

## RESEARCH ARTICLE

# A comparative analysis of nurses' reported number of patients and perceived appropriate number of patients in integrated nursing care services

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## Funding information

National Health Insurance Service; Ministry of Education of the Republic of Korea; National Research Foundation of Korea, Grant/Award Number: 2021R1A2C200662511

## Abstract

This study aimed to compare the number of assigned and appropriate patients per nurse in integrated nursing care service wards and analyze factors associated with the gap. For this cross-sectional secondary analysis, data were collected from surveys of 2312 nurses and institutional data from their affiliated 106 hospitals in Korea. We used the Wilcoxon signed-rank test and t-test to compare the number of patients assigned to nurses with the number they considered appropriate. We used ratio analysis for measuring the gap between these numbers, and robust regression to evaluate the factors affecting this gap. The results found an average gap of 1.45, indicating that the reported number of assigned patients per nurse was 1.45 times higher than the appropriate number. Gender, employment type, wage satisfaction, workload, overtime work, and hospital level of care were identified as factors associated with the gap. Findings suggest that the current nurse staffing standard should be revised to consider nurses' professional judgments of appropriate staffing levels and adopt policies that reduce nurses' workload.

## KEYWORDS

integrated nursing care service, nurse staffing, nurses, nurse-to-patient ratio

## Key points

- In South Korea, nurses reported that they took care of an average of 1.45 times more patients than what they perceive as appropriate number of patients per nurse.
- The discrepancy between the number of assigned patients per nurse and the number of patients they perceived as appropriate per nurse tends to be larger in cases of lower levels of hospital care and unfavorable nursing work environments.
- To narrow the gap, we suggest revising the staffing ratio calculation policy to exclude nurses who do not provide direct patient care, such as those in administrative and educational roles.

## 1 | INTRODUCTION

Maintaining appropriate nurse staffing levels is essential for achieving positive outcomes for both patients and nurses (Blume et al., 2021).

The literature suggests that an increase in nurse staffing levels is associated with improvements in patient safety (Aiken et al., 2018; Hammad et al., 2021; Jansson et al., 2019) and nurses' job satisfaction (Cho, Mark, et al., 2017). Appropriate nurse staffing encompasses

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factors beyond the patient-to-nurse ratio. It is defined as matching nurses' skills and knowledge with the specific nursing needs of patients (American Nurses Association [ANA], 2020). Additionally, the delivery of nursing care can vary based on professional characteristics, such as nurses' experience and skillset, even when faced with the same patient conditions (Hill & DeWitt, 2018). Therefore, it is imperative to consider the complex components of appropriate nurse staffing, including patient characteristics, nurse characteristics, and reimbursement structure (ANA, 2020).

## 2 | BACKGROUND

To maintain appropriate nurse staffing levels, many countries have adopted nurse staffing legislation or policies (Data S1). Some states in the United States and Australia have implemented legislation establishing minimum nurse-to-patient ratios (Aiken et al., 2010; McHugh et al., 2021). In England, the safe nurse-to-patient ratio has been set at 1:8 (Van den Heede et al., 2020). Japan implemented a combination of a minimum nurse staffing ratio and a financial incentive policy within its national health insurance system (Morioka et al., 2022).

### 2.1 | Nurse staffing policy in Korea

Similar to Japan, Korea has adopted both a minimum nurse staffing ratio through the Korean Medical Service Act and a financial reimbursement system based on the nurse staffing policy (Data S2). These policies are divided into two: The Nursing Fee Differentiation Policy (NFD), which was implemented in 1999, and the Integrated Nursing Care Service Policy (INCS), which was implemented in 2013. Currently, two reimbursement policies regarding nurse staffing levels are being used, and medical institutions can claim the inpatient nursing fee based on the unit characteristics (NFD or INCS). Based on Article 63 of the Medical Service Act, corrective orders can be issued and facility operations can be prohibited; however, there is a lack of specific criteria regarding penalties, resulting in relatively weak enforcement (Han & Lee, 2022; Shin, Park, & Shin, 2020). Before implementing NFD policy, only 24% of general hospitals met the legal standard (Cho et al., 2016). To improve nurse staffing levels, the government has implemented the NFD policy in 1999, which categorizes nurse-to-bed ratio into six to seven grades based on the level of hospital care. The higher the nurse staffing level, the more nursing reimbursement fees are paid to the medical institutions in NFD. After implementing NFD, the nurse staffing levels have significantly improved, with approximately 50% of medical institutions meeting the legal nurse staffing requirements (Cho et al., 2016). However, Korean nurses still care for on average of 15–16 patients per nurse under the NFD across all grades (Kim, Kwon, et al., 2021). This is approximately twice as high as the average of 8.3 patients per nurse reported across nine European countries and even three times higher than Norway, which has the minimum at an average of 5.2 patients per nurse among nine countries (Aiken et al., 2014). This inappropriate

