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RESEARCH ARTICLE

Occupancy rate and adverse patient outcomes in general hospitals in Thailand: A predictive study

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Abstract

Patient outcomes are important indicators of the quality of care. Occupancy rate is one factor that significantly affects adverse patient outcomes. The aim of the present study was to determine factors associated with adverse patient outcomes in Thailand. A retrospective study was conducted with 146 inpatient units from 16 general hospitals. Hospital characteristics and adverse patient outcomes were recorded, and data were analyzed by using frequency, percentage, and binomial logistic regression. The results revealed that the average number of beds per hospital was 430.5 (standard deviation [SD] = 108.6), the average number of beds per unit was 27.9 (SD = 8.9), and the average occupancy rate was 81.1% (SD = 20.6, range = 28.8–133.1%). Data were adjusted for hospital size, unit type, and number of beds in each unit; a 1% increase in occupancy rate increased the likelihood of pressure ulcers by 4.3% (P = 0.001), of hospital-acquired pneumonia by 2.4% (P = 0.032), and of hospital-acquired urinary tract infections by 2.1% (P = 0.033). The findings suggest that a higher level of occupancy rates predicted a greater likelihood of adverse patient outcomes.

KEYWORDS

adverse patient outcome, general hospital, nursing, occupancy rate, Thailand

1 | INTRODUCTION

Quality of care has been a crucial goal for the improvement of the health-care environment since 1900. It is "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (The Institute of Medicine, 1990, p. 4). Regulations on quality of care benefit the regulators, in that they help to ensure that the care provided by a health-care organization meets minimal standards and that the organization makes credible efforts to improve quality of care. At the same time, quality of care is important as regards consumers' selection of clinicians or health-care organizations (Office of Behavioral & Social Sciences Research, 2016).

With the consensus of the National Quality Forum, the nursing-sensitive quality indicators developed by the American Nurses Association were endorsed for use as indicators for evaluating the quality of care. These indicators include the structures, processes, and outcomes of nursing care. The structure indicators can be collected from the nursing hours per patient-day, the supply of nursing staff, the skill level of the nursing staff, the education of the nursing staff, and others. The processes of nursing care are the processes of assessing and providing nursing interventions to patients, such as pain assessment. Outcomes of nursing care can be evaluated from patient outcomes, such as urinary catheter-associated urinary tract infection (UTI) and ventilator-associated pneumonia (Montalvo, 2007).

Patient outcomes can be defined as the results of care structures, which are environmental and which include processes that integrate the functional, social, physical, psychological, and physiological aspects of people's experience in positive outcomes and adverse events (Mitchell, Ferketich, & Jennings, 1998). Patient outcomes in a health-care setting are indicators of whether quality of care is ensured. They are crucial in providing safe, effective, patient-centered, timely, efficient, and equitable health care to all patients (Office of Behavioral & Social Sciences Research, 2016). Patient

outcomes can be categorized into three simple types: adverse events, patient well-being, and patient satisfaction (Doran & Pringle, 2011). Adverse patient outcomes are the occurrence and frequency of negative patient incidences; for example, nosocomial infections, catheter-associated UTI, ventilator-associated pneumonia, patient falls (Montalvo, 2007), failures to rescue, patient turnover, post-operative sepsis (Park, 2011), increased length of stay (LOS) (Needleman, Buergaus, Mattek, Stewart, & Zelevinsky, 2002), and medication errors (Heede, Clarke, Sermeus, Vleugels, & Aiken, 2007). These adverse patient outcomes are important for the clinicians who manage and provide clinical care to monitor and improve the services they are providing to individual patients (Office of Behavioral & Social Sciences Research, 2016).

There are a number of factors affecting adverse patient outcomes. Occupancy rate, which is the capacity of beds in a unit in comparison to how those beds are actually used over a specific period of time, was found to have a positive relationship with patient falls with injuries, pressure ulcers, and UTI discovered during the shift (Al-Kandari & Thomas, 2008). According to Kaier, Mutters, and Frank's (2012) systematic review, 75% of studies revealed that occupancy rate was related to the incidence of hospital-acquired infections. Hospital characteristics, such as hospital size, hospital type, and unit type, were found as factors affecting patient outcomes. Hwang and Hwang (2011) found that hospitals with intern and resident training were more likely to make errors than non-teaching hospitals. The study also found that the emergency department, intensive care unit, and general care units recorded a higher number of errors than other units. Medical wards and intensive care units were identified as the two major places where medication errors occurred (Tang, Sheu, Yu, Wei, & Chen, 2007). Large hospitals were found to have higher rate of pressure ulcers and catheter-related central line blood stream infections than medium and small hospitals (Manojlovich, Antonakos, & Ronis, 2010).

