



Nursing unit teams matter: Impact of unit-level nurse practice environment, nurse work characteristics, and burnout on nurse reported job outcomes, and quality of care, and patient adverse events—A cross-sectional survey



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ABSTRACT

Aim: To investigate the impact of nurse practice environment factors, nurse work characteristics, and burnout on nurse reported job outcomes, quality of care, and patient adverse events variables at the nursing unit level.

Background: Nurse practice environment studies show growing insights and knowledge about determining factors for nurse workforce stability, quality of care, and patient safety. Until now, international studies have primarily focused on variability at the hospital level; however, insights at the nursing unit level can reveal key factors in the nurse practice environment.

Design: A cross-sectional design with a survey.

Method: In a cross-sectional survey, a sample of 1108 nurses assigned to 96 nursing units completed a structured questionnaire composed of various validated instruments measuring nurse practice environment factors, nurse work characteristics, burnout, nurse reported job outcomes, quality of care, and patient adverse events. Associations between the variables were examined using multilevel modelling techniques.

Results: Various unit-level associations (simple models) were identified between nurse practice environment factors, nurse work characteristics, burnout dimensions, and nurse reported outcome variables. Multiple multilevel models showed various independent variables such as nursing management at the unit level, social capital, emotional exhaustion, and depersonalization as important predictors of nurse reported outcome

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variables such job satisfaction, turnover intentions, quality of care (at the unit, the last shift, and in the hospital within the last year), patient and family complaints, patient and family verbal abuse, patient falls, nosocomial infections, and medications errors.

Conclusion: Results suggested a stable nurse work force, with the capability to achieve superior quality and patient safety outcomes, is associated with unit-level favourable perceptions of nurse work environment factors, workload, decision latitude, and social capital, as well low levels of burnout. Nurses, physicians, nursing leaders, and executives share responsibility to create an environment supportive of interdisciplinary team development.

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What is already known about the topic?

- Nursing unit variation of the perceived nurse practice environment (e.g. nurse–physician relationship, nurse management at the unit level and hospital management and organizational support) and feelings of burnout predicts job outcomes such as job satisfaction and turnover intentions and nurse reported quality of care variables.

What this paper adds

- Besides nurse practice environment, perceived unit variation of nurse work characteristics such as workload, decision latitude and social capital predicted job satisfaction and turnover intentions and nurse reported quality of care.
- Unit variation of perceived nurse practice work environment and feelings of burnout predicted also adverse patient events such as patient and family complaints, patient and family verbal abuse, patient falls, nosocomial infections, and medications errors.
- Social capital is relevant for patient falls and medications errors, workload is relevant for patient and family verbal abuse and both social capital and decision latitude is relevant for patient and family complaints.
- Nurse management at the unit level, emotional exhaustion as well as depersonalisation seems to be important predictors of various studied outcome variables.
- To achieve excellent quality of care and patient safety outcomes nursing unit teams matter through involvement of leaders, physicians, nurse managers as well as staff nurses.

1. Introduction

For almost three decades studies have carefully built a body of knowledge about the relevance of the nurse practice environment for nurse outcomes such as job dissatisfaction, turnover intentions, quality of care, and patient safety outcomes such as mortality, complications, failure to rescue, and patient satisfaction. Primarily conducted in United States (U.S.) and Canada (Aiken et al., 2008; Friese et al., 2008), these studies were also introduced in Europe by initiatives like the Nurses Early Exit (NEXT) and RN4CAST (Aiken et al., 2012; Estry-Béhar et al., 2007; van der Heijden et al., 2010). Notwithstanding country-specific factors, aspects such as hospital work environments, quality of teamwork, social support of peers and supervisors, and feelings of burnout were predictors

for poor nurse and patient outcomes in both of these European studies.

An abundance of research has demonstrated the negative impact work-related aspects can have on nurses' mental health (Mark and Smith, 2012; Schulz et al., 2011; Su et al., 2009). Nurses seem especially vulnerable to stress and burnout because they often work in particularly stressful and burdensome environments. Although burnout is generally conceptualized as an individual syndrome consisting of emotional exhaustion, depersonalisation, and personal accomplishment (Maslach et al., 1996), literature suggests that burnout might also occur at the level of nursing unit teams. Garman et al. (2002) confirmed the existence of a meaningful unit-level burnout construct. Moreover, their multilevel analyses showed that a significant proportion of the variance in client satisfaction data could be attributed to unit-level effects, particularly the emotional exhaustion component of burnout. This is in line with studies that considered a relationship between stress and burnout among nurses and patient outcomes.

Previous studies at the unit level found emotional exhaustion and depersonalisation to be inversely related to patient satisfaction, while personal accomplishment was positively related to patient satisfaction (Leiter et al., 1998; Vahey et al., 2004). A recent paper within the RN4CAST research that studied 11 countries, 352 hospitals, more than 2000 nursing units, and almost 23,500 nurses showed associations between unfavourable nurse perceived work environment and nurses' burnout experiences at both the nursing unit and the hospital level (Li et al., 2013). The authors suggested both hospital-wide and unit-specific interventions to achieve better work environments.

Our previous research results showed associations between the nurse practice environment factors of nurse–physician relations, nursing management, and hospital management with burnout dimensions, job outcomes, and quality of care variables studying both hypothetical models (e.g. structural equation modelling) and unit-level analyses (e.g. multilevel modelling). These study approaches were developed based on international insights and empirical studies about nurse practice environments (Choi et al., 2004; Estabrooks et al., 2002; Gunnarsdóttir et al., 2007; Li et al., 2007; Rafferty et al., 2001; Schubert et al., 2009; Vahey et al., 2004), psychosocial work environments (Kowalski et al., 2010; Leiter and Maslach, 2009), and quality and patient safety (Aiken et al., 2008; Friese et al., 2008; Laschinger and Leiter, 2006; Tourangeau et al., 2005). Structural equation models confirmed associations between favourable nurse practice environment factors and favourable job outcomes and

quality of care variables, with burnout dimensions such as relatively low emotional exhaustion, low depersonalization, and high personal accomplishments in a mediating position (Van Bogaert et al., 2009b, 2013b,c). In addition, unit-level predictions were shown (Van Bogaert et al., 2010, 2013a).

