

A causal model for the quality of nursing care in Thailand

R. Boonpracom¹ MNS, RN, W. Kunaviktikul² PhD, RN, FAAN,
P. Thungjaroenkul³ PhD, RN & O. Wichaikhum⁴ PhD, RN

¹ Instructor, Faculty of Nursing, Naresuan University, Phitsanulok, ² Dean and Professor, ³ Assistant Professor, ⁴ Assistant Professor, Faculty of Nursing, Chiang Mai University, Chiang Mai, Thailand

BOONPRACOM R., KUNAVIKTIKUL W., THUNGJAROENKUL P. & WICHAIKHUM O.-A. (2019)
A causal model for the quality of nursing care in Thailand. *International Nursing Review* **66**, 130–138

Background: A growing global nursing shortage has affected the quality of care (QOC) provision.

Aim: To test the structure-process-outcome model for quality of nursing care in regional medical centres in Thailand.

Methods: A cross-sectional study with multi-stage, proportional stratified random sampling. The sample comprised 136 units, 916 nurses and 943 patients from nine regional medical centres. Data were collected from six instruments in February–June 2016 and analysed with structural equation modelling.

Results: The modified model fitted the empirical data. The nurse practice environment (NPE) had a negative direct effect on pressure ulcer prevalence and a positive direct effect on patient satisfaction, perceived QOC and interpersonal processes of care (IPC). Increasing the patient-to-nurse ratio had a positive direct effect on catheter-associated urinary tract infections and pressure ulcer prevalence and had negative direct effects on patient satisfaction and perceived QOC. Skill mix had negative direct effects on the two former conditions but had a positive direct effect on patient satisfaction. The patient-to-nurse ratio and skill mix also had indirect effect on four outcomes via NPE.

Limitations: The generalizability of findings may be limited to settings similar to this study.

Conclusion: We empirically demonstrated that NPE, patient-to-nurse- ratio and skill mix had direct effects on unfinished nursing care and four outcomes. Also, the IPC had significant influence on patient satisfaction.

Implications for nursing and health policy: The findings add to increasing international evidence that favourable nurse working conditions, low nurse-to-patient ratio and richer skill mix result in positive patient outcomes. Health systems can foster nurses to perform high-quality care by improving work conditions, and providing sufficient nurses and resources.

Keywords: Nurse–Patient Ratio, Nursing, Patient Satisfaction, Quality of Care, Skill Mix, Structural Equation Modelling, Thailand

Correspondence address: Wipada Kunaviktikul, Faculty of Nursing, Chiang Mai University, 110 Intawaroros Road, Sriphum, Muang, Chiang Mai 50200, Thailand; Tel: 66-53-945-011; Fax: 66-53-289231; E-mail: wipada1111@hotmail.com.

Funding

This study was funded by the National Research Council of Thailand for a graduate scholarship in 2016.

Conflict of interest

No conflict of interest has been declared by the authors.

Introduction

Internationally nursing shortages have had an adverse impact on nurses and patients (Coster et al. 2018). When hospitals lack sufficient nurses, this results in a higher patient-to-nurse ratio with resultant effects on the quality of care (QOC) and patient outcomes. Nurse-to-patient ratios vary considerably across the globe: for example, nurses in acute hospitals in the UK in 2010 cared for an average of 9.1 patients (Ball et al. 2014); and Thai nurses cared for an average of 10 patients (Aiken et al. 2012).

A response to the nursing shortage is to increase the use of unlicensed staff to replace registered nurses (RNs). Skill mix or the percentage of total nursing hours provided by RNs in the US hospitals ranged from 61.7% to 62.8% in medical and surgical units (He et al. 2013) and this was lower than 81.5% to 88.5% in the Australian hospitals (Twigg et al. 2012). In Asia, skill mix varies from 53.9% in Korean hospitals (Su-Jin & Jin-hyun 2014) to 59.3% in northern Thailand (Chitpakdee et al., 2008). Prior studies indicated that a richer skill mix was related to lower catheter-associated urinary tract infection (CAUTI) (Twigg et al. 2016) and pressure ulcer incidence (Choi & Staggs 2014), and greater patient satisfaction (You et al. 2013).

Nurses may also be required to work overtime in order to maintain a satisfactory level of nursing care. Kunaviktikul et al. (2015) reported that nurses in Thai hospitals worked on average 18.82 h per week longer than the traditional 40 h week. Extreme workloads adversely affect nurses in a number of ways including job-related burnout and lower job satisfaction. Nurses in 12 countries in Europe reported their work environments as poor with percentages ranging from 76% in Poland to 29% in Norway (Aiken et al. 2013) and You et al. (2013) reported that 61% of nurses in Chinese hospitals described their practice environment as only fair or poor. Importantly, a poor nurse practice environment (NPE) is associated with an increase rate of CAUTI (Van Bogaert et al. 2014) and pressure ulcers (Choi & Staggs 2014), decreased patient satisfaction (Aiken et al. 2012) and perceived QOC (You et al. 2013). Similarly, a Thai study (Apisarntharak et al. 2017) reported the percentage of hospitals that regularly use at least four of six recommended CAUTI prevention was only 42.9%, and such actions may have led to CAUTI being widespread in many hospitals. The European Centre for Disease Prevention and Control reported that around one-third of hospital-acquired infections were CAUTI, with a median percentage of 6.3% in 2014. Similarly, the CAUTI prevalence in 245 Thai public and private hospitals was 4.62 per 1000 catheter days in 2014 (Apisarntharak et al. 2017). Additionally, prior studies have shown that the more nurses work

overtime, the greater the incidence of CAUTI and pressure ulcers (Kunaviktikul et al. 2015) and greater patient dissatisfaction in their hospitals (Stimpfel et al. 2012).