A proper occupancy rate will lead to the achievement of safety and the efficient delivery of care service. However, the complexity of service systems, including service demands and time taken to serve those demands, might lead to difficulty in making decisions on how and when to allocate beds to patients, which could result in serious adverse consequences.

Queueing theory is the mathematical theory of waiting lines. It includes the process in which customers arrive, wait for their turn for desired service, receive service, and leave. Based on queueing theory, a queueing model is constructed in order to predict queue lengths and waiting time. The queueing model is an effective tool in estimating capacity requirements that would elicit a timely and efficient health service response, especially in hospitals. It can be a useful tool to evaluate and assess alternatives in providing services, inform possibilities and also the best method in gaining insights about the impact of those various alternatives, and be an instrument in developing effective policies in managing and allocating resources in hospitals. These policies will minimize delays experienced by patients by making a choice as to the extent to which resources should be dedicated to specific patient types in order to achieve a specified service standard (Green, 2011).

Thailand's constitution guarantees equal rights to citizens with regard to receiving standard public health services. General hospitals are public hospitals under the Ministry of Public Health (MoPH); these hospitals provide tertiary and other specialized care depending on their size and capacity (WHO, 2015). These hospitals are located in all of the 76 provinces in all regions of Thailand, and account for 17.8% of outpatient service utilization of hospitals under the MoPH (Bureau of Policy and Strategy, Ministry of Public Health, 2011). In 2014, the number of outpatient visits in general hospitals was >28 million, and the number of inpatient visits was greater than two million. The duration of LOS for these inpatients was >12 million days, and the occupancy rate was 87% (Bureau of Policies and Strategy, Permanent Secretary Offices, Ministry of Public Health, 2014). The quality of care of hospitals in Thailand is ensured through the hospital accreditation process by the Healthcare Accreditation Institute (The Healthcare Accreditation Institute, 2013); in the accreditation process, adverse patient outcomes are considered as indicators in monitoring the quality of care.

Many research studies have been conducted in Western countries in relation to patient outcomes. In Thailand, studies have found that there was a correlation between nursing hours per patient day and patients who contacted UTI. In addition, a negative relationship between nursing hours per patient day and nosocomial UTI existed (Sujijantararat, Booth, & Davis, 2005). There was a significant relationship found between the ratio of total nurse staffing to patients and in-hospital mortality (Sasichay-Akkadechanunt, Scalzi, & Jawad, 2003); and there were correlations between nurse staffing and adverse patient outcomes, including patient falls, pressure ulcers, and UTI (Chitpakdee, Kunaviktikul, Srisuphan, & Akkadechanunt, 2008). However, information related to occupancy rate and adverse patient outcomes is inconclusive. Therefore, in the present study, we investigated factors associated with adverse patient outcomes in a Thai context and included consideration of a comprehensive number of influencing factors. Seven adverse patient outcomes, including patient falls, pressure ulcers, hospital-acquired pneumonia, hospital-acquired UTI, medication errors, complaints, and patient identification errors, were examined in the present study.

2 | METHODS

2.1 | Study design

The predictive study was designed to examine the association between occupancy rate and seven adverse patient outcomes in general hospitals in Thailand. Data were collected by using a retrospective method.

2.2 | Population and sample

The population in the present study included inpatient units from 69 general hospitals in Thailand. The sample size of the units was determined by using power analysis. According to Polit and Hungler (1999), the sample size for bivariate correlation analysis is 145 (effect size of 0.30, power of 0.95, $\alpha = 0.05$). An additional 30% of the sample size ($n = 44$) was added to the study to compensate for missing data.

The samples were selected using multi-stage sampling. First, all eligible general hospitals were identified and then classified into four

strata with regard to four regions: north, northeast, central and west, and south; second, simple random sampling was used to select hospitals from each stratum; and third, inpatient units, including obstetrics unit, surgical unit, medical unit, pediatric unit, orthopedic unit, private unit, and special unit, were randomly selected by using random number table.