Nursing unit teams are known to influence nurse-sensitive patient outcomes in the important areas of quality of care and patient safety. Kirwan et al. (2013) conducted a multi-level study of 108 medical and surgical wards ($n = 30$ hospitals) in Ireland. Nurse-assessed ward practice environment and the proportion of nurses with baccalaureate degrees predicted better nurse-reported patient safety outcomes (e.g. nurse-graded patient safety in ward and the number of adverse event reports submitted within the past year). Our previous nursing unit-level studies with a study population of acute care ($n = 42$ nursing units) (Van Bogaert et al., 2010) and psychiatric hospital care ($n = 32$ nursing units) (Van Bogaert et al., 2013a) showed the impact of nurse practice environment factors on outcome variables (e.g. burnout dimensions, job outcome, and quality of care variables). In turn, feelings of burnout were associated with poor nurse reported job outcomes and quality of care.

Optimal multiple multilevel models in both data sets showed that low degrees of emotional exhaustion, depersonalization, and favourable nurse practice environment factors of nurse–physician relations and nursing management at the unit level were predictors of both favourable job outcome and quality of care variables. Differences between acute and psychiatric hospital care unit-level analyses were also found. Favourable hospital management and organizational support were more present as predictors of job satisfaction and favourable quality of care at the unit level in the acute care population in comparison with the psychiatric care population (multiple multilevel models). These results showed the importance of nursing unit teams investigating predictors for job satisfaction, turnover intentions, and nurse-assessed quality of care.

Recently, nurse work characteristics such as workload (Van Bogaert et al., 2013c), decision latitude, and social capital were also considered in a cross sectional study design on theoretical and empirical grounds (Kanter, 1993; Kowalski et al., 2010; Leiter and Maslach, 2009). A studied structural equation model confirmed associations between nurse practice environment factors and nurse work characteristics, and in turn these variables were associated with burnout, job outcomes, and quality of care variables (Van Bogaert et al., 2013c). In fact, nurse practice environment dimensions reported to be unfavourable were associated with high workload, low decision latitude, low social capital, and unfavourable outcome variables.

These results support further research with additional nurse work characteristics at the unit level to investigate associations with various predicting variables to better understand their impact on nurse-reported nurse and patient outcomes including adverse patient events. Therefore, the aim of the current study is to investigate the impact of nurse practice environment factors, nurse work characteristics, and burnout on nurse-reported job

outcomes, quality of care, and patient safety variables at the nursing unit level.

2. Methods

This cross-sectional study was conducted in one 700-bed general hospital and one 600-bed university hospital in the Dutch speaking part of Belgium (Flanders), as well as in one hospital group comprised of six hospitals (number of beds ranged from 125 to 320) in the French speaking part of Belgium (Wallonia). The studied participants were registered nurses working in a direct-care nursing unit: medical and surgical units, intensive care and medium care units, emergency room (ER), operation theatre (OR) and post anaesthetic care units (PACU). Nurses working in both adult and paediatric care settings were included. The total study sample was 1201 nurses (response rate 56.5%) of 116 units. We selected 96 units for further analyses with $\geq 30\%$ unit response rate (range from 30% to 100%; 4–37 respondents per unit). This resulted in a study sample of 1108 nurses.

Twenty nursing units were dropped from analysis because of a low unit response rate ($<30\%$). Previous study results including units with low response rates showed larger effect sizes and wider confidence bounds (Van Bogaert et al., 2010, 2013c). Members of nursing units were invited by a coordinator/contact person at each institution to voluntarily complete the questionnaires between June 2011 and June 2012. The survey was offered in one hospital and the hospital group on paper, and was offered electronically in one hospital. Respondents could complete the questionnaire at home and/or in their hospital.

2.1. Variables and instruments

Measures were selected from our previous research studying the impact of nurse work environment, nurse work characteristics, and burnout on nurse-reported job outcomes, quality of care, and patient safety variables.

The *Nursing Work Index Revised* (NWI-R) (Aiken and Patrician, 2000; Lake, 2002) adapted for our samples tapping three dimensions of nurse–physician relations (3 items), nursing management at the unit level (13 items), and hospital management and organizational support (15 items) (Van Bogaert et al., 2009a). Respondents rated various statements on a 4-point likert scale from *strongly disagree* to *strongly agree*.

Three instruments measured the *nurse work characteristics* of perceived workload, decision latitude, and social capital. Nurse-perceived workload was measured with a six-item intensity of labour scale (Richter et al., 2000). Decision latitude was measured with a seven-item scale measuring participants' ability to make decisions, be creative, and use and develop their professional and personal skills in the workplace (Richter et al., 2000). Social capital was measured with a six-item scale measuring participants' shared values and perceived mutual trust within teams and organizations (Ernstmann et al., 2009; Pfaff et al., 2004). Respondents rated each nurse work characteristic scale item on a four-point scale from *strongly disagree* to *strongly agree*.

The *Maslach Burnout Inventory Human Services Survey* (MBI HSS) (Maslach et al., 1996; Schaufeli and Van Dierendonck, 2000) is a three-construct measure including emotional exhaustion (eight items), depersonalization (five items) and personal accomplishment (seven items). Respondents rated their experience of various job-related feelings on a seven-point likert scale ranging from *never* to *every day*.

Nurse-reported job outcomes were measured with two items: satisfaction with the current job (*very dissatisfied, dissatisfied, satisfied, very satisfied*) and intention to leave the nursing profession within a year (*yes, no*). Nurse-assessed quality of care was measured with three items: at the current unit, the last shift (*poor, fair, good, excellent*), and in the hospital within the last year (*definitely deteriorated, deteriorated, improved, definitely improved*).