Aiken et al. (2012) examined patient satisfaction across 12 countries in Europe and the United States. They reported that hospitalized patients who scored their hospitals as excellent varied widely from 35% in Spain to 61% in Finland and Ireland. Similarly, another study demonstrated almost half of surveyed Chinese patients were dissatisfied with communications about medications and 7.63% of patients were dissatisfied with nurses' responsiveness to the call button (Zhu et al. 2012). Within understaffed units, patients may not be provided with timely nursing care as nurses are forced to speed up or neglect certain tasks, thereby increasing the risk of adverse events in patient care (Kunaviktikul et al. 2015). In addition, hasty or incomplete nursing care interrupts risk assessment, monitoring and other processes of nursing care which may cause pressure ulcer development. The prevalence of pressure ulcers at unit level in Norwegian hospitals was 7.2% (Bredesen et al. 2015). Similarly, the prevalence of pressure ulcers at one regional medical centre in eastern Thailand in 2008 was 9.58 per 1000 patient days (Kitkaew et al. 2011). This rate was higher than the hospital-acquired pressure ulcer rate at unit level in the US hospitals in 2013 of 1.87–2.23% (Boyle et al. 2016) or 1.26% in the Chinese hospitals (Zhou et al. 2018).

Most existing studies have explored the relationships between NPE, nurse staffing and patient outcomes as CAUTI or pressure ulcers (Van Bogaert et al. 2014) or between unfinished nursing care and perceived QOC (Ball et al. 2014) and patient satisfaction (Aiken et al. 2012). Some have explored the relationships between the NPE, staffing and unfinished nursing care but these were not linked to patient outcomes. In conclusion, until this study, there were no existing studies on the relationships between NPE, staffing, unfinished nursing care and patient outcomes, hence, the important need to address this. This study aimed to address this gap by testing a causal model for QOC in regional medical centres at unit level in Thailand.

Theoretical framework

There are a number of conceptual frameworks that link nursing resources such as patient-to nurse-ratio or skill mix to patient outcomes through some kind of pathway that includes the NPE. To guide this study, an adapted QOC model based on the structure-process-outcomes QOC model (S-P-O) (Donabedian 1980) was used. It comprises organizational characteristics (NPE), human resources (nurse staffing) and technical care (unfinished nursing care), all of which have been shown to impact on patient outcomes (Aiken et al.

2012; Choi & Staggs 2014; Twigg et al. 2016). The S-P-O Model does not predict the exact mechanism of relationships among these concepts but is useful for guiding research and testing theory. The relationships between structure, process and outcome are linear. The structure influences the process of care so that its quality is diminished or enhanced, and both in turn influence the effectiveness of care on patient health status and functioning (Donabedian 2005).

The three variables in structure included *organizational characteristics*, represented by a NPE indicator. Secondly, *human resources* refer to nursing staffing issues such as the patient-to-nurse ratio and the skill mix of nursing staff and thirdly, *material resources* such as facilities, which cannot be modified under the nurses' authority. Therefore, material resources were not included in the testing model in this study.

Other concepts added to the theoretical framework: *process* consists of two variables of technical care which is quantified by the level of rationing of nursing care (RNC) and the interpersonal processes of care (IPC) which in turn is quantified by an IPC indicator such as communication or interpersonal style. *Outcomes* refer to changes in patients' health and patient satisfaction. In this study, outcomes were quantified by the variables of CAUTI, pressure ulcer prevalence and patient satisfaction. CAUTI and pressure ulcers were selected because they are both preventable by good nursing care. They represent a foundation for the contribution of nursing to a high QOC. In addition, the perceived QOC, which refers to the nurses' perceptions of QOC that they deliver to patients in their units, was added to the outcomes.

The hypothesis of this study was that the NPE, patient-to-nurse ratio and skill mix together have direct effects on CAUTI, pressure ulcers, patient satisfaction and perceived QOC. These factors also have indirect effects on these same outcomes through the link of the RNC. In addition, the NPE was hypothesized to have an indirect effect on patient satisfaction through the IPC. The hypothesized model for the quality of nursing care in regional medical centres is presented in Fig. 1.

Methods

Design

A cross-sectional model testing design with the aim of developing a causal model for the QOC care at nurse unit level in regional medical centres around Thailand.

