomes, in the expected direction. By providing conceptual coherence around the meaning of various staffing variables, we inform the selection of staffing indicators to consider in outcomes effectiveness studies. The finding that in the MRSA model coefficients for active ingredient and intensity were practically identical suggests that both attributes of nurse dose may be equally important in influencing MRSA. The strong association between MRSA and intensity suggests that both higher amounts and frequency of nursing staff may result in fewer MRSA infections. Having more nurses available to perform critical monitoring and surveillance functions has been associated with lower mortality and adverse patient outcomes in other studies as well (Aiken et al., 2002; Kane et al., 2007).

Yet to reduce reported patient falls, differences in the size of coefficients suggest that the active ingredient may be more influential than the intensity of nurse dose. No other study has examined the combination of education, experience, and skill mix, but in studies examining the relationship of skill mix and patient falls, our finding of an inverse relationship between active ingredient (of which skill mix is a part) and patient falls is similar to Blegen and Vaughn (Blegen & Vaughn, 1998) but contrary to Unruh (Unruh, 2003).

Unlike the bulk of staffing research done to date, our results suggest that more than one staffing variable should be measured when attempting to demonstrate the influence of staffing on patient outcomes. By conceptualizing nurse and staffing variables (education, experience, skill mix, FTEs, RN-patient ratio, RN-HPPD) as components of nurse dose, and by including these in the same analysis, we were able to determine their relative influence on MRSA infections and reported patient falls. Research using multiple staffing variables in the same study and investigating the relative influence of one predictor over others provides additional knowledge about nurse staffing variables and their effect on patient outcomes. When multiple studies by different authors use the same measures consistently, knowledge is built in an area.

Moreover nurse dose may have practical applicability as a valuable tool for nurse administrators to help them make evidence-based staffing decisions. Depending on what specific nurse-sensitive adverse event is plaguing a particular unit, nurse managers may be able to titrate their staffing in a way that helps to reduce that adverse outcome. Thinking about staffing in nurse dose terms may allow nurse managers to make their case in a way that is understood by non-nurse finance personnel. For example, nurse managers may be able to argue that an emphasis on FTEs or skill mix alone may be insufficient to make an impact on outcomes. They can use dose language to point out that since prescribing a medication effectively requires attention to both the medication's active ingredient and intensity (amount and frequency), similarly for nurse dose both the active ingredient (of which skill mix is a part) and intensity (of which FTE is a part) should be considered.

There were several limitations to our study. Although we were able to demonstrate significant relationships between several staffing variables and outcomes, because of the cross-sectional nature of our investigation we cannot claim that the staffing variables caused a reduction in adverse outcomes. Longitudinal studies wherein changes in nurse dose are tracked over time are needed to determine the causal relationship between nurse dose attributes and outcomes. There was a wide variety of staffing patterns among units providing data, but our small sample means that findings cannot be generalized beyond the health care systems in Ontario Canada and in the United States that participated in the study. We purposefully constructed the active ingredient of nurse dose as the average of education, experience, and skill mix to facilitate simplicity and ease of use. However, in the future more sophisticated methods such as constructing active ingredient from z-scores or factor scores may be needed as we continue work in this area. Both outcomes were rare events but we were constrained in the outcomes we investigated because of what comparable outcome data were available in both Canadian and American sites. A thorough review of measures and their sources has not been reported in the literature making a comparison with the measures we have used difficult and perhaps hindering others' abilities to produce our nurse dose composites from their administrative data.

Earlier work by members of this research team contributed to conceptual coherence and clarification of the nurse dose concept, and by empirically validating nurse dose with actual staffing and outcome data this study extends our knowledge of nurse dose. In future work research outcomes other than MRSA infections and reported patient falls should be studied. Outcomes such as urinary tract infections and pressure ulcers may be similarly sensitive to variations in staffing because, like patient falls, they are also designated as being "nurse sensitive" and thus consistent with the conceptualization of nurse dose. Adverse outcomes with known or anticipated variability in a variety of settings would facilitate more thorough testing of nurse dose attributes.