Each of these measures have been thoroughly examined by exploratory and confirmatory factor analyses as well as assessment of subscale internal consistency and reliability with several study samples of acute care nurses, psychiatric care nurses (Van Bogaert et al., 2009a,b, 2013b), and with the current study sample (Van Bogaert et al., 2013c).

In the current study, *adverse patient events* were also studied including patient and family complaints, patient and family verbal abuse, patient falls, nosocomial infections, and medication errors (Laschinger and Leiter, 2006). Nurses were asked to rate the frequency of these events on seven-point likert scale of *never, few times a year, at least once a month, several times a month, at least once a week, several times a week, or daily*. Cronbach alpha's value ($>.80$) of the adverse patient events showed internal consistency and reliability between these variables.

Variables were tested for multicollinearity with correlations ranging from $-.079$ to $.598$. Higher scores on study measures indicate stronger agreement, or more favourable ratings, with the exception of the indicators of workload, emotional exhaustion, depersonalization, and adverse patient events (e.g. patient and family complaints, patient and family verbal abuse, patient falls, nosocomial infections, and medication errors). Higher scores in these scales signify a heavier burden and/or poorer conditions. High and low unit-level mean scores for each burnout dimension were calculated based on following norms (mean values) described by Schaufeli and Van Dierendonck (2000): emotional exhaustion ≥ 2.12 ; depersonalisation ≥ 1.59 (female)– 1.79 (male); personal accomplishment ≥ 4.42 .

2.2. Data analysis

Descriptive statistics and intra-class correlation coefficients (ICC) were examined. The degree of homogeneity of observations within nursing units of each measure was indicated by ICCs (Fitzmaurice et al., 2004; Park and Lake, 2006; Van Bogaert et al., 2010). The ICCs also verify the degree of group homogeneity of unit-level aggregate measures in these analyses (Kreft and De Leeuw, 1998).

Multilevel modelling was used to investigate the unit-level effect of nurse practice environment, nurse work

characteristics, and burnout on nurse-reported job outcomes, quality of care, and patient safety. Based on previous studies nurse practice environment dimensions, nurse work characteristics, and burnout dimensions were treated as independent variables (Van Bogaert et al., 2010, 2013a).

Conventional regression analyses ignore the correlated structure of the observations on clustered data because they underestimate standard errors and increase the likelihood of a false rejection of the null hypothesis or acceptance of a relationship when in fact it does not exist (Type I error). Meanwhile, a two-level model incorporating a nested structure of staff members with nursing units corrects for the dependency of observations. Therefore, the effects of the independent variables on the dependent variables were tested with two-level linear mixed effects models with a random intercept. Level One involved variables related to the staff members on a given nursing unit, and Level Two involved variables related to the nursing unit (Fitzmaurice et al., 2004; Van Bogaert et al., 2010, 2013a).

Generalized linear mixed effects models were fitted analysing discrete dependent variables (simple multilevel models). To determine optimal predictive models, the final models were assessed with backward procedures dropping variables that did not improve goodness of fit (multiple multilevel models). Coefficients for all the independent measures were estimated in both unadjusted models as well as models adjusted for several nurse characteristics that had significant associations with at least one of the dependent variables. This was done in an attempt to adjust for potential confounders at the individual level such as age, years in nursing, years on the present unit, gender, education, and work schedule as previously applied in prior studies (Van Bogaert et al., 2010, 2013b). In addition, adjustments were made for response rates at the unit level as well as four types of units ((1) medical–surgical units, $n = 51$; (2) ICU – medium care units, $n = 19$; (3) OR and PACU, $n = 9$; and (4) ER, $n = 9$) and. The Statistical Package for the Social Sciences (SPSS Inc, Chicago) version 20.0 software was used for descriptive analysis. PROC MIXED and PROC NL MIXED under SAS 9.2 (SAS Institute Inc, Cary, NC) were used to fit the multilevel models.

3. Results

The unit-level mean age was 38.5 (p25: 35.0; p75: 41.8), the mean years in nursing was 15.5 (p25: 11.7; p75: 18.3), and the mean years on the current unit was 8.9 (p25: 5.8; p75: 11.3). The majority of study participants were female nurses (unit-level mean 86.0%; p25: 80.0%; p75: 100.0%), on average 60.0% (p25: 38.1%; p75: 80.9%), worked 80% or more of a full-time position, and on average 76.6% of the participants (p25: 61.5%; p75: 94.2%) held baccalaureate degrees in nursing. Table 1 summarizes the unit-level ($N = 96$) descriptive analysis of study variables.

Nurse–physician relations, nurse management at the unit level, decision latitude, and social capital were rated predominately favourable, while hospital management and organizational support, and workload were rated

Table 1
Characteristics and ICC values of the nursing units (N = 96).

	ICC	Mean	SD	p25	p75
Nurse physician relations (mean) [#]	.26	2.84	.33	2.67	3.07
Nurse management at the unit-level (mean) [#]	.31	2.88	.22	2.74	3.06
Hospital management and organizational support (mean) [#]	.20	2.44	.21	2.28	2.60
Workload (mean) [#]	.28	2.97	.32	2.75	3.20
Social capital (mean) [#]	.33	2.95	.36	2.79	3.18
Decision latitude (mean) [#]	.09	3.02	.15	2.91	3.14
Emotional exhaustion (mean) ^{##}	.26	1.93	.73	1.42	2.33
Depersonalization (mean) ^{##}	.13	1.09	.47	.75	1.38
Personal accomplishment (mean) ^{##}	.09	4.72	.41	4.45	5.00
Job satisfaction (strongly satisfied – satisfied) (%) ^a	.17	90.4	12.5	84.7	100.0
Intention to leave the nursing profession (no) (%) ^b	.04	89.9	12.4	83.3	100.0
Quality of care at the current unit (excellent – good) (%) ^c	.15	87.1	16.6	80.0	100.0
Quality of care at the last shift (excellent – good) (%) ^c	.14	90.1	13.8	85.0	100.0
Quality of care in the hospital the last year (definitely improved – improved) (%) ^d	.30	59.2	27.6	38.1	80.0
Patient and family complaints (never – few times a year) (%) ^e	.21	64.3	24.0	50	80.9
Patient and family verbal abuse (never – few times a year) (%) ^e	.30	58.6	27.4	37.5	81.6
Patient falls (never – few times a year) (%) ^e	.33	82.0	20.4	70.3	100.0
Nosocomial infections (never – few times a year) (%) ^e	.24	71.3	23.4	53.8	88.9
Medication errors (never – few times a year) (%) ^e	.10	81.6	15.4	73.4	92.9

ICC: Inter-class correlations.

