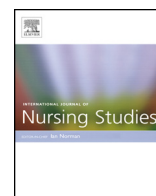




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## Nurse staffing level and overtime associated with patient safety, quality of care, and care left undone in hospitals: A cross-sectional study



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## ABSTRACT

**Objective:** The purpose of this study was to explore the association of nurse staffing and overtime with nurse-perceived patient safety, nurse-perceived quality of care, and care left undone.

**Design:** A cross-sectional survey.

**Setting and participants:** A total of 65 hospitals were selected from all of the acute hospitals ( $n = 295$ ) with 100 or more beds in South Korea by using a stratified random sampling method based on region and number of beds, and 60 hospitals participated in the study. All RNs working on the date of data collection in units randomly selected from the list of units in each hospital were invited to participate. The analyses in this study included only bedside RNs ( $n = 3037$ ) and hospitals ( $n = 51$ ) with responses from at least 10 bedside RNs.

**Methods:** We collected data on nurse staffing level, overtime, nurse-perceived patient safety, nurse-perceived quality of care, nurse-reported care left undone, and nurse characteristics through a nurse survey. Facility data from the Health Insurance Review Agency (HIRA) were used to collect hospital characteristics. Multilevel logistic regression models considering that nurses are clustered in hospitals were used to analyze the effects of hospital nurse staffing and overtime on patient safety, quality of care, and care left undone.

**Results:** A higher number of patients per RN was significantly associated with higher odds of reporting poor/failing patient safety (OR = 1.02, 95% CI = 1.004–1.03) and poor/fair quality of care (OR = 1.02, 95% CI = 1.01–1.04), and of having care left undone due to lack of time (OR = 1.03, 95% CI = 1.01–1.05). Compared with RNs who did not work overtime, RNs working overtime reported an 88% increase in failing or poor patient safety (OR = 1.88, 95% CI = 1.40–2.52), a 45% increase in fair or poor quality of nursing care (OR = 1.45, 95% CI = 1.17–1.80), and an 86% increase in care left undone (OR = 1.86, 95% CI = 1.48–2.35).

**Conclusions:** Our findings suggest that ensuring appropriate nurse staffing and working hours is important to improve the quality and safety of care and to reduce care left undone in hospitals.

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## What is already known about the topic?

- Nursing staffing and workload varies considerably among hospitals as well as across countries.
- Studies conducted in Western countries reported the association of nurse staffing and overtime with nurses' perceived patient safety and quality of care.
- Few studies have explored the relationships of nursing staffing level and overtime with patient safety, quality of care, and care left undone in South Korea.

## What this paper adds

- Korean nurses were overloaded because of inadequate nurse staffing levels and excessive overtime work compared with findings in Western and some Asian countries.
- Nurse staffing level and overtime work were significantly associated with nurses' perceived patient safety, quality of care, and care left undone in South Korea.

## 1. Introduction

High quality of care is an ultimate goal in the health care system worldwide. To address rising health expenditures in the context of changes in the health care system such as the growth of the aging population and the complexity of diseases, as well as the appearance of new technologies, many countries have implemented 'efficiency' focused, cost saving strategies. As a result of these strategies, the quality of care may deteriorate (Aiken et al., 2012). The Institute of Medicine (IOM)'s report, 'Crossing the Quality Chasm' revealed serious gaps in the quality of care in the health care system and presented the components of quality care in the twenty-first-century health care system to bridge the gap; quality care should be safe, effective, patient-centered, timely, efficient, and equitable. Safety is a fundamental component of quality care (Committee on the Quality of Health Care in America, 2001).

As an underpinning of high quality of care, patient safety has received increased attention as a growing body of evidence shows that medical errors, as a leading cause of death and injury, frequently occur worldwide in hospitals (Kohn et al., 2000). Patient safety involves constant surveillance of patients' conditions to prevent adverse events and early detection of patient deterioration (Clarke and Donaldson, 2008). Patient safety issues may arise when the wrong thing is done (commission error) or when the correct thing is not done (omission error) (World Health Organization, 2011). Care left undone is an important kind of error of omission in nursing (Kalisch and Xie, 2014). Evaluating care left undone has been used to comprehensively assess the quality of the process of care (Lucero et al., 2009) and has been found to be strongly associated with nurses' rating of quality of care (Sochalski, 2004).

Care left undone has been an ongoing concern internationally as a common quality and safety threat that has a negative impact on the quality of care and leads to adverse events (Jones et al., 2015). Care left undone, which has been used interchangeably with "missed

nursing care" (Jones et al., 2015), is defined as necessary nursing delayed or not completed (Kalisch et al., 2009a), and the reasons for leaving necessary care undone include lack of labor resources, material resources, and poor teamwork and communication (Kalisch et al., 2009b). Time scarcity is the primary driver of care left undone, leading to adverse events (Schubert et al., 2008).

As the largest health care workforce, nurses play a significant role in ensuring the safety and quality of care in hospitals (Hassmiller and Cozine, 2006). An emerging body of research has shown how organizational factors are related to the safety and quality of care in hospitals (Aiken, 2009). Specifically, the nurse staffing level has been reported to be associated with safety and quality of care (Aiken et al., 2012; Clarke and Donaldson, 2008; You et al., 2013). In addition, the nursing staffing level was reported to be a significant predictor of care left undone (Kalisch et al., 2011). Systematic reviews have shown that higher nurse staffing levels are associated with better patient outcomes such as a decreased mortality rate, a shorter length of stay, and fewer adverse events in the hospital (Blegen, 2006; Shekelle, 2013). A nurse's overtime working was also reported to be a risk factor for errors (Liu et al., 2012). Even though care left undone is a significant issue with regard to quality and safety, there is relatively less evidence on the association between care left undone and nursing workload (Jones et al., 2015).

Current nurse staffing and overtime situations vary considerably across countries as well as among hospitals (Aiken et al., 2011, 2013). However, most research examining how nurse staffing level and overtime affect safety and quality of care has been conducted in Western countries (Coetzee et al., 2013; Nantsupawat et al., 2011; You et al., 2013). These countries tend to have a relatively high staffing level, and therefore the results may not be generalizable to other countries with lower staffing levels and/or different health care systems.

Inadequate nursing staffing is a serious issue in Korea. While some studies have showed that the nursing staffing level in Korean hospitals is poor (Cho et al., 2008a, 2015), there is still lack of data at the national level about nurse staffing and overtime in South Korea. According to the Korean Enforcement Regulation of Medical Law, the patient-to-nurse ratio for inpatients is set at 2.5 (The National Assembly of the Republic Korea, 2015). However, the regulation has not shown any real influence on the level of nurse staffing because it allows for the substitution of nurse aids for nurses if necessary and does not include any sanctions for breaches of the regulation.

In 1999, a financial incentive system for hospitals was established by the Korean government that pays a fee according to the average ratio of beds per nurse in an effort to improve the nurse staffing level. The government has also increased the number of nursing schools the entry quota of the nursing schools. However, the policies have not had a dramatic effect on nursing staffing. Due to the low level of nurse staffing and a family-centered culture in Korea, the patient's family or relatives typically stay with patients during hospitalization. Parts of nursing care, especially basic nursing care (e.g., feeding, washing, or toileting assistance) tend to be passed on to informal

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