nurse staffing in Korea leads to missed and overlooked aspects of nursing care and has become a social basis for the widespread nature of private caregiving in Korea (Cho et al., 2016; Han & Lee, 2022). According to Jin and Yi (2019), it is essential for a private caregiver or family member to remain in the hospital, as nurse delegate certain tasks of patient care to them in Korea. These tasks may include bathing, position change, and even procedures like suctioning and tube feeding. Delegating nursing activities to private caregiver in healthcare poses risks by potentially overlooking essential nursing tasks, such as assessing patient integumentary status during position changes or identifying symptoms of aspiration during feeding, thereby compromising care quality and patient safety (Ahn, 2013; Cho & Kim, 2006; Lee & Lee, 2020). Furthermore, the presence of hired caregivers in wards increases congestion, leading to turnover issues and decreased adherence to safety protocols like hand hygiene (Ahn, 2013; Islam et al., 2014). Moreover, households face significant financial burdens from hiring private caregivers (Park et al., 2023).

In 2013, the Korean government implemented a revised nurse staffing policy (INCS), which offers comprehensive nursing services during hospitalization without the need for private caregivers, provided by nursing personnel with an increased staffing level compared with the existing NFD (National Health Insurance Service [NHIS], 2023). The INCS policy sets the minimum nurse-to-patient ratio based on the hospital level of care. The designated nurse-to-patient ratio was ranged from 1:5 to 1:7 in tertiary hospitals, from 1:7 to 1:12 for general hospitals, and from 1:10 to 1:16 for hospitals. The INCS policy is a pilot inpatient care policy that is not mandatory for all hospitals, but it incentivizes participation by increasing the reimbursement fee. Transitioning to INCS wards demands two to three times more nurses compared with existing NFD wards. The nursing workforce is heavily concentrated in metropolitan cities and tertiary hospitals in Korea (Park & Ko, 2020), resulting in significant challenges in recruiting nurses to smaller regional hospitals. To mitigate the exacerbation of nurse concentration, regulations limit tertiary hospitals to operate a maximum of four as INCS wards (NHIS, 2023), hindering complete transitions. Simultaneously, smaller hospitals still struggle with nurse recruitment (Park et al., 2019), impeding full implementation of the INCS wards. Due to these obstacles, only a fraction of hospitals transitioned from NFD to INCS wards. As of 2020, the proportion of INCS beds among total beds ranged from 5.6% to 100% (Kim et al., 2020).

### 2.2 | Effect of the INCS policy on nurse staffing and appropriateness of INCS nurse staffing levels

The INCS policy has had a positive effect on enhancing nurse staffing levels in general (Kim, Kwon, et al., 2021). However, the workload per patient for nurses in INCS has also increased as they have taken on the responsibilities of private caregivers for patients in NFD (Kim et al., 2018; Park et al., 2017). Approximately 60% of nurses reported an increase in their workload following the transition from NFD to INCS wards (Park, 2018). Researchers have reported that the current

INCS-designated nurse staffing standard does not appropriately reflect the patients' nursing needs in clinical settings (Cho et al., 2020; Kim et al., 2018). Kim et al. (2018) found that the current INCS-designated staffing level does not sufficiently reflect the patients' nursing needs and severity. A comparison of actual and expected nursing hours, based on patient severity scores in INCS wards, revealed that over 70% of the wards did not meet the expected nursing hours during standard working hours (Cho et al., 2020). These studies highlight the need for revising the staffing standards for INCS but may not fully consider factors related to appropriate nurse staffing, such as nurses' experience, skills, and knowledge. Measurement of nurses' professional judgment on staffing adequacy could shed light on this issue. In previous studies, researchers used a four-point Likert scale to examine nurses' perceptions of staffing adequacy (Park et al., 2018; Shim & Lee, 2017). However, inconsistent results were found, and these studies have limitations in providing precise guidance on necessary staffing enhancements to ensure safe levels based on nurse judgment. This highlights the need for new research to supplement these limitations.