[#] Scale range from 1 to 4.

^{##} Scale range from 0 to 6. Mean value: higher scores on study measures indicate stronger agreement or more favourable ratings with the exception of the indicators of workload, emotional exhaustion, and depersonalization.

^a Strongly satisfied or satisfied versus dissatisfied or strongly dissatisfied.

^b No, intention to leave versus yes, intention to leave.

^c Excellent or good versus fair or poor.

^d Definitely improved or improved versus deteriorated or definitely deteriorated.

^e Never or few times a year versus at least once a month, several times a month, at least once a week, several times a week or daily.

predominately unfavourable. On average about 10% of respondents at the unit level were (very) dissatisfied with the current job and had the intention to leave the nursing profession. Nurse-perceived quality of care at the unit, and during the latest shift, was reported as good or excellent, while quality of care in the hospital within the last year, patient/family complaints, and patient/family verbal abuse were reported less favourable.

Frequency of adverse patient events such as patient falls and medical errors were rated more favourably than nosocomial infections. One out of three units had high or very high mean values for emotional exhaustion, one out of seven units had high or very high mean values on depersonalization, and eight out of ten units had high or very high mean values for personal accomplishment.

The ICCs showed acceptable values (ranged from .10 to .33). Decision latitude (.093), personal accomplishment (.087), intention to leave the nursing profession (.044), and medication errors (.097) had relatively lower ICCs, but the models showed significant unit level associations for these variables too ($p < .05$).

Tables 2–4 summarize associations (simple multilevel models) between nurse practice environment dimensions, nurse work characteristics, burnout dimensions, and the various outcome variables. The odds ratios showed that a one point increase in the predictors corresponds with the probability of a favourable outcome (x-fold probability of 1: strongly satisfied – satisfied; no intention to leave; excellent or good; never of few times).

Nurse practice environment and burnout dimensions were associated with all outcome variables unadjusted

and adjusted for all confounders with the exception of the associations between nurse–physician relations and management at the unit level with patient and family verbal abuse; between nurse management at the unit level, nurse–physician relations, and personal accomplishment with patient falls, nurse management at the unit level, and nosocomial infections; and between personal accomplishment and medication errors. Moreover, the nurse work characteristics of workload, decision latitude, and social capital were associated with job outcome variables as well as nurse-perceived quality of care at the unit, during the last shift, and within the hospital the last year.

No associations were found between workload and decision latitude with the intention to leave the nursing profession, and no relationship was found between workload and nurse-perceived quality of care at the unit. Associations with the frequency of adverse patient events were found between decision latitude and social capital with patient and family complaints, between workload and patient/family verbal abuse, as well as between social capital and both patient falls and medication errors.

Multiple multilevel models (Table 5) showed nursing management at the unit level and emotional exhaustion as predictive of both studied job outcome variables. In addition, personal accomplishment was associated with no intention to leave the nursing profession. Nursing management at the unit level and social capital were predictive of nurse-perceived quality of care at the unit level and during the last shift.

Table 2

Generalized linear mixed effects model – simple multilevel model with random intercept: nurse reported job outcome, quality of care and patient adverse events (dependent variables) and nurse work characteristics (independent variables).

N = 96	Unadjusted	Adjusted ^g
	OR	OR
Satisfaction with the current job ^a		
Nurse–physician relations ^f	1.98*** [1.30; 3.02]	2.28*** [1.46; 3.54]
Nurse management at the unit level ^f	10.06*** [4.86; 20.82]	10.71*** [4.97; 23.06]
Hospital management and organizational support ^f	8.63*** [4.04; 18.43]	9.42*** [4.23; 20.96]
(No) intention to leave the nursing profession ^b		
Nurse–physician relations ^f	1.37 [0.92; 2.04]	1.71* [1.13; 2.59]
Nurse management at the unit level ^f	4.19*** [2.19; 8.00]	4.10*** [2.05; 8.21]
Hospital management and organizational support ^f	4.38*** [2.26; 8.50]	4.23*** [2.09; 8.53]
Quality of care at the current unit ^c		
Nurse–physician relations ^f	2.42*** [1.60; 3.64]	2.92*** [1.89; 4.51]
Nurse management at the unit level ^f	47.07*** [19.22; 115.26]	50.17*** [19.67; 127.97]
Hospital management and organizational support ^f	6.32*** [3.19; 12.54]	6.87*** [3.52; 14.25]
Quality of care at last shift ^c		
Nurse–physician relations ^f	2.58*** [1.66; 4.02]	2.94*** [1.86; 4.66]
Nurse management at the unit level ^f	22.73*** [9.75; 52.95]	20.02*** [8.59; 46.68]
Hospital management and organizational support ^f	4.92*** [2.38; 10.20]	4.71*** [2.23; 9.95]
Quality of care in hospital the last year ^d		
Nurse–physician relations ^f	2.94*** [2.11; 4.09]	3.13*** [2.23; 4.39]
Nurse management at the unit level ^f	31.91*** [15.80; 64.45]	30.58*** [15.26; 61.28]
Hospital management and organizational support ^f	15.83*** [8.73; 28.68]	17.29*** [9.31; 32.09]
Patient and family complaints ^e		
Nurse–physician relations ^f	0.55*** [0.40; 0.74]	0.52*** [0.39; 0.71]
Nurse management at the unit level ^f	0.40*** [0.24; 0.68]	0.42*** [0.25; 0.71]
Hospital management and organizational support ^f	0.31*** [0.19; 0.52]	0.31*** [0.19; 0.52]
Patient and family verbal abuse ^e		
Nurse–physician relations ^f	0.95 [0.70; 1.28]	0.88 [0.65; 1.20]
Nurse management at the unit level ^f	0.72 [0.43; 1.21]	0.74 [0.43; 1.26]
Hospital management and organizational support ^f	0.47** [0.28; 0.79]	0.45** [0.29; 0.85]
Patient falls ^e		
Nurse–physician relations ^f	0.72 [0.49; 1.05]	0.70 [0.48; 1.03]
Nurse management at the unit level ^f	0.54 [0.28; 1.05]	0.55 [0.29; 1.07]
Hospital management and organizational support ^f	0.53 [0.28; 1.02]	0.49 [0.26; 0.94]
Nosocomial infections ^e		
Nurse–physician relations ^f	0.62** [0.45; 0.85]	0.56** [0.41; 0.78]
Nurse management at the unit level ^f	0.48** [0.28; 0.83]	0.59 [0.34; 1.03]
Hospital management and organizational support ^f	0.45** [0.27; 0.76]	0.43** [0.26; 0.74]
Medication errors ^e		
Nurse–physician relations ^f	0.61** [0.44; 0.86]	0.58** [0.41; 0.82]
Nurse management at the unit level ^f	0.45** [0.26; 0.77]	0.45** [0.26; 0.78]
Hospital management and organizational support ^f	0.46** [0.28; 0.78]	0.49 [0.29; 0.85]