2.3 | Instruments

The research instruments employed in the present study were developed by the researchers and included two recording forms: (i) the daily recording form was used to collect the unit type, number of nursing personnel and patient in each shift, number of inpatient days of care, and number of bed days available; and (ii) the patient outcome recording form was used to collect information regarding incidents of adverse patient outcomes, including patient falls, pressure ulcers, hospital-acquired pneumonia, hospital-acquired UTI, medication errors, complaints, and patient identification errors of each unit. The daily recording form and the patient outcome recording form were confirmed by face validity. There were three nursing faculty members who were experts in the areas of patient outcomes and human resource management who assessed the suitability, adequateness, and relevance of the instruments. These two recording forms were revised according to these experts' recommendations. Pretest of each instrument was conducted in 15 units to confirm the applicability of the instruments.

2.4 | Data collection

After obtaining the permission of the hospital directors, the nursing director was contacted by the researchers to appoint research coordinators who were given the package for data collection, which included an information sheet, a consent form, a daily recording form, and a patient outcome recording form; they were then briefed about the research procedure and their responsibilities with regard to data collection. Next, the research coordinators distributed the package for data collection to the quality-assurance nurse of each of the units who was responsible for collecting the data from the daily reports of the units, the incident reports of the units, or the datasets of the hospital. Data collected from the daily recording form included the following: unit type, number of nursing personnel and patients in each shift, number of inpatient days of care, and number of bed days available. Data collected from the patient outcome recording form included the following: incidents of patient falls, pressure ulcers, hospital-acquired pneumonia, hospital-acquired UTI, medication errors, complaints, and patient identification errors. All data were collected during a 6 month period from the beginning of January to the end of June 2014. After collecting all the data, the research coordinators sent back all the recording forms to the researchers. Of the 189 recording forms distributed, 177 (93.7%) were returned, of which 146 (77.2%) were completed; those formed the basis of the analysis.

2.5 | Ethical considerations

Ethical approval for this research proposal was obtained from the ethics committee of the Faculty of Nursing, Chiang Mai University (037/2557). Data collection was conducted with permission from the hospital directors. The information sheet and the informed consent form were attached with the instrument and given to the nurse responsible for collecting data from the different units. These nurses were free to withdraw from the study without any consequences. Although the data collections did not involve patients, confidentiality was maintained throughout the study. The collected data excluded the personal details of the patients.

2.6 | Data analysis

All collected data were analyzed using SPSS 13.0 for Windows. Frequency and percentage were used to describe the hospital characteristics and the adverse patient outcomes (Table 1). The binomial logistic regression was used to determine the association between occupancy rate and adverse patient outcomes, presenting as odds ratio (OR) and 95% confidence intervals. The statistical significance of the data was considered at $P < 0.05$. To conduct the binomial logistic regression, three hospital characteristics, including hospital size, number of beds in unit, and unit type, were selected as covariates, as the literature review showed that they were associated with patient outcomes and would be the confounding factors in the present study. Assumption of binomial logistic regression was confirmed. Correlation matrix was used to confirm multicollinearity of predictor factors (Table 2). We judged there was not a multicollinearity if the correlation coefficient was <0.8 (Midi, Sarkar, & Rana, 2010).

3 | RESULTS

3.1 | Hospital characteristics

Included in the study were 146 units of 16 general hospitals from four regions: north, northeast, central and west, and south. Out of the 146 units, 35 were medical units (24%), 32 were surgical units (21.9%), 29 were private units (19.9%), 20 were pediatric units (13.7%), 14 were orthopedic (9.6%), 11 were obstetrics units (7.5%), and the rest were other units, such as ear, eye, nose, throat units (3.4%). The average number of beds per unit was 27.9 (standard deviation [SD] = 8.9), and the distribution was as follows: 18 units (12.3%) had <12 beds, 23 units (15.8%) had 13–26 beds, and 105 units (71.9%) had >27 beds. The average occupancy rate was 81.1%; 13% of the units had an occupancy rate of >100%. The findings of the present study showed that patient falls and complaints were relatively low in the bigger hospitals, whereas percentages of pressure ulcer, hospital-acquired pneumonia, and hospital-acquired UTI were relatively high in the bigger hospitals. Pressure ulcers were more likely to have occurred in the orthopedic, medical, and surgical units. Medication errors were generally found in every unit, whereas hospital-acquired UTI were relatively high in medical and orthopedic units (Table 1).