Sample and setting

A sample of 105 units with 21 observed variables was used. Based on Wolf et al. (2013), a ratio of 5–10 cases per

observed variable is recommended for structural equation modelling (SEM) analysis, with an additional 30% of units calculated to compensate for the dropout rate; therefore, the estimated sample size was 140 units.

The settings comprised adult general medical, surgical, orthopaedic and gynaecological units of nine regional medical centres which were selected by multi-stage, proportional stratified random sampling. Study participants were 952 clinical nurses (seven nurses per unit) who provided bedside care and had worked >1 year in their present unit and 952 patients (seven patients per unit) aged >18 years admitted for at least three nights in the same units. Nurses who worked in present unit <1 year and patients who had unstable medical conditions were excluded. All nurses and patients data were aggregated to calculate a unit-level mean.

Ethical considerations

Approvals were obtained from the research ethics committees of the Faculty of Nursing, Chiang Mai University (approval – EXP: 100-2015, and the nine hospitals, as well as permission from all hospital directors. All participants gave informed consent prior to study participation, and their anonymity was preserved. The questionnaires were coded to classify hospitals and units without identifying individuals who completed the questionnaires.

Instruments

The selection of six instruments was based on theoretical concepts used appropriately to measure data from nurses or patients in previous research. Permission was gained from authors to use and where necessary translate the questionnaires.

1 *Demographic questionnaire*, developed by the primary investigator (PI), included demographics of participants and the number of patients they were responsible for; this number was calculated as the mean of patients load across all staff nurses in those units which represented the patient-to-nurse ratio and level of care quality provided.

2 *The Practice Environment Scale of the Nursing Work Index (PES-NWI)* was developed by Lake (2002) and translated into Thai by Nantsupawat et al. (2011). It comprises 31 items with five subscales. Nurses were asked the extent to which they agreed that each PES-NWI item was present in their current unit on a 4-point Likert response scale varying from 1 (strongly disagree) to 4 (strongly agree). The total PES-NWI score was calculated as the mean of the five subscales scores. A mean subscale score of >2.5 on four or five subscales represents a favourable practice environment. In this study, the Cronbach's alpha coefficient was 0.96.

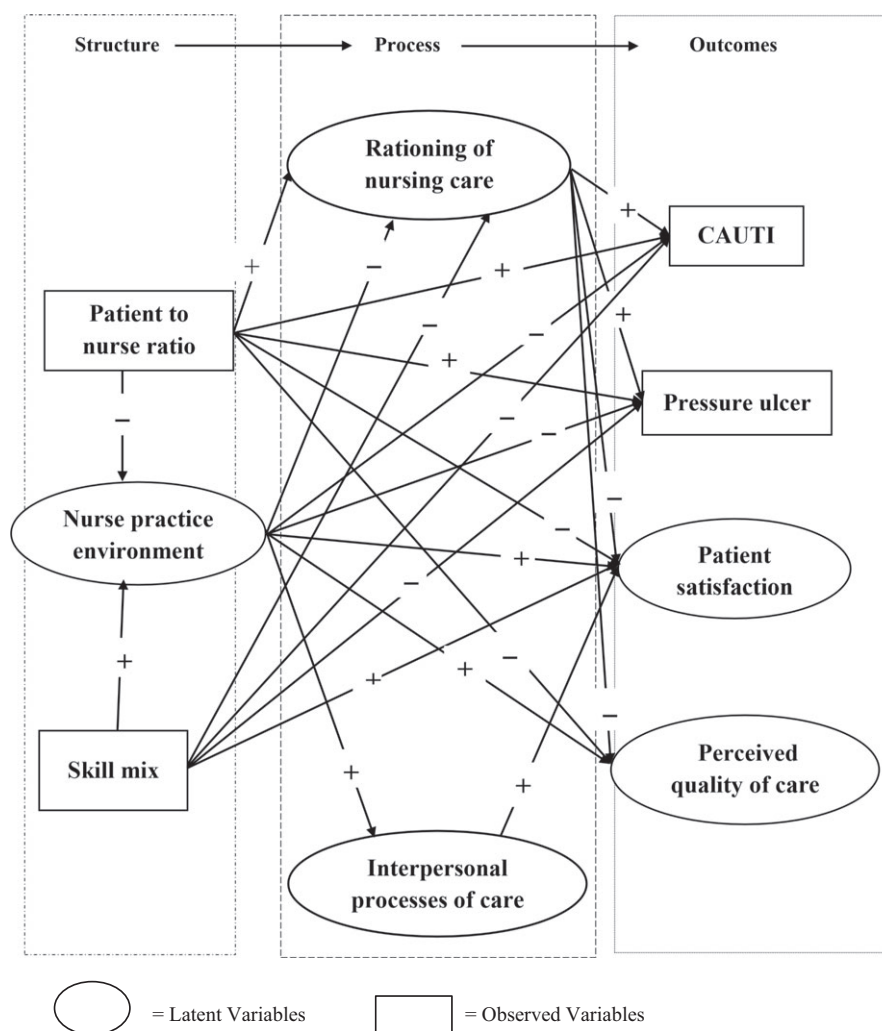


Fig. 1 The hypothesized model for the quality of nursing care in regional medical centres.