* *p*-Value < .05.

** *p*-Value < .01.

*** *p*-Value < .001.

OR, odds ratio 95% CI [lower and upper bound].

^a Strongly satisfied or satisfied (1) versus dissatisfied or strongly dissatisfied (0).

^b No, intention to leave (1) versus yes, intention to leave (0).

^c Excellent or good (1) versus fair or poor (0).

^d Definitely improved or improved versus deteriorated or definitely deteriorated.

^e Never or few times a year (1) versus *at least once a month, several times a month, at least once a week, several times a week or daily* (0).

^f Mean value.

^g Adjusted for years in nursing – years on present unit – gender – bachelor of nursing science – work schedules – type of unit and unit response rate.

Nurse-perceived quality of care within the hospital was predicted by workload, as well by hospital and nursing management. Patient and family complaints, as well as patient and family verbal abuse, were both predicted by depersonalization. Patient and family complaints were also predicted by emotional exhaustion. Nurse-reported frequency of patient falls, nosocomial infections, and medication errors were predicted by depersonalization and the latter two outcome variables in addition to nurse–physician relations and social capital respectively.

4. Discussion

In comparison with our previous studies (Van Bogaert et al., 2010, 2013a), the present multilevel study confirmed the impact of all nurse practice environment dimensions on job outcomes and quality of care variables, and also an impact on nurse-reported adverse patient events. Nurse work characteristics such as workload, decision latitude, and social capital also have an impact on job outcomes and quality of care variables, but were less relevant on adverse

Table 3

Generalized linear mixed effects model–Simple Multilevel Model with Random Intercept: Nurse Reported Job Outcome, Quality of Care and Patient Adverse Events (dependent variables) and Nurse Work Characteristics (independent variables).

N = 96	Unadjusted OR	Adjusted ^f OR
Satisfaction with the current job ^a		
Workload ^g	0.36*** [0.23; 0.58]	0.35*** [0.21; 0.57]
Decision latitude ^g	5.99*** [2.81; 12.76]	5.27*** [2.45; 11.36]
Social capital ^g	2.44*** [1.57; 3.77]	2.19*** [1.39; 3.45]
(No) intention to leave the nursing profession ^b		
Workload ^e	0.59 [†] [0.39; 0.89]	0.56 [0.36; 0.87]
Decision latitude ^e	1.50 [0.80; 2.82]	1.82 [0.93; 3.57]
Social capital ^e	2.02*** [1.35; 3.00]	2.07*** [1.36; 3.16]
Quality of care at the current unit ^c		
Workload ^e	0.82 [0.53; 1.25]	0.77 [0.49; 1.20]
Decision latitude ^e	8.36*** [4.04; 17.28]	7.03*** [3.36; 14.71]
Social capital ^e	12.28*** [7.27; 20.75]	13.18*** [7.85; 22.92]
Quality of care at last shift ^c		
Workload ^e	0.59 [†] [0.37; 0.95]	0.57 [†] [0.35; 0.92]
Decision latitude ^e	5.62*** [2.59; 12.20]	4.71*** [2.17; 10.25]
Social capital ^e	6.22*** [3.80; 10.18]	6.06*** [3.63; 10.13]
Quality of care in hospital the last year ^d		
Workload ^e	0.35*** [0.25; 0.48]	0.32*** [0.23; 0.44]
Decision latitude ^e	2.62*** [1.61; 4.26]	2.26*** [1.38; 3.69]
Social capital ^e	3.25*** [2.30; 4.59]	3.13*** [2.21; 4.43]
Patient and family complaints ^e		
Workload ^e	1.24 [0.91; 1.70]	1.24 [0.91; 1.71]
Decision latitude ^e	0.60 [†] [0.38; 0.95]	0.60 [†] [0.37; 0.95]
Social capital ^e	0.70 [†] [0.52; 0.96]	0.73 [0.54; 1.00]
Patient and family verbal abuse ^e		
Workload ^e	1.74** [1.26; 2.41]	1.79*** [1.29; 2.49]
Decision latitude ^e	1.17 [0.73; 1.86]	1.14 [0.71; 1.83]
Social capital ^e	1.05 [0.77; 1.44]	1.14 [0.83; 1.57]
Patient falls ^e		
Workload ^e	1.23 [0.82; 1.86]	1.19 [0.79; 1.79]
Decision latitude ^e	0.63 [0.35; 1.13]	0.65 [0.36; 1.17]
Social capital ^e	0.64 [†] [0.42; 0.96]	0.69 [0.46; 1.03]
Nosocomial infections ^e		
Workload ^e	1.18 [0.84; 1.64]	1.29 [0.92; 1.81]
Decision latitude ^e	0.64 [0.39; 1.05]	0.63 [0.38; 1.03]
Social capital ^e	0.72 [0.52; 1.01]	0.79 [0.57; 1.11]
Medication errors ^{***e}		
Workload ^e	1.30 [0.93; 1.81]	1.34 [0.95; 1.89]
Decision latitude ^e	0.85 [0.51; 1.42]	0.87 [0.51; 1.47]
Social capital ^e	0.59** [0.42; 0.83]	0.61** [0.43; 0.86]