TABLE 1 Frequency and percentage of hospital and unit characteristics by adverse patient outcomes (n = 146)

Hospital and unit characteristic	Adverse patient outcomes							
	Total[a] Yes N (%)	Patient fall Yes N (%)	Pressure ulcer Yes N (%)	Hospital-acquired pneumonia Yes N (%)	Hospital-acquired urinary tract infection Yes N (%)	Medication error Yes N (%)	Complaint Yes N (%)	Patient identification error Yes N (%)
Occupancy rate (mean = 81.1, SD = 20.6, range = 28.8–133.1)								
<79	62 (42.5)	14 (22.6)	26 (41.9)	15 (24.2)	23 (37.1)	51 (82.3)	8 (12.9)	12 (19.4)
80–100	65 (44.5)	14 (21.5)	37 (56.9)	25 (38.5)	30 (46.2)	54 (83.1)	9 (13.8)	4 (6.2)
101–120	13 (8.9)	4 (30.8)	12 (92.3)	8 (61.5)	9 (69.2)	11 (84.6)	4 (30.8)	3 (23.1)
>121	6 (4.1)	0 (0)	5 (83.3)	3 (50.0)	5 (83.3)	6 (100)	2 (33.3)	0 (0)
Hospital size (mean = 430.5, SD = 108.6, range = 186–627)								
<299	6 (4.1)	2 (33.3)	3 (50.0)	1 (16.7)	2 (33.3)	5 (83.3)	2 (33.3)	0 (0)
300–500	90 (61.6)	18 (20.0)	47 (52.2)	28 (31.1)	35 (38.9)	76 (84.4)	13 (14.4)	14 (15.6)
>501	50 (34.3)	12 (24.0)	30 (60.0)	22 (44.0)	30 (60.0)	41 (82.0)	8 (16.0)	5 (10.0)
No. beds on unit (mean = 27.9, SD = 8.9, range = 5–51)								
<12	18 (12.3)	1 (5.6)	8 (44.4)	4 (22.2)	8 (44.4)	12 (66.7)	0 (0)	0 (0)
13–26	23 (15.8)	7 (30.4)	8 (34.8)	3 (13.0)	8 (34.8)	17 (73.9)	2 (8.7)	3 (13.0)
>27	105 (71.9)	24 (22.9)	64 (61.0)	44 (41.9)	51 (48.6)	93 (88.6)	21 (20.0)	16 (15.2)
Unit type								
Obstetrics	11 (7.5)	1 (9.1)	0 (0)	0 (0)	2 (18.2)	8 (72.7)	2 (18.2)	0 (0)
Surgical	32 (21.9)	8 (25.0)	25 (78.1)	14 (43.8)	17 (53.1)	31 (96.9)	7 (21.9)	4 (12.5)
Medical	35 (24.0)	8 (22.9)	29 (82.9)	24 (68.6)	24 (68.6)	33 (94.3)	6 (17.1)	4 (11.4)
Pediatric	20 (13.7)	4 (20.0)	1 (5.0)	5 (25.0)	1 (5.0)	16 (80.0)	4 (20.0)	6 (30.0)
Orthopedic	14 (9.6)	5 (35.7)	13 (92.9)	3 (21.4)	10 (71.4)	10 (71.4)	3 (21.4)	3 (21.4)
Private unit	29 (19.9)	6 (20.7)	12 (41.4)	5 (17.2)	13 (44.8)	19 (65.5)	1 (3.4)	0 (0)
Other (ear, nose, throat)	5 (3.4)	0 (0)	0 (0)	0 (0)	0 (0)	5 (100)	0 (0)	2 (40.0)

[a] Frequency divided by 146. SD = standard deviation.

3.2 | Factors related to adverse patient outcomes

The results of the simple correlation among study variables are presented in Table 2. The correlations among predicting variables (hospital size, number of beds on unit, unit type, occupancy rate) were between 0.006 and 0.442, indicating no multi-collinearity.

The modeling of the effects of occupancy rate on seven adverse patient outcomes – patient fall, pressure ulcer, hospital-acquired pneumonia, hospital-acquired UTI, medication errors, complaint, and patient identification errors – are presented in Table 3. Adjusted OR estimated the effect of occupancy rate on adverse patient outcomes

TABLE 2 Means, SD, and correlation matrix among study variables (n = 146)