### 2.3 | Factors associated with nurse staffing levels and their appropriateness

Numerous studies have explored the impact of nurse staffing levels, but there is a lack of research on staffing determinants, particularly nurses' perception of staffing appropriateness. Deciding on nurse staffing involves multiple considerations, such as nursing personnel costs, patient intensity, ownership (private or public), and nurse supply (Blegen et al., 2008). According to a previous scoping review, nurses' perceived staffing adequacy was associated with institutional-level characteristics such as unit size, number of beds, and availability of high-technology hospital services (Van den Heede et al., 2020). Additionally, Veenstra and Gautun (2021) found a significant correlation between perceptions of staffing adequacy and nurse-level variables, including experience, position, and collaborative dynamics among nurses. However, there has been a noticeable gap in research within Korea in recent years regarding factors associated with the nurses' perceived staffing adequacy, highlighting a need for further studies to address this gap.

### 2.4 | Research aims

The literature suggests there are two knowledge gaps relevant to the Korean nursing workforce; we therefore aim to explore and describe:

- Two different nurse-to-patient ratios: the nurses' perceived appropriate number of patients per nurse and the nurse-reported number of assigned patients per nurse.
- We intend to compare these two ratios and investigate the factors associated with the gap between them. This gap represents the degree of nurses' perception of staffing adequacy.

## 3 | METHODS

### 3.1 | Study design, data sources, and ethical considerations

This study is a cross-sectional secondary analysis of linked data from a nurse survey and NHIS medical institution information data. The nurse survey data were derived from the Integrated Nursing Care Service Evaluation Study (INCSES), which was designed to evaluate the effects of the INCS policy in Korea on both patient and nurse outcomes and to suggest alternative plans for the policy (Kim et al., 2020). The medical institution information database contains data on the characteristics of institutions, such as the number of beds, location, hospital level of care, ownership, and INCS-designated staffing levels. However, some information was not publicly available. As a result, the complete dataset was obtained through a formal request to the NHIS (NHIS, 2020). The medical institution information database utilized in our study was sourced from the second quarter of 2020. We linked the institutional data to provide the characteristics of the hospital where staff nurses were employed. The original survey obtained informed consent from a total of 3761 nurses. As our study was conducted as a secondary analysis, we received exempt approval from the institutional review board of the Seoul national university institution (IRB No. E2112/003-005).

### 3.2 | Study setting and sample

This research was conducted in South Korea, where private caregiving is widely practiced (Park et al., 2023). To address issues such as ward congestion and decreased quality of nursing care, the Korean government introduced the INCS policy. As of 2020, 534 out of 1565 eligible medical institutions (39.5%) are participating in this policy. In this study, 2312 nurses from 106 hospitals were included (Figure 1).

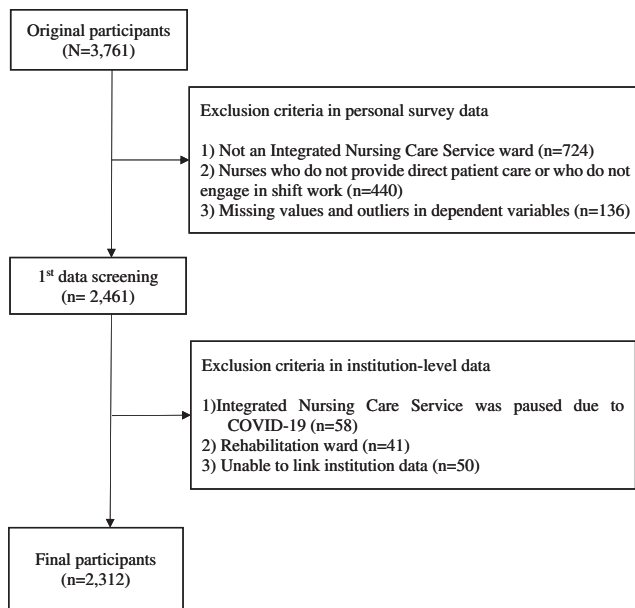
### 3.3 | Measurements

#### 3.3.1 | Nurse-reported number of assigned patients per nurse (RP)

The data on the patient-to-nurse ratio were obtained through a survey conducted at the nurse level. The survey asked staff nurses to indicate the number of patients they typically care for during day, evening, and night shifts. Subsequently, we calculated the average RP.