* *p*-Value < .05.** *p*-Value < .01.*** *p*-Value < .001.

OR, odds ratio 95% CI [lower and upper bound].

^a Strongly satisfied or satisfied (1) versus dissatisfied or strongly dissatisfied (0).^b No, intention to leave (1) versus yes, intention to leave (0).^c Excellent or good (1) versus fair or poor (0).^d Never or few times a year (1) versus *at least once a month, several times a month, at least once a week, several times a week or daily*.^e Never or few times a year (1) versus *at least once a month, several times a month, at least once a week, several times a week or daily* (0).^f Adjusted for years in nursing – years on present unit – gender – bachelor of nursing science – work schedules a – type of unit and unit response rate.^g mean value.

patient events. Higher levels of burnout were associated with unfavourable job outcomes, patient and family complaints, and patient and family verbal abuse. Moreover, these data confirm the link between nursing unit-level burnout and job outcomes, quality of care, and patient satisfaction.

A recent systematic review of burnout in relation to specific contributing factors and health outcomes among nurses (Khamisa et al., 2013) revealed a handful of studies confirming three way relationships of work related stressors, burnout, job satisfaction, or general health. The authors suggested that despite work related stress,

burnout, job satisfaction, and general health being inter-related, the complexity of these relationships can only be well understood if all variables are explored simultaneously. This type of exploration was performed in our study.

Certain limitations of this study merit mention. This cross-sectional study was conducted with 96 units of two hospitals and one hospital group. We recommend these results be interpreted carefully for common method bias (e.g. cross-sectional design, selection of units based on response rate, etc.). Replication with a broader sample in different socio-economic contexts will be of added value,

Table 4

Generalized linear mixed effects model – simple multilevel model with random intercept: nurse reported job outcome and quality of care and patient adverse events (dependent variables) and burnout (independent variables).

N = 96	Unadjusted OR	Adjusted ^g OR
Satisfaction with the current job ^a		
Emotional exhaustion ^f	0.41*** [0.34; 0.49]	0.40*** [0.33; 0.49] [#]
Depersonalization ^f	0.55*** [0.45; 0.67]	0.55*** [0.44; 0.68]
Personal accomplishment ^f	1.70*** [1.33; 2.18]	1.62*** [1.25; 2.12]
(No) intention to leave the nursing profession ^b		
Emotional exhaustion ^f	0.63*** [0.54; 0.75]	0.59*** [0.49; 0.71]
Depersonalization ^f	0.68*** [0.55; 0.82]	0.72*** [0.58; 0.89]
Personal accomplishment ^f	1.50*** [1.19; 1.89]	1.64*** [1.28; 2.12]
Quality of care on the current unit ^c		
Emotional exhaustion ^f	0.70*** [0.59; 0.83]	0.68*** [0.57; 0.82]
Depersonalization ^f	0.67*** [0.54; 0.82]	0.66*** [0.53; 0.82]
Personal accomplishment ^f	1.59*** [1.26; 2.01]	1.48*** [1.16; 1.88]
Quality of care at last shift ^c		
Emotional exhaustion ^f	0.68*** [0.56; 0.81]	0.65*** [0.54; 0.79]
Depersonalization ^f	0.66*** [0.53; 0.82]	0.66*** [0.53; 0.83]
Personal accomplishment ^f	1.75*** [1.36; 2.25]	1.69*** [1.31; 2.19]
Quality of care in hospital the last year ^d		
Emotional exhaustion ^f	0.61*** [0.52; 0.70]	0.58*** [0.50; 0.67]
Depersonalization ^f	0.65*** [0.55; 0.77]	0.63*** [0.53; 0.76]
Personal accomplishment ^f	1.44*** [1.19; 1.74]	1.37*** [1.13; 1.66]
Patient and family complaints ^e		
Emotional exhaustion ^f	1.41*** [1.24; 1.61]	1.42*** [1.24; 1.63]
Depersonalization ^f	2.16*** [1.80; 2.58]	2.14*** [1.78; 2.58]
Personal accomplishment ^f	0.63*** [0.52; 0.76]	0.62*** [0.51; 0.76]
Patient and family verbal abuse ^e		
Emotional exhaustion ^f	1.58*** [1.38; 1.83]	1.41*** [1.23; 1.61]
Depersonalization ^f	1.76*** [1.47; 2.10]	2.09*** [1.74; 2.51]
Personal accomplishment ^f	0.80*** [0.67; 0.97]	0.61*** [0.50; 0.74]
Patient falls ^e		
Emotional exhaustion ^f	1.27*** [1.08; 1.50]	1.25*** [1.06; 1.48]
Depersonalization ^f	1.40*** [1.16; 1.69]	1.40*** [1.15; 1.70]
Personal accomplishment ^f	0.83 [0.67; 1.04]	0.81 [0.64; 1.02]
Nosocomial infections ^e		
Emotional exhaustion ^f	1.32*** [1.14; 1.52]	1.33*** [1.15; 1.53]
Depersonalization ^f	1.59*** [1.34; 1.88]	1.57*** [1.31; 1.87]
Personal accomplishment ^f	0.75*** [0.62; 0.91]	0.78*** [0.64; 0.95]
Medication errors ^{h,e}		
Emotional exhaustion ^f	1.38*** [1.20; 1.60]	1.39*** [1.20; 1.61]
Depersonalization ^f	1.68*** [1.41; 1.99]	1.67*** [1.40; 2.00]
Personal accomplishment ^f	0.87 [0.71; 1.06]	0.88 [0.71; 1.08]

* p-Value < .05.