Variables	Mean	SD	Correlation										
			1	2	3	4	5	6	7	8	9	10	11
1. Occupancy rate	81.1	20.6	--										
2. Hospital size	430.5	108.6	0.033	--									
3. No. beds on unit	27.9	8.9	−0.082	0.023	--								
4. Unit type	0.5	0.5	−0.292**	−0.006	−0.442**	--							
5. Patient fall	0.2	0.4	0.080	0.094	0.178*	−0.044	--						
6. Pressure ulcers	0.5	0.4	0.384**	0.075	0.227**	−0.477**	0.149	--					
7. Hospital-acquired pneumonia	0.3	0.4	0.264**	0.103	0.247**	−0.421**	0.063	0.377**	--				
8. Hospital-acquired urinary tract infection	0.4	0.5	0.256**	0.187*	0.082	−0.283**	0.143	0.505**	0.334**	--			
9. Medication error	0.8	0.3	0.100	0.021	0.220**	−0.297**	0.012	0.154	0.209*	0.112	--		
10. Complaint	0.1	0.3	0.115	−0.046	0.210*	−0.092	0.089	0.015	0.117	−0.059	0.040	--	
11. Identification error	0.01	0.3	−0.156	−0.014	0.163*	0.029	0.090	−0.058	−0.070	−0.029	0.062	−0.055	--

*P < 0.05. **P < 0.01. Unit type is coded 0 = medical and surgical units, 1 = obstetrics unit, pediatric unit, orthopedic unit, private unit, and ear, nose, and throat unit. Patient fall, pressure ulcers, hospital-acquired pneumonia, hospital-acquired urinary tract infection, medication error, complaint, patient identification error are coded 0 = without incident, 1 = incident. SD = standard deviation.

TABLE 3 Binary logistic regression model predicting adverse patient outcomes (n = 146)

Predicting variables	Adverse patient outcomes													
	Patient fall		Pressure ulcer		Hospital-acquired pneumonia		Hospital-acquired urinary tract infection		Medication error		Complaint		Patient identification error	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Occupancy rate (%)	1.015 (0.994–1.037)	0.170	1.043 (1.018–1.068)	0.001	1.024 (1.002–1.046)	0.032	1.021 (1.002–1.041)	0.033	1.007 (0.983–1.032)	0.577	1.024 (0.998–1.051)	0.067	0.983 (.958–1.009)	0.208
Hospital size (bed)	1.002 (0.998–1.006)	0.277	1.002 (0.998–1.005)	0.362	1.002 (0.999–1.006)	0.198	1.004 (1.001–1.007)	0.023	1.000 (0.996–1.005)	0.944	0.999 (0.994–1.003)	0.511	1.000 (0.995–1.005)	0.984
No. beds on unit (bed)	1.075 (1.012–1.141)	0.018	1.030 (0.982–1.082)	0.226	1.038 (0.985–1.094)	0.167	0.997 (0.952–1.043)	0.879	1.036 (0.980–1.095)	0.217	1.102 (1.024–1.185)	0.009	1.074 (0.998–1.156)	0.055
Unit type Other units	Reference													
Medical/surgical units	0.616 (0.234–1.624)	0.328	5.400 (2.211–13.187)	0.000	4.216 (1.737–10.229)	0.001	2.820 (1.221–6.513)	0.015	5.437 (1.366–21.634)	0.016	0.617 (0.199–1.908)	0.402	0.648 (0.198–2.119)	0.473
Nagelkerke R^2	8.7%		39.1%		28.8%		19.2%		17.7%		12.5%		9.6%	
Overall percentage	78.1%		78.1%		78.1%		65.1%		83.6%		84.2%		87.0%	

For unit type, the categories of medical and surgical units were used as the indicator variables and other units including obstetrics unit, pediatric unit, orthopedic unit, private unit, and ear, nose, and throat unit were used as the reference. CI = confidence interval; OR = odds ratio.

by controlling for hospital size, number of beds in unit, and unit type. Adjusted OR showed that a 1% increase in occupancy rate was associated with a 4.3% increase in pressure ulcers (P = 0.001), 2.4% of hospital-acquired pneumonia (P = 0.032), and 2.1% of hospital-acquired UTI (P = 0.033). The model explained 39.1% (Nagelkerke R^2) of the variance in pressure ulcers, 28.8% (Nagelkerke R^2) of the variance in hospital-acquired pneumonia, and 19.2% (Nagelkerke R^2) of the variance in hospital-acquired UTI. In the overall model of pressure ulcers, hospital-acquired pneumonia, and hospital-acquired UTI, the percentages of correct classification were 78.1%, 78.1%, and 65.1%, respectively.