3 *The Perceived Implicit Rationing of Nursing Care (PIRNCA)* instrument was developed by Jones (2014) and translated into Thai by the PI. A forward-backward translation technique was applied. It comprises 30 items in six subscales. Nurses were asked to rate how often during the last seven working shifts they were unable to perform the listed activities. The responses on a 4-point Likert scale varied from 0 (not required or never) to 3 (often). The interpretation of mean scores was shown in six categories as never (scores ≤ 0.49) to more common than sometimes (scores ≥ 2.5). For this study, the Cronbach's alpha coefficient was 0.98.

4 *The Interpersonal Processes of Care (IPC)* was developed by Stewart et al. (2007) and translated into Thai by the PI. The forward-backward translation technique was applied. The PI modified this scale from a patients' perspective to a nurses' perspective. The content validity index of this scale from a

panel of six experts was 0.89. It has three dimensions with 14 items. Nurses were asked how often they performed these activities for their patients. The responses on a 5-point Likert scale varies from 1 (never) to 5 (always). The interpretation of summation scores is shown in five categories as never (scores <15) to always (scores ≥ 57). In this study, the Cronbach's alpha coefficient was 0.72.

5 *The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS)* was developed by the Centers for Medicare & Medicaid Services and the Agency for Healthcare Research and Quality in 2002 and translated into Thai by Nantsupawat et al. (2014). The HCAHPS survey was used to measure patient satisfaction. It has 21 items, nine dimensions and two global dimensions. Patients were asked the extent to which they agreed that each HCAHPS item happened during their hospitalization. Patients were classified as satisfied if the

average score of each dimension was ≥ 3 (Jha et al., 2008). In this study, the Cronbach's alpha coefficient was 0.93.

6 Data Recording Form was developed by the PI to collect CAUTI, pressure ulcer rate, and skill mix for three consecutive months by head nurses.

Data collection

A pilot study with 20 nurses and 20 patients was conducted to pre-test the research questionnaires but no modification to these was required. A total of 952 surveys then were distributed to nurses and another 952 to patients in 136 units by research coordinators who worked outside the sample unit. They gave questionnaires to seven randomly selected RNs in their units from the nurse roster and selected seven eligible patients on their discharge days. The PI provided training for research coordinators in the relevant procedures. Four units were excluded because patients had unstable medical conditions.

All 136 units returned at least five responses from both nurses and patients. A total of 916 nurses and 943 patients returned the completed surveys with a nurse response rate of 96.22% and a patient response rate of 99.05%, a high response rate not unusual in the Thai cultural context of nursing. All data were collected from February to June 2016.

Data analysis

The nurses' responses to the PES-NWI, PIRNCA, IPC, perceived QOC in their units and the number of patients they were responsible for were aggregated to calculate a unit-level mean score. The patients' responses to the HCAHPS were also collected to calculate unit-level average scores of HCAHPS score.

Descriptive statistics were used to describe the demographic characteristics of the sample. Statistical assumptions underlying SEM such as normality, linearity, homoscedasticity and multicollinearity were tested. The hypothesized model was employed using a LISREL program version 8.3. The maximum likelihood estimation was used to estimate the model fit.

In the preliminary data analysis, 15 outliers from CAUTI and pressure ulcer were deleted as they caused a non-normality distribution. Therefore, the final sample group for this SEM analysis comprised of 121 units, 819 nurses and 840 patients. After testing SEM assumptions, all variables were acceptable for SEM analyses.

Results

Demographic characteristics of the samples

Most of the RN sample were women, 35 years on average, married, graduated with a bachelor degree, and worked in

surgical units. Most of the patient sample were men, 48 years on average, married, were general workers, and had universal health coverage insurance.

Characteristics of the study variables

The characteristics of the study variables as divided by S-P-O Model are shown in Table 1 as follows.

Model testing

The result of SEM analyses demonstrated that the original hypothesized model did not adequately fit the sample data. Based on theoretical reasoning and informed by the modification indices, parameters in the variance-covariance matrices were freed for estimation as correlated error terms and the model was re-examined. The results of the modified model indicated that all the pathway coefficients were statistically significant and showed an improvement in the structural equation model fitted the empirical data with the following results: $P = 0.079$, χ^2 : $df = 1.21:1$, RMSEA = 0.042, GFI = 0.91, CFI = 1.00 and SRMR = 0.053.