** p-Value < .01.

*** p-Value < .001.

OR, odds ratio 95% CI [lower and upper bound].

^a Strongly satisfied or satisfied (1) versus dissatisfied or strongly dissatisfied (0).

^b No, intention to leave (1) versus yes, intention to leave (0).

^c Excellent or good (1) versus fair or poor (0).

^d Definitely improved or improved versus deteriorated or definitely deteriorated.

^e Never or few times a year (1) versus at least once a month, several times a month, at least once a week, several times a week or daily (0).

^f Mean value.

^g Adjusted for years in nursing – years on present unit – gender – bachelor of nursing science – work schedules – type of unit and unit response rate.

^h As the method did not converge for this case, generalized linear model with correction for correlated structure was used.

especially for the three-construct approach of measuring nurse practice environment with (1) nurse–physicians relations, (2) nurse management at the unit level, and (3) hospital management and organizational support as well the studied nurse work characteristics as predictors of job outcomes, quality of care, and adverse patient events. Longitudinal designs evaluating well-developed interventions at the unit level might also offer valuable perspectives. Moreover, study outcomes were nurse-reported. Evaluating objective well-chosen quality and patient

safety outcomes could extend the confirmation of these study outcomes.

These results highlight the importance of the relationship between health care workers' feelings of burnout, coping with unfavourable assessed practice environments, and the resulting job outcomes and quality of care. In fact, multiple models showed nurse management at the unit level as a strong predictor of outcome variables. Therefore, practice environments with a perceived lack of support and lack of respectful relationships within the healthcare

Table 5

Final Generalized linear mixed effects model – multiple multilevel model with random intercept: nurse reported job outcome, quality of care and patient adverse events (dependent variables) and nurse practice environment, nurse work characteristics and burnout (independent variables).

N = 96	Unadjusted	Adjusted [§]
	OR	OR
Satisfaction with the current job ^a		
Nurse management at the unit level ^f	7.95 ^{***} [3.72; 17.00]	4.79 ^{***} [2.16; 10.65]
Emotional exhaustion ^f	0.54 ^{***} [0.44; 0.66]	0.53 ^{***} [0.43; 0.66]
(No) intention to leave the nursing profession ^b		
Nurse management at the unit level ^f	2.41 [†] [1.15; 5.08]	2.26 [†] [1.03; 4.96]
Emotional exhaustion ^f	0.67 ^{***} [0.55; 0.82]	0.63 ^{***} [0.51; 0.79]
Personal accomplishment ^f	1.46 [†] [1.11; 1.93]	1.57 [†] [1.16; 2.14]
Quality of care on the current unit ^c		
Nurse management at the unit level ^f	15.11 ^{***} [5.61; 40.72]	15.18 ^{***} [5.39; 42.71]
Social Capital ^f	8.13 ^{***} [4.26; 15.54]	8.86 ^{***} [4.49; 17.50]
Quality of care at last shift ^c		
Nurse management at the unit level ^f	8.83 ^{***} [3.26; 23.93]	8.67 ^{***} [3.18; 23.67]
Social Capital ^f	3.91 ^{***} [2.12; 7.21]	3.79 ^{***} [2.04; 7.05]
Personal accomplishment ^f	1.48 [†] [1.10; 2.01]	1.45 [†] [1.07; 1.97]
Quality of care in hospital the last year ^d		
Nurse management at the unit level ^f	10.22 ^{***} [4.58; 22.82]	8.99 ^{***} [4.08; 19.81]
Hospital management and organizational support ^f	4.30 ^{***} [2.11; 8.78]	4.62 ^{***} [2.25; 9.47]
Workload ^f	0.51 [†] [0.34; 0.77]	0.50 [†] [0.33; 0.75]
Patient and family complaints ^e		
Hospital management and organizational support ^f	0.43 ^{**} [0.25; 0.73]	0.45 ^{**} [0.26; 0.77]
Depersonalization ^f	2.31 ^{***} [1.88; 2.85]	2.24 ^{***} [1.81; 2.77]
Patient and family verbal abuse ^e		
Emotional exhaustion ^f	1.38 ^{***} [1.17; 1.61]	1.40 ^{***} [1.19; 1.65]
Depersonalization ^f	1.48 ^{***} [1.20; 1.81]	1.43 ^{***} [1.16; 1.77]
Patient falls ^e		
Depersonalization ^f	1.40 ^{***} [1.16; 1.69]	1.40 ^{**} [1.15; 1.71]
Nosocomial infections ^e		
Nurse–physician relations ^f	0.65 [†] [0.47; 0.92]	0.62 ^{**} [0.44; 0.86]
Depersonalization ^f	1.56 ^{***} [1.31; 1.86]	1.53 ^{***} [1.28; 1.83]
Medication errors ^e		
Social capital ^f	0.69 [†] [0.49; 0.97]	0.69 [†] [0.49; 0.98]
Depersonalization ^f	1.58 ^{***} [1.33; 1.88]	1.58 ^{***} [1.32; 1.90]

* *p*-Value < .05.

** *p*-Value < .01.

*** *p*-Value < .001.

OR, odds ratio 95% CI [lower and upper bound].

^a Strongly satisfied or satisfied (1) versus dissatisfied or strongly dissatisfied (0).

^b No, intention to leave (1) versus yes, intention to leave (0).

^c Excellent or good (1) versus fair or poor (0).

^d Definitely improved or improved versus deteriorated or definitely deteriorated.