#### 3.3.2 | Nurses' perceived appropriate number of patients per nurse (AP)

The study gathered data on the nurses' perception of the optimal patient-to-nurse ratio by asking them to indicate the appropriate



**FIGURE 1** Flow diagram of the participant selection process.

number of patients for a nurse to care for during day, evening, and night shifts. Subsequently, we computed the average AP.

### 3.3.3 | Designated nurse staffing standard of INCS

The designated nurse staffing standard of each hospital was obtained from NHIS, which establishes the standard for participation in the INCS. Medical institutions submit their desired nurse-to-patient ratio to the NHIS for evaluation, and the NHIS designates the nurse staffing standard based on the institution's operational status. The INCS nurse staffing standards that can be designated for each hospital level of care are as follows: Tertiary hospitals can choose from three ratios (1:5, 1:6, and 1:7), while general hospitals and hospitals can choose from four ratios (1:7, 1:8, 1:10, and 1:12 for general hospitals and 1:10, 1:12, 1:14, and 1:16 for hospitals).

### 3.3.4 | Gap between RP and AP (RA ratio)

The gap between RP and AP was estimated by dividing RP by AP (RA ratio) using ratio analysis methods (Formula 1). For example, if the nurse who reported took care of 10 patients and perceived that eight patients were appropriate, the RA ratio is calculated as  $10/8 = 1.25$ . The RA ratio represents the degree of discordance between RP and AP. When the RA ratio exceeds one ( $>1$ ), RP surpasses AP. This indicates that nurses perceive the nurse staffing level as inappropriate. We operationally defined nurses' perceived staffing appropriateness as an RA ratio equal to or less than one, whereas nurses' perceived staffing inappropriateness was defined as an RA ratio exceeding one. As the magnitude of this gap increases, the nurses' perception of inappropriateness intensifies.

### 3.3.5 | Institution-level characteristics

We considered various institutional characteristics, including hospital level of care (tertiary hospital, general hospital, or hospital), the number of beds, ownership (public or private), and region (capital city, metropolitan area, or province). Hospital level of care classification in Korea is legally categorized into tertiary hospitals, general hospitals, and hospitals (hereafter referred to as "small hospitals" to distinguish from the general term "hospitals") based on bed capacity and departmental structure. Ownership is divided into public and private, where public-owned hospitals denote medical institutions owned and overseen by different levels of government entities, such as city, or district authorities. Private ownership, on the other hand, refers to medical institutions controlled by a legal entity distinct from a government agency such as an individual, an educational corporation. We divided the region into three types: the capital city (Seoul), metropolitan area, and province. Seoul is a mega city with a population exceeding 10 million, and metropolitan areas, designated by law and a total of six, refer to cities with a population exceeding 1 million.

### 3.3.6 | Nurse-level characteristics

Age, gender, total nursing years, employment type, daily overtime work, perceived nursing workload and satisfaction with wages were collected at the nurse level. The employment type can be either permanent employment or contractual employment. Overtime work per day was obtained by asking participants to report the duration of their average daily overtime work in minutes. Perceived nursing workload and wage satisfaction were assessed on a five-point scale: workload from 1 (very low) to 5 (extremely heavy), and wage satisfaction from 1 (very dissatisfied) to 5 (very satisfied).

## 3.4 | Data analysis

Descriptive statistics were used to analyze nurse and institution characteristics, reporting means and standard deviations (SD) for continuous variables and frequencies with percentages for categorical variables. The Student's *t*-test or Wilcoxon signed-rank test examined the differences between RP and AP at each designated staffing standard. The Wilcoxon rank-sum and Kruskal-Wallis tests assessed the RA ratio based on characteristics. Robust multivariate regression identified factors influencing the RA ratio. All statistical analyses were conducted with a significance level set at  $p < 0.05$ .

## 4 | RESULTS

### 4.1 | Descriptive statistics of study institutions and nurses

The descriptive statistics for the institutions and nurses are shown in Table 1. Tertiary hospitals accounted for 15.1% of the total, while