There were significant linear relationships among the S-P-O Model in regional medical centres. The modified model could significantly explain 68% of the variance in CAUTI, 63% of the variance in pressure ulcers, 89% of the variance

Table 1 Characteristics of the study variables by structure, process and outcomes ($n = 121$)

Variables	Possible score	Actual score	X	SD	Level
Structure					
Nurse practice environment	1–4	2.43–3.67	2.88	0.24	Favourable
Patient-to-nurse ratio	0–100	8.29–18.00	11.80	2.11	High
Skill mix	0–100	52.00–83.00	68.02	6.52	Accepted
Process					
Rationing of nursing care	0–3	0.11–2.93	0.95	0.48	Less rarely
Interpersonal processes of care	14–70	41.71–57.50	48.19	3.11	Usually
Outcomes					
CAUTI	0– ∞	0–6.26	3.09	1.60	Low
Pressure ulcer	0– ∞	0–2.93	1.29	0.74	Low
Patient satisfaction	1–4	3.11–3.84	3.43	0.20	Satisfied
Perceived quality of care	1–4	2.08–3.38	2.79	0.26	Good

CAUTI, catheter-associated urinary tract infections incidence.

in patient satisfaction and 80% of the variance in perceived QOC (Fig. 2).

The NPE had negative direct effects on RNC and pressure ulcers and had positive direct effects on patient satisfaction and perceived QOC. The NPE had a direct effect on IPC and was linked to patient satisfaction. The patient-to-nurse ratio ($\beta = -0.35, P < 0.001$) and skill mix ($\beta = 0.63, P < 0.001$) had indirect effects on IPC through the NPE.

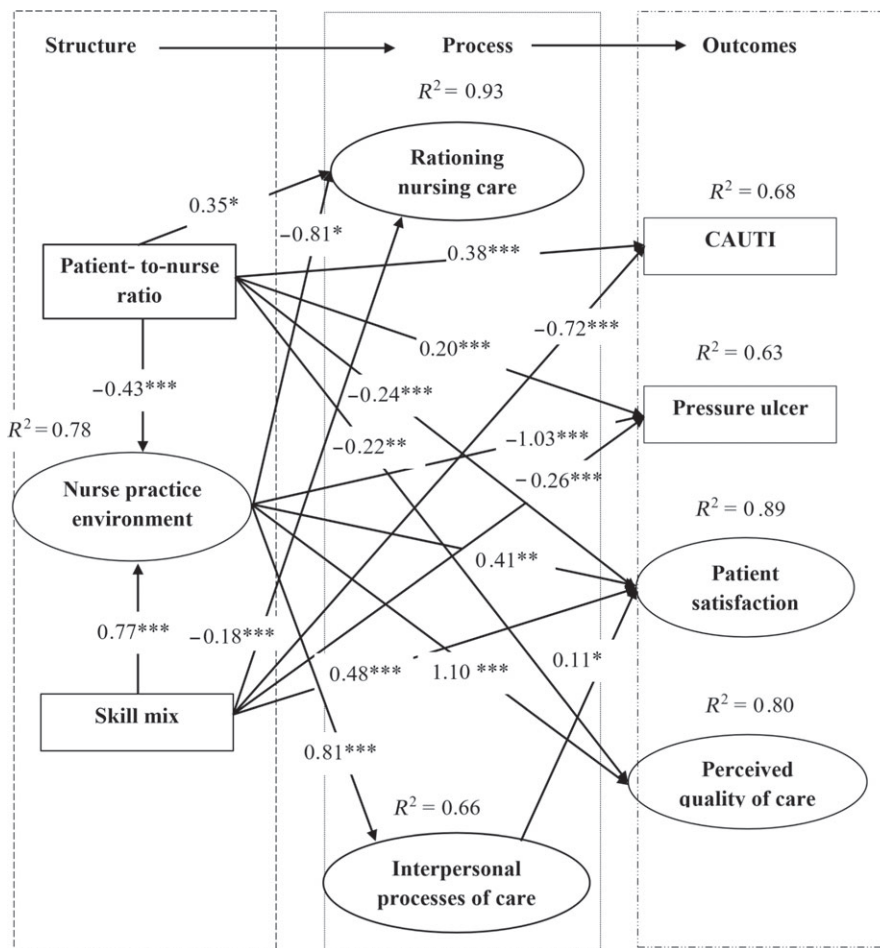
The patient-to-nurse ratio had a positive direct effect on RNC, CAUTI and pressure ulcers, and had negative direct effects on patient satisfaction and perceived QOC. The patient-to-nurse ratio also had an indirect effect on pressure ulcers ($\beta = 0.14, P < 0.001$) and patient satisfaction ($\beta = -0.18, P < 0.01$) via the NPE.

The skill mix had negative direct effects on RNC, CAUTI and pressure ulcers but had a positive direct effect on patient

satisfaction. Skill mix also had indirect effects on pressure ulcers ($\beta = -0.27, P < 0.001$), patient satisfaction ($\beta = 0.34, P < 0.05$) and perceived QOC ($\beta = 0.56, P < 0.001$) through NPE.

Discussion

These results confirmed Donabedian’s underpinning concept that structure as related to the healthcare setting is a strong determinant of the QOC. Donabedian’s explanation is that when there is suitable and sufficient structure, good nursing care will be provided thus generating desired outcomes, in both patient health status and patient satisfaction. Additionally, the results of this study corroborated the concept that all relationships in this model were linear and each factor was influenced by its antecedent factors, resulting in those factors becoming dependent on each other (Donabedian 2005).