^e Never or few times a year (1) versus *at least once a month, several times a month, at least once a week, several times a week or daily* (0).

^f Mean value.

[§] Adjusted for years in nursing – years on present unit – gender–bachelor of nursing science – work schedules – type of unit and unit response rate.

team are identified as important causes of burnout, particularly within the nursing profession (Demir et al., 2003).

In line with previous study results (Garman et al., 2002), the present study also found a relationship of emotional exhaustion and depersonalization on certain patient outcomes (e.g. verbal abuse and family complaints). This might be explained by the theory that higher staff depersonalization impacts the emotional distance in the patient–provider relationship, and higher levels of emotional exhaustion diminishes emotional resilience, thereby also directly impacting the patient–provider relationship. Because of the impact of burnout symptoms on the quality of care, care for healthcare workers might be important.

The multilevel approach allows leaders to look at their complex unit-specific issues in relation to the independent variables reported in this study. For example, when a unit

is struggling with high rates of patient and family complaints it would be wise to assess the level of nurse burnout on the unit as depersonalization and emotional exhaustion were associated with high rates of patient and family complaints. Or, an organization struggling with nurse-perceived low quality of care could use these study results to focus their attention upon workload and nurse-perception of unit and hospital management (e.g. agreement about patient care goals and unit resources).

Most research regarding burnout interventions focus at the organization level or are job-related. Interventions, however, should also be aimed at the level of care for healthcare teams as well as the individual team members. An analysis of strengths and vulnerabilities might provide context for individual and team coaching with teams that experience higher levels of burnout. Training in communication, both for team leaders and team members, might

be a potential method of intervention. One such training methodology that is being used in the U.S. is the TeamSTEPPS model being championed by the Agency for Healthcare Research and Quality (Agency for Healthcare Research and Quality, 2013).

Particular patient safety initiatives are focussed on improving teamwork in healthcare and are useful to align goals and agreements about resources (e.g. balanced workload) between hospital and nursing management and nursing teams. Thomas (2011) discussed the strengths, weaknesses, future use, and research needs of three approaches: (1) comprehensive generic curricula developed from successes in commercial aviation and military such as crew resource management (CRM) and the TeamSTEPPS approach developed by the Agency of Healthcare Research and Quality (AHRQ); (2) brief team training curricula for specific tasks and activities such as training for surgery, resuscitations, hand-off/sign-out procedures, and multidisciplinary daily rounds and (3) quality improvements efforts that require teamwork such as a checklist for postoperative complications, catheter-associated blood-stream infection prevention, and ventilator-associated pneumonia.

Depending on the purpose, resources, and particular circumstances, healthcare organizations can choose one or more of these approaches to support nurses' involvement in interdisciplinary teamwork to achieve better outcomes. In addition, Thomas suggested that future studies could explore additional evidence for feasible and sustainable team-supporting strategies, as well as team-related curricula in nursing and medical schools. We suggest that these approaches can have a positive impact on nurse practice environment, nurse work characteristics, feelings of burnout, and the studied outcome variables.

Team development to learn and improve patient care can be a team supporting strategy. Timmermans et al. (2013) reported a major effect of contextual factors of (nursing) teams on the prevalence of team learning activities. Earlier study results, added to our results, provide a rationale for managers to work on team-development by promoting the positive contextual factors of management support and the use of learning methods. To enhance team learning in nursing teams, managers and nurses should strengthen team-based learning initiatives. By doing this, teams receive feedback on their performance and discuss the progress that has been made in venues such as staff meetings (Timmermans et al., 2011). Before participating in team learning feedback methods, individual nurses were unaware of the performance of their team. As an effect, the team learning feedback methods enhance nurses' involvement (e.g. decision latitude and social capital), and constituted the attention for better patient outcomes (e.g. patient falls, nosocomial infections, medication errors).

The Magnet Hospital concept has a strong focus on nurse and patient outcomes within nursing teams, structural empowerment by hospital management, and positive interdisciplinary relations. The outcomes of this study add strength to the components of the Magnet Recognition Program Model (American Nurses Credentialing Center, 2013). Those components include transformational

leadership; structural empowerment; exemplary professional practice; new knowledge, innovations, and improvements; and empirical outcomes (American Nurses Credentialing Center, 2013). The research supportive of the forces of magnetism associated with nurse excellence has been built over the past three decades (McClure and Hinshaw, 2002), and continues to provide guidance to nurse leaders creating work environments conducive to nurse satisfaction and quality patient care.

The results of this study are also congruent with other research related to work environments conducive to nurse job outcomes and quality patient care. Structures that empower nurses were described by Tinkham (2013), while the significance of nurses being involved in decision making was described by Houston et al. (2012). Lacey et al. (2007) reported on improved organizational support, workload, nurse satisfaction, and intent to stay among hospitals that have attained or are pursuing a Magnet environment. McHugh et al. (2013) report lower mortality in Magnet hospitals. Finally, Kalisch and Lee (2012) discussed the impact of Magnet characteristics and efficiencies in operations, the work environment, and the organizational culture. The results of each of these studies support the findings of the study discussed in this manuscript as an approach for leaders and nurse managers, and encourage nurses to be structurally involved in leadership to develop and support a healthy and productive environment.

5. Conclusion

The implications of this study are significant for hospital organizations. Nursing unit teams matter when creating work environments achieving positive nurse outcomes, promoting high quality care, and advocating for patient safety. Nurse leaders can use these study results to guide concentrated action on specific issues of concern. Although the implications for practice may seem most clear for nurse leaders, the study results also have relevance for direct-care nurses. Direct-care nurses are increasingly being involved in organizational decision making, and as a result have an opportunity to design and implement solutions to the issues of concern on their unit. These study results encourage nurses at all levels to raise their voice to create improved outcomes for both patients and nurses.

Conflict of interest

None declared.

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Ethical approval

The study was approved by the ethics committees of two hospitals and approved by the board of executives of all participated hospitals.

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