**TABLE 1** Descriptive statistics of study hospitals and nurses.

Level	Variable	Categories	N (%)	Mean ± SD
Hospital (N = 106)	Hospital level of care <sup>a</sup>	Tertiary hospital	16 (15.1)	
		General hospital	60 (56.6)	
		Small hospital	30 (28.3)	
	Ownership <sup>b</sup>	Public	23 (21.7)	
		Private	83 (78.3)	
	Region <sup>c</sup>	Capital city (Seoul)	20 (18.9)	
		Metropolitan area	39 (36.8)	
		Province	47 (44.3)	
	Number of beds	50–99	14 (13.5)	
		100–199	17 (16.3)	
		200–299	26 (25.0)	
		300–499	21 (20.2)	
		500–699	10 (9.6)	
700–999		11 (10.6)		
≥1000		5 (4.8)		
Nurse (N = 2312)	Gender	Male	84 (3.6)	
		Female	2228 (96.4)	
	Age	≤29	1634 (70.6)	28.7 ± 7.5
		30–39	520 (22.4)	
		40–49	134 (5.8)	
		≥50	28 (1.2)	
		Total nursing years	<1	325 (14.0)
		1 to <3	705 (30.4)	
		3 to <5	471 (20.3)	
		5 to <10	462 (20.1)	
		≥10	353 (15.2)	
		Employment type	Contractual employment	55 (2.4)
	Permanent employment		2257 (97.6)	
	Wage satisfaction	Very dissatisfied	545 (23.6)	
		Dissatisfied	1055 (45.6)	
		Moderate	645 (27.9)	
		Satisfied	66 (2.9)	
		Very satisfied	1 (0.0)	
	Workload <sup>d</sup>	Very low	2 (0.1)	
		Low	7 (0.3)	
		Moderate	691 (29.9)	
Heavy		1314 (56.9)		
Extremely heavy		297 (12.8)		
Overtime work per day (min) <sup>d</sup>	None	300 (13.0)	34.6 ± 34.7	
	≤30 min	1246 (53.9)		
	30 to ≤60 min	630 (27.3)		
	>60 min	135 (5.8)		

Abbreviation: SD, standard deviation.

<sup>a</sup>A small hospital is a medical facility equipped with more than 30 beds, a general hospital has over 100 beds with 7 or 9 or more specialized departments, each staffed by dedicated specialist physicians. A tertiary care hospital, specifically addressing severe illnesses, is an institution specializing in high-complexity medical procedures, featuring over 20 medical departments, each with dedicated specialist physicians, and providing opportunities for specialist training.

<sup>b</sup>Public ownership denotes medical institutions owned and overseen by different levels of government entities, such as city, county, or district authorities. Private ownership, on the other hand, refers to medical institutions controlled by a legal entity distinct from a government agency. This entity can take the form of an individual, an educational corporation, or any other nongovernmental organization.

<sup>c</sup>The metropolitan areas in Korea, totaling six (Busan, Incheon, Daegu, Daejeon, Gwangju, Ulsan), are legally designated metropolitan areas that are generally characterized by a population exceeding 1 million.

<sup>d</sup>n = 2311, missing (n = 1).

**TABLE 2** The reported number of assigned patients, the nurses' appropriate number of patients per nurse, and mean RA ratio by designated nurse staffing standard.

Hospital level of care	Designated nurse staffing standard	Reported number of assigned patients per nurse			Appropriate number of patients per nurse			MD	t or Z	p	RA ratio mean (SD)
		Mean	SD	95% CI	Mean	SD	95% CI				
Tertiary hospital	1:5 (n = 206)	6.2	2.6	5.8–6.5	4.9	0.8	4.8–5.0	1.3	11.28	<0.001*	1.27 (0.35)
	1:6 (n = 445)	7.7	2.5	7.5–8.0	5.9	2.0	5.7–6.1	1.8	16.38	<0.001*	1.36 (0.47)
General hospital	1:7 (n = 14) <sup>a</sup>	9.2	0.9	8.7–9.8	6.3	1.0	5.8–6.9	2.9	3.30	0.001**	1.50 (0.28)
	1:8 (n = 748)	11.2	5.6	10.8–11.6	8.0	3.6	7.7–8.3	3.2	22.68	<0.001*	1.45 (0.58)
	1:10 (n = 635)	16.7	8.7	16.0–17.4	11.6	6.7	11.1–12.1	5.1	23.76	<0.001*	1.54 (0.70)
Small hospital	1:12 (n = 15) <sup>a</sup>	25.2	13.4	17.8–32.6	16.6	7.2	12.6–20.6	8.6	3.33	0.005**	1.57 (0.76)
	1:10 (n = 41)	13.3	6.1	11.4–15.2	11.1	5.4	9.4–12.8	2.3	6.07	<0.001*	1.27 (0.34)
	1:12 (n = 206)	19.8	10.2	18.4–21.2	13.7	8.3	12.6–14.9	6.0	13.42	<0.001*	1.56 (0.66)
	1:14 (n = 2) <sup>a</sup>	21.3	8.0	50.7–93.3	10.7	3.8	23.2–44.5	10.7	1.34	0.180	2.28 (1.56)

Abbreviations: CI, confidence interval; MD, mean difference; SD, standard deviation.