4 | DISCUSSION

The main findings of the present study showed that occupancy rate was associated with hospital-acquired pneumonia and hospital-acquired UTI. This is similar to the results of previous studies that found bed occupancy correlates significantly with Methicillin-resistant Staphylococcus aureus (MRSA) infection (Cunningham, Kernohan, & Rush, 2006) and UTI (Al-Kandari & Thomas, 2008). The findings of the present study showed that 13% of units had an occupancy rate higher than the appropriate point (80–100%). This might be because of the high number of patients admitted to general hospitals. General hospitals as tertiary care facilities are required to admit patients referred from 770 community hospitals through the referral system of the MoPH, and leads to an increase in occupancy rate of some of the units in the hospitals. A high occupancy rate increased the undesirable effects of turn-away (queues for a bed) (Jones, 2011). It also reflects the problem of overcrowded hospitals. Overcrowding induced staff to feel that they did not have enough time to perform hand hygiene, as hand washing takes some considerable time away from the floor (Cunningham et al., 2006), and poor hand hygiene is a factor in infection. Kaier et al. (2012) conducted a systematic review and found that 75% of studies indicated that overcrowded hospitals led to the incidents of hospital-acquired infection, and there was a relationship between occupancy rate and incidents of hospital-acquired infection. This was also observed in a study by Borg (2003) who found a similar relationship between bed occupancy rate and MRSA infections, which implies that overcrowding could be relevant to MRSA infection within hospitals. Moreover, patient overcrowding in hospitals might be from the turnover that stems from a wide variation in the nature of the patients. The variation increases ward complexity, which then increases the workload of nurses. It was observed that the high workload of nurses is a powerful predictor of occurrence of nosocomial infections (Yang, 2003). Furthermore, a Thai study found that patient characteristics, including complications, procedures, age, and co-morbidity, were positively significant in relation to prolonged LOS (Lekvilai, 2005). It is possible that patients with greater LOS are more likely to contract hospital-acquired infections, as Hassan, Tuckman, Patrick, Kountz, and Kohn (2010) found, concluding that extending the LOS by even 1 day increased the probability of infection by 1.37%.

The findings of the present study also showed that occupancy rate is associated with pressure ulcers. Although it is not clear whether occupancy rates have direct impacts on pressure ulcers,

overcrowding might result in insufficient time for adequate patient care. The Australian Nursing Federation (2016) notes that nurses who have too many patients to care for cannot provide optimal care. Moreover, the relationship between occupancy rate and pressure ulcers is complex. The wide variation in patient characteristics, such as age, type of operation, admission score, and number of nursing interventions, were risk factors of pressure ulcers (Shaw, Chang, Lee, Kung, & Tung, 2014).

The findings of the present study further showed a correlation between occupancy rate and adverse patient outcomes. The occupancy rate should be proposed as a measure to reflect the ability to deliver proper care to patients, as it provides useful guidance for the planning and management of hospital beds (Keegan, 2010). Many organizations and researchers consider that occupancy rates >85% will have negative impacts on the operation of a hospital, as occupancy rates effect bed numbers and the ability of staff to provide safe and efficient care (Keegan, 2010). The high occupancy rates imply that there might be insufficient beds to prepare for admission of patients (Cunningham et al., 2006). Therefore, hospital directors need to address discrepancies within the system and set appropriate bed-management policy.

4.1 | Limitations

In the present study, we collected prevailing data regarding adverse patient outcomes from hospital reports and databases. A limitation of the study could be the underreporting of incidents due to the fact that reporting an incident of adverse patient outcome could be related to legal and ethical issues among nurses, as well as the maintenance and protection of the image of the hospital. However, other significant factors related to adverse patient outcomes, such as nursing hours per patient day, patient-to-nurse ratio, and skill mix, were not taken into consideration in the present study. Future studies should consider the association of these variables that predict adverse patient outcomes adjusting for the hospital and patient characteristics that are factors influencing adverse patient outcomes.

5 | CONCLUSION

The key findings of the present study confirmed that a higher level of occupancy rates predicted a greater likelihood of pressure ulcers, hospital-acquired UTI, and hospital-acquired pneumonia. The results could encourage nurse managers and hospital directors to maintain an appropriate occupancy rate to decrease the workload of nurses. This will lead to a decrease in the incident of adverse patient outcomes resulting from the modification of policies regarding the maximum occupancy rate.

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AUTHOR CONTRIBUTIONS

Study design: K.A., O.W., W.K., A.N., and R.N.

Data collection: K.A., O.W., and A.N.

Data analysis: K.A., O.W., and A.N.

Manuscript writing and revisions for important intellectual content: K.A., O.W., W.K., A.N., and R.N.

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