Chi-square (χ^2) = 117.32, $df = 97, p = .079, RMSEA = 0.042$

Fig. 2 The modified model for the quality of nursing care in regional medical centres. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

In this study, the NPE had negative direct effects on the RNC, pressure ulcer incidence but had positive direct effects on IPC, patient satisfaction and perceived QOC. These results were consistent with a bulk of previous findings that favourable NPE would lower the rate of pressure ulcer (Choi & Staggs 2014), increase patient satisfaction (Aiken et al. 2012) and perceived QOC (Van Bogaert et al. 2014), and improve IPC (Papastavrou et al. 2015). Further improving a NPE can improve the well-being of nurses and safety of paediatric patients (Alves et al. 2017). These findings provide more evidence to authenticate the hypothesis of Donabedian (1980) in that sufficient and qualified healthcare personnel, who can function to produce care or are a feature of the environment of care influence the kind of care that is provided. When organizational environments support nurses' practice or allow nurses to deliver care according to the nursing philosophy of care, nurses will perceive competence and success in their work along with their patients. They had enough time to deliver complete nursing care, provide more comfort talk, and spend more time taking care of the psychosocial aspects of patient care and caring, and in turn, how nurses delivered nursing care to their patients affected patients' judgment on the QOC in their units. Patients who received care in units where nurses had a good working environment perceived better experience and greater patient satisfaction.

In this study, we empirically demonstrated that the patient-to-nurse ratio had positive direct effects on RNC, CAUTI and pressure ulcer incidence but had negative direct effects on patient satisfaction and perceived QOC. These results were congruent with earlier research demonstrating that an increased number of patients in the patient-to-nurse ratio are associated with a rise in prevalence of nursing care left undone (Ausserhofer et al. 2014), higher rates of CAUTI (Liu et al. 2012) and pressure ulcers (Cho et al. 2016), and lower patient satisfaction (Zhu et al. 2012) and perceived QOC (You et al. 2013). Maura et al. (2017) found that nurses who experienced heavy workloads on a daily basis were almost four times more likely to report CAUTI on a weekly basis than nurses who experienced heavy workload less frequently (OR = 3.51). The UK Nursing and Midwifery Council (2014) also emphasized that the adequacy of nurse staffing plays a significant role in the delivery of safe and effective patient health and the QOC. Most standard care for the prevention of CAUTI and pressure ulcers needs highly educated and skilled nurses. Therefore, having a greater number of nurses in the nursing care team may provide continuous monitoring of patients' conditions to guarantee early recognition of patient deterioration and, when problems are detected, may lead to a rapid, appropriate interdisciplinary team response to these complications (Clarke & Donaldson 2008).

Interestingly, in this study, the patient-to-nurse ratio had an indirect effect on the IPC, pressure ulcer and patient satisfaction through the NPE. The number of patients not only affected patient health status but also affected how nurses perceived their work conditions. Garrett (2008) noted that unrealistic workloads placed an unnecessary burden on nurses, leading to fatigue, and unachievable expectations. Nursing activities such as communication with patients, timely responses to pages and telephone calls, and complete discharge planning were neglected or postponed, which, in turn, lowered IPC and patient satisfaction (Ausserhofer et al. 2014; Ball et al. 2014). Hinno et al. (2012) provided evidence that if the amount of patients per nurse is increased from 4 to >10 per nurse, the nurses' perception of time to perform nursing tasks significantly declined.

In this study, when there were higher percentages of RNs in the skill mix, there were negative direct effects on the RNC, CAUTI and pressure ulcer incidence and it had positive direct effect on patient satisfaction. This finding conforms to the proposition put forth in earlier studies, indicating that richer RNs in the skill mix was related to lower levels of incomplete nursing care (Ausserhofer et al. 2014), reduced the rate of CAUTI (Twigg et al. 2016) and pressure ulcer incidence (Choi & Staggs 2014), and improved patient satisfaction (You et al. 2013). According to Weiss & Tappen (2015), nurses identify priorities and decide the needs to be met first, help in establishing care and in designing which other team members can meet patient needs. When nurses have more available time, they could clearly communicate with or educate the patients and their families in preparation for discharge which influences patient satisfaction. In addition, the skill mix also had indirect effects on pressure ulcer, patient satisfaction and perceived QOC via NPE. This means that the number of nurses in a nursing care team not only affect patient outcomes but also affect how nurses perceive their working conditions. Sufficient qualified nurses in a team are important for professional satisfaction, job engagement, and a sense of professional efficacy (Maslach & Leiter 2008) which influences nurses' perceptions that they are able to deliver good quality care to the patients in their units. Concerning the relationships between the two variables from process and four outcomes in this study, only IPC had a direct effect on patient satisfaction. This finding fully supports the Donabedian's hypothesis that IPC is a key factor which affects patient's judgment about QOC in all its aspects. Each patient–nurse interaction requires adequate time for nurses to understand the needs of patients. When nurses have more time to understand the needs of patients and develop therapeutic relationships, it will influence patient satisfaction (Branson et al., 2003).