<sup>a</sup>Wilcoxon signed-rank test.

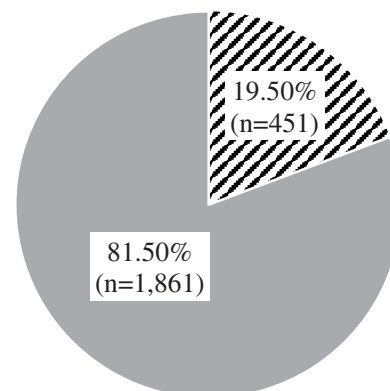
\* $p < 0.001$ ; \*\* $p < 0.01$ .

general hospitals made up 56.6%, and the remaining 28.3% were small hospitals. The majority of hospitals (78.3%) were privately owned, with 44.3% located in the province and 25% having 200–299 beds. Regarding the characteristics of nurses, the majority of them were female (96.4%), under the age of 29 (70.6%), permanent workers (97.6%), and had an average of 5 years of nursing experience. Most nurses (69.2%) responded as being very dissatisfied or dissatisfied with their wages, and approximately 70% of nurses reported having a heavy workload. The reported average amount of overtime work per day was 34.6 minutes.

## 4.2 | Comparison of RP and AP

Except for the designated nurse staffing level of 1:14 in the small hospital, there were significant differences between RP and AP in all designated staffing standards (Table 2). In a tertiary hospital with a 1:5 designated nurse staffing level, on average, nurses reported that 6.2 patients were assigned to them, but they perceived that 4.9 patients were appropriate per nurse (mean difference [MD] = 1.3,  $p < 0.001$ ). For a 1:6 designated staffing standard in a tertiary hospital, RP was 7.7, while AP was 5.9 (MD = 1.8,  $p < 0.001$ ). In 1:7 designated staffing general hospitals, RP was 9.2, but AP was 6.3 (MD = 2.9,  $p = 0.001$ ). According to the 1:8 designated staffing standard for a general hospital, there was an MD of 3.2 in patient numbers ( $p < 0.001$ ). In the designated staffing standard of 1:10 for general hospitals, RP was 16.7, whereas AP was 11.6 (MD = 5.1,  $p < 0.001$ ). In the 1:12 designation for general hospitals, RP was 25.2, while AP was 16.6 (MD = 8.6,  $p = 0.005$ ). In small hospitals where the designated staffing level was 1:10, RP was significantly higher than the AP (MD = 2.3,  $p < 0.001$ ). Similarly, in the small hospitals with designated staffing of 1:12, the mean difference between RP and AP was 6.0 ( $p < 0.001$ ). Nevertheless, for the small hospitals where the

Distribution of the RA Ratio



▣ ≤ 1 (Sufficient nurse staffing) ■ > 1 (Insufficient nurse staffing)

**FIGURE 2** Distribution of the RA ratio. The RP ratio represents the ratio between the reported number of assigned patients per nurse and the nurses' perceived appropriate number of patients per nurse. This ratio serves as an indicator of the extent to which nurses' professional judgment on staffing adequacy.

designated staffing level was 1:14, there was no significant difference between the two staffing levels ( $p = 0.180$ ).

## 4.3 | The RA ratio

The gap between RP and AP (RA ratio) was calculated by dividing RP by AP (Formula 1). The mean RA ratio was 1.45 (SD ± 0.59), and the proportion of RA ratio that was less than or equal to 1 was 19.5% (Figure 2). The mean RA ratio at each designated staffing standard is presented in Table 2. The mean RA ratio was lowest at the 1:5

designated nurse staffing standard in tertiary hospitals (Mean  $\pm$  SD, 1.27  $\pm$  0.35) and at 1:10 in small hospitals (Mean  $\pm$  SD, 1.27  $\pm$  0.34), and highest at 1:14 in small hospitals (Mean  $\pm$  SD, 2.28  $\pm$  1.56). The RA ratio varies based on gender, wage satisfaction, workload, employment type, hospital level of care, region, number of beds, overtime work, and total nursing years (Table 3).