More refinement of nurse dose may be needed. Just as the dose of an analgesic can be too weak to alleviate pain, so too a specific nurse dose may be too weak to prevent an adverse outcome. More research may help specify the nurse dose at which certain outcomes can be averted. Research is also needed to determine if positive patient outcomes such as decreased length of stay and patient satisfaction can be achieved through a specific nurse dose.

We acknowledge that nurse staffing is a proxy for actual nursing care and that staffing variables do not identify what it is nurses do to achieve optimal patient outcomes (Mitchell & Lang, 2004). Nurse dose *per se* may not necessarily provide a measure of good nursing care. Monitoring and surveillance are core nursing activities whose effectiveness is influenced by the number of nurses available to provide care (Aiken et al., 2002). However the effectiveness of other interventions such as positioning and patient self-care assistance (Doran et al., 2006) may be more difficult to attribute to staffing. Thus, staffing is a necessary but not sufficient condition for good nursing care.

In summary, this study represented the next logical step in a program of research aimed at determining how staffing data can be configured in a unique way known as nurse dose and linked to patient outcomes. Nurse staffing variables in their various permutations represent an indirect measure of nurses' capacity to prevent adverse outcomes and promote quality care. Using nurse dose terminology to tease out the influence of staffing variables in multiple combinations on adverse outcomes is crucial because some nursing processes may very well depend on a specific nurse dose for optimal patient outcome achievement.

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Table 1

Nurse Dose Attributes: Conceptual Indicators, Operational Definitions, and Empirical Indicators

Attribute	Conceptual Indicator	Operational Definition	Empirical Indicator
Active Ingredient	Education	Percentage of RNs with BSN Degree or higher	number of RNs with BSN or higher / total number of RNs
	Experience	Average years of RN organizational experience	RN organizational experience total / total number of RNs
	Skill mix	Percentage of RNs to other nursing personnel	RN earned hours (productive and nonproductive) / Total earned hours (RN + RPN/LPN + nonprofessional productive and nonproductive hours)
Intensity	FTEs	Number of RN FTEs	RN worked (productive) hours / number of worked hours per year (Canada 1527; US 1768)
	RN-patient ratio	RN to patient ratio	RN worked (productive) hours / patient days x 24
	RN-HPPD	RN-HPPD	RN worked (productive) hours / patient days

Table 2

Descriptive Statistics

Variable	Mean	Median	Range	Std. Dev.
Patient length of stay (days)	7	6	1.5 – 13.1	2.8
Percentage of RNs with a BSN or higher degree	44	46	2 - 86	18
Experience	7.5	7.02	3 - 16	3.0
RN FTEs	83	84	65 - 97	8
RN – patient ratio	3	3.19	2 - 5	0.6
RN-HPPD	8.3	7.5	5.3 – 15.1	2.7
Skill mix (percentage of RNs to all nursing staff)	78	77	65 - 98	7.8
Patient Fall Rate	8.1	7.03	0.8 - 18	6.6
MRSA rate	1.0	0.17	0 – 3.8	1.3

Note. RNs=Registered Nurses; BSN = Bachelor of Science in Nursing; FTEs=Full-time equivalents; HPPD=hours per patient day; MRSA= methicillin-resistant staphylococcus aureus.

Table 3

Multiple Regression Models

Independent variables	Dependent variables	Coeff.	Std. error	z	p value	95% CI		Pseudo R^2
Model 1 – *p* = .001	***MRSA Infections***							.25
LR $chi^2(2) = 19.97$								
Active ingredient (ed/exp/sk)		-1.12	.51	-2.22	0.03	-2.13	-.13	
Intensity (fte/rnptratio/RN-HPPD)		-1.15	.31	-3.73	0.001	-1.76	-.55	
Model 2 – *p* = .001	***Reported Patient Falls***							.18
LR $chi^2(2) = 40.52$								
Active ingredient (ed/exp/sk)		-.66	.15	-4.31	0.001	-.97	-.36	
Intensity (fte/rnptratio/RN-HPPD)		-.48	.12	-4.16	0.001	-.71	-.26	

Note. Coeff.=coefficient; std=standard; CI=confidence interval; LR=Log ratio; ed=education; exp=experience; sk=skill mix; fte=full-time equivalent; rnptratio= nurse-patient ratio; RN-HPPD=Registered nurse hours per patient day.