Conclusion and recommendations

These findings empirically confirmed that good NPE, sufficient RNs in nursing care team and good patient–nurse interactions were correlated with a lower rate of CAUTI and pressure ulcer, and greater patient satisfaction and perceived QOC. Therefore, in order to improve patient safety and satisfaction, attention should be paid to improving nurse working conditions, retaining adequately qualified nurses and setting a low nurse-to-patient ratio. Further studies in other settings such as general hospitals or community hospitals may extend the knowledge and confirm these findings.

Implications for nursing and health policy

To ensure patient safety and satisfaction, it is vital for nurse managers and policymakers to develop policy strategies and take actions for improving nurse working condition and providing adequate RNs in bedside nursing care. Such strategies comprise creating flexibility in nurse scheduling to maximize the nurses' preferences for working shifts. This also includes improving an attractive pay and benefit and setting a low nurse-to-patient ratio to retain experienced nurses and recruit new nurses. Nursing directors should consider nurses' role and work function to promote them having enough time to deliver the best nursing care possible to their patients. In addition, nurse managers can foster nurses to perform high QOC by providing sufficient staffing level in skill mix and resources. These require government policy makers to provide adequate funding to enable this to happen.

Limitations

In this study, the unit sample was recruited from adult general medical, surgical, orthopaedic and gynaecological units of regional medical centres, so generalizability as an extension of the research findings to other healthcare settings might be limited.

Acknowledgements

Associate Professor Dr. Pakorn Prajanban, Faculty of Education, Naresuan University, who kindly guided and helped to perform LISREL program in structure equation modelling (SEM) analysis. All the participants and research coordinators who participated in this study.

Author contributions

Study design: RB, WK, PT, OW

Data collection: RB

Data analysis: RB, WK, PT, OW

Study supervision: WK

Manuscript Writing: RB, WK, PT, OW

Critical revisions for important intellectual content: WK, PT, OW

Permissions

Professor Dr. Anita Stewart and her colleagues at University of California, San Francisco gave permissions to use and translate the Interpersonal Processes of Care Survey (IPC). Assistant Professor Dr. Terry L. Jones from School of Nursing, University of Texas at Austin giving a permission to use and translate the Perceived Implicit Rationing of Nursing Care (PIRNCA) questionnaire.

References

- Aiken, L.H., et al. (2012) Patient safety, satisfaction, and quality of hospital care: cross sectional surveys of nurses and patients in 12 countries in Europe and the United States. *BMJ (Clinical Research Edition)*, **344**, e1717–e1717.
- Aiken, L.H., et al. (2013) Nurses' reports of working conditions and hospital quality of care in 12 countries in Europe. *International Journal of Nursing Studies*, **50** (2), 143–153.
- Alves, D.F., et al. (2017) Nursing practice environment, job outcomes and safety climate: a structural equation modelling analysis. *Journal of Nursing Management*, **25** (1), 46–55.
- Apisarnthanarak, A., et al. (2017) National survey of practices to prevent health care-associated infections in Thailand: the role of prevention bundles. *American Journal of Infection Control*, **45** (7), 805–810.
- Ausserhofer, D., et al. (2014) Prevalence, patterns and predictors of nursing care left undone in European hospitals: results from the multicountry cross-sectional RN4CAST study. *BMJ Quality & Safety*, **23** (2), 126.
- Ball, J.E., et al. (2014) Care left undone during nursing shifts: associations with workload and perceived quality of care. *BMJ Quality and Safety*, **23** (2), 116–125.
- Boyle, D.K., et al. (2016) A pressure ulcer and fall rate quality composite index for acute care units: a measure development study. *International Journal of Nursing Studies*, **63**, 73–81.
- Branson, C., et al. (2003) Patient satisfaction with skill mix in primary care: a review of the literature. *Primary Health Care Research & Development*, **4** (4), 329–339. <https://doi.org/10.1191/1463423603pc1620a>
- Bredesen, I.M., et al. (2015) The prevalence, prevention and multilevel variance of pressure ulcers in Norwegian hospitals: a cross-sectional study. *International Journal of Nursing Studies*, **52**, 149–156.
- Chitpakdee, B., et al. (2008) Nurse staffing and adverse patient outcomes. *Chiang Mai University Journal of Natural Sciences*, **7** (1), 59–72.
- Choi, J. & Staggs, V.S. (2014) Comparability of nurse staffing measures in examining the relationship between RN staffing and unit-acquired pressure ulcers: a unit-level descriptive, correlational study. *International Journal of Nursing Studies*, **21** (10), 1344–1352.
- Clarke, S.P. & Donaldson, N.E. (2008) Nurse staffing and patient care quality and safety. In *Patient Safety and Quality: An Evidence-Based Handbook for Nurses* (Hughes, R.G., ed.). Agency for Healthcare Research and Quality, Rockville, MD, April. Chapter 25. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK2676/> (accessed 25 March 2018)
- Coster, S., et al. (2018) What is the impact of professional nursing on patients' outcomes globally? An overview of research evidence. *International Journal of Nursing Studies*, **78**, 76–83.