#### 4.4 | Factors associated with RA ratio

The variables that significantly influenced the RA ratio were gender, wage satisfaction, workload, employment type, hospital level of care, and overtime work (Table 4). Every increase in wage satisfaction is associated with a decrease in the RA ratio by 0.048 ( $p < 0.001$ ). As for nurses' perceived workload, every increase in workload also increases the ratio by 0.139 ( $p < 0.001$ ). Compared with the contract nurses, the permanent nurses' RA ratio was 0.099 higher ( $p < 0.001$ ). Nurses who reported participating in overtime work had a higher RA ratio compared with those who did not engage in overtime work. In terms of hospital level of care, the RA ratio of tertiary hospitals was lower than that of small hospitals ( $p < 0.001$ ), and the RA ratio of general hospitals (0.049) was lower than that of small hospitals ( $p = 0.022$ ).

## 5 | DISCUSSION

### 5.1 | Discrepancy between nurses' perceived appropriate number of patients and reported number of assigned patients and factors related to the RA ratio

This study identified RP and AP according to the designated nurse staffing standard of the INCS policy in Korea and analyzed the RA ratio. We also assessed the factors that are linked with this ratio. As a result of our study, there were definite discrepancies between the RP and AP at each designated INCS staffing standard, except for the ratio of 1:14 in small hospitals. Since adopting the RA ratio for the first time in our study, direct comparisons were limited. We defined nurses' perception of appropriate staffing as a gap of one or less for comparison with other studies. In this study, 19.5% of nurses perceived staffing as adequate, surpassing previous findings of 10.2%–17.8% in NFDP wards, indicating a higher perceived staffing adequacy among Korean nurses (Cho et al., 2022; Cho, Mark, et al., 2017). This suggests that the INCS nurse staffing policy has a positive effect on nurses' perceived staffing adequacy.

From our study, the RA ratio, reflecting nurses' perceptions of staffing adequacy, was influenced by gender, employment type, workload perception, wage satisfaction, daily overtime hours, and hospital level. Notably, the RA ratio tends to decrease when the level of care in the hospital is elevated. This trend aligns with the research conducted by Kim and Choi (2017), which highlighted that a higher level of hospital care is associated with higher designated INCS staffing levels. This can be attributed to a reduction in the RA ratio, primarily achieved by decreasing the denominator of the RA ratio. Regarding

work-related characteristics, work type, workload, extended work hours, and wage satisfaction affect the RA ratio. Similar to prior research, our study demonstrates that heavy workloads and extended hours negatively impact nurses' perceptions of adequate staffing (Jawahir et al., 2021; Van der Mark et al., 2021). Our findings highlight that wage satisfaction influences perceptions of staffing adequacy, consistent with McHugh and Ma's (2014) emphasis on the critical role of wages in nursing outcomes. In conclusion, maintaining an appropriate workload for nurses is crucial in order to ensure that nurses perceive staffing as appropriate and to prevent potential negative effects. Nevertheless, in unavoidable situations of excessive workload, providing adequate financial compensation for their additional efforts becomes significant.

However, there was no association between nursing experience, age, and the RA ratio. Our findings differ from previous researchers, who suggested a potential link between nurses' skills and experience and their perception of staffing adequacy (Schmalenberg & Kramer, 2008; Veenstra & Gautun, 2021). As experienced nurses have higher competency in patient care than novice nurses (Karami et al., 2017), we anticipated they would consider a larger number of patients per nurse acceptable, thereby predicting lower RA ratio. This may be due to patient assignment practices in hospitals, where experienced nurses are assigned to patients with higher nursing needs and severity, while new nurses handle mild to moderate cases (Kim, Kim, et al., 2021). Because patient severity negatively affects the perception of appropriate nurse staffing (Mark et al., 2002), the impact of nursing experience and age on the RA ratio was influenced by patient assignment tendencies in clinical settings.