- Donabedian, A. (1980) *The Definition of Quality and Approaches to Its Assessment/Avedis Donabedian*. Health Administration Press, Ann Arbor, MI.
- Donabedian, A. (2005) Evaluating the quality of medical care. *Milbank Quarterly*, **83** (4), 691–729.
- Garrett, C. (2008) The effect of nurse staffing patterns on medical errors and nurse burnout. *AORN Journal*, **87**, 1191, 1194, 1196, 1202–1192, 1194, 1200, 1204.
- He, J., et al. (2013) Unit-level time trends and seasonality in the rate of hospital-acquired pressure ulcers in US acute care hospitals. *Research in Nursing and Health*, **36** (2), 171–180.
- Hinno, S., et al. (2012) Nursing activities, nurse staffing and adverse patient outcomes as perceived by hospital nurses. *Journal of Clinical Nursing*, **21** (11/12), 1584–1593.
- Jha, A.K., et al. (2008) Patients' perception of hospital care in the United States. *The New England Journal of Medicine*, **359**, 1921–1931. <https://doi.org/10.1056/NEJMsa0804116>.
- Jones, T.L. (2014) Validation of the perceived implicit rationing of nursing care (PIRNCA) instrument. *Nursing Forum*, **49** (2), 77–87.
- Kitkaew, J., et al. (2011) The effect of continuing care for the prevention of pressure ulcers in patients with stroke in female medical units (SK.6) Chonburi hospital. Available at: www.cbh.moph.go.th/ (accessed 25 March 2018).
- Kunaviktikul, W., et al. (2015) Nurses' extended work hours: patient, nurse and organizational outcomes. *International Nursing Review*, **62** (3), 386–393.
- Lake, E.T. (2002) Development of the practice environment scale of the nursing work index. *Research in Nursing and Health*, **25** (3), 176–188.
- Maslach, C. & Leiter, M.P. (2008) Early predictors of job burnout and engagement. *Journal of Applied Psychology*, **93** (3), 498–512.
- Maura, M., et al. (2017) The impact of heavy perceived nurse workloads on patient and nurse outcomes. *Administrative Sciences*, **7** (1), 7.
- Nantsupawat, A., et al. (2011) Impact of nurse work environment and staffing on hospital nurse and quality of care in Thailand. *Journal of Nursing Scholarship*, **43** (4), 426–432.
- Nantsupawat, A., Nuntasupawat, R., Kunaviktikul, W., Wichaikhum, O. & Taintong, H. (2014) Factor effecting patient and nurse outcomes in university hospital in Thailand. Research Proposal. Faculty of Nursing Chiang Mai University.
- Papastavrou, E., et al. (2014) Linking patient satisfaction with nursing care: the case of care rationing – a correlational study. *BMC Nursing*, **13** (1), 26.
- Stewart, A.L., et al. (2007) Interpersonal processes of care survey: patient-reported measures for diverse groups. *Health Services Research*, **42** (3P1), 1235–1256.
- Stimpfel, A.W., et al. (2012) The longer the shifts for hospital nurses, the higher the levels of burnout and patient dissatisfaction. *Health Affairs*, **31** (11), 2501–2509.
- Su-Jin, C. & Jinhyun, K. (2014) Determinants of registered nurse skill mix & staffing level in Korea. *Journal of Korean Academy of Nursing Administration*, **20** (1), 10–21.
- Twigg, D.E., et al. (2012) Impact of skill mix variations on patient outcomes following implementation of nursing hours per patient day staffing: a retrospective study. *Journal of Advanced Nursing*, **68** (12), 2710–2718.
- Twigg, D.E., et al. (2016) The impact of adding assistants in nursing to acute care hospital ward nurse staffing on adverse patient outcomes: an analysis of administrative health data. *International Journal of Nursing Studies*, **63**, 189–200.
- U.K Nursing & Midwifery Council. (2014). NMC briefing appropriate staffing in health and care setting. Available at: <http://www.nmc-uk.org/About-Us/Safe-staffing> (accessed 25 March 2018)
- Van Bogaert, P., et al. (2014) 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. *International Journal of Nursing Studies*, **51** (8), 1123–1134.
- Weiss, S.A. & Tappen, R.M. (2015) *Essentials of Nursing Leadership and Management*, 6th edn. F.A.Davis Company, Philadelphia, PA.
- Wolf, E.J., et al. (2013) Sample size requirements for structural equation models: an evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement*, **73** (6), 913–934.
- You, L.-M., et al. (2013) Hospital nursing, care quality, and patient satisfaction: cross-sectional surveys of nurses and patients in hospitals in China and Europe. *International Journal of Nursing Studies*, **50** (2), 154–161.
- Zhou, Q., et al. (2018) The prevalence and specific characteristics of hospitalised pressure ulcer patients: a multicentre cross-sectional study. *Journal of Clinical Nursing*, **27** (34), 694–704.
- Zhu, X.-W., et al. (2012) Nurse staffing levels make a difference on patient outcomes: a multisite study in Chinese hospitals. *Journal of Nursing Scholarship*, **44** (3), 266–273.