### 5.2 | Discrepancy between the designated maximum number of patients and RP

Interestingly, there were notable differences in the required maximum number of patients designated by INCS policy and the RP. This result is consistent with previous studies that reported a larger number of patients per nurse than the staffing standard (Park & Hwang, 2021; Shin, Oh, et al., 2020). The discrepancy observed can be ascribed to the practice of nurses attending to both discharged and admitted patients during the same shift. It is plausible that nurses working in a surgical ward with a significant influx of admissions and discharges are more prone to reporting in this manner. The difference becomes larger when the level of care in the hospital is lower, and the designated nurse staffing level is also worse within the same level of care. We infer that those small differences (e.g., 1 or 2 patients) result from the INCS nurse staffing calculation criteria. Unlike the California nurse staffing legislation, which includes only frontline nurses (Aiken et al., 2010), Korea's INCS nurse staffing policy includes all nursing staff when calculating the nurse-to-patient ratio. For example, in a ward with 5 staff nurses, 1 head nurse, and 30 patients in a shift, according to Korea INCS standards, the nurse-to-patient ratio is 1:5. However, if only the direct caregiving nurses are included, the ratio will change to 1:6, which is slightly different from the standard nurse-

**TABLE 3** The RA ratio categorized by nurse-level and institution-level characteristics.

Category	n	Mean	SD	$\chi^2$ or Z	p
Total	2312	1.45	0.59		
Gender <sup>a</sup>					
Male	84	1.51	0.43	2.52	0.012***
Female	2228	1.44	0.60		
Age <sup>b</sup>					
≤29	1634	1.43	0.56	4.46	0.216
30–39	517	1.48	0.66		
40–49	133	1.53	0.69		
≥50	28	1.52	0.72		
Total nursing years <sup>b</sup>					
<1	325	1.46	0.76	17.62	0.002**
1–<3	705	1.40	0.48		
3–<5	471	1.50	0.62		
5–<10	461	1.45	0.48		
≥10	350	1.46	0.70		
Wage satisfaction <sup>b</sup>					
Very dissatisfied	545	1.58	0.62	132.17	<0.001*
Dissatisfied	1055	1.44	0.58		
Moderate	645	1.36	0.58		
Satisfied	66	1.18	0.27		
Very satisfied	1	2.50	0.0		
Workload <sup>b,c</sup>					
Very low	2	1.50	0.71	415.03	<0.001*
Low	7	1.24	0.36		
Moderate	691	1.21	0.32		
Heavy	1314	1.49	0.55		
Extremely heavy	297	1.80	0.93		
Employment type <sup>a</sup>					
Permanent employment	2257	1.45	0.59	–3.00	0.003**
Contractual employment	55	1.36	0.61		
Overtime work (per day) <sup>b,c</sup>					
None	300	1.30	0.45	96.99	<0.001*
≤30 min	1246	1.42	0.55		
30 min–≤60 min	630	1.53	0.63		
>60 min	135	1.62	0.87		
Hospital level of care <sup>b</sup>					
Small hospital	249	1.52	0.64	48.30	<0.001*
General hospital	1412	1.49	0.64		
Tertiary hospital	651	1.33	0.44		
Ownership <sup>a</sup>					
Public	598	1.46	0.59	0.86	0.392
Private	1714	1.44	0.59		
Region <sup>b</sup>					
Capital city (Seoul)	478	1.34	0.43	22.96	<0.001*
Metropolitan area	960	1.45	0.64		
Province	874	1.50	0.61		



TABLE 3 (Continued)

Category	n	Mean	SD	$\chi^2$ or Z	p
Number of beds <sup>b</sup>					
50–99	99	1.37	0.37	81.81	<0.001*
100–199	268	1.58	0.75		
200–299	359	1.59	0.72		
300–499	514	1.47	0.64		
500–699	459	1.43	0.53		
700–999	416	1.34	0.44		
≥1000	197	1.25	0.33		

<sup>a</sup>Wilcoxon rank-sum test.

<sup>b</sup>Kruskal–Wallis test.

<sup>c</sup>n = 2311, missing (n = 1).

\*p < 0.001; \*\*p < 0.01; \*\*\*p < 0.05.

TABLE 4 Factors related to the RA ratio.

Category	RA ratio <sup>a</sup>			
	Estimate	Robust SE	t	p
Gender (ref. Male)				
Female	−0.114	0.033	−3.48	0.001**
Age	0.002	0.002	1.11	0.265
Total nursing years (ref. <1 year)				
1–<3	−0.001	0.019	−0.05	0.956
3–<5	0.036	0.021	1.71	0.088
5–<10	0.042	0.022	1.88	0.060
≥10	0.030	0.030	1.00	0.318
Wage satisfaction	−0.048	0.008	−6.00	<0.001*
Workload	0.140	0.011	12.59	<0.001*
Employment type (ref. contractual employment)				
Permanent employment	0.099	0.00	2.45	0.014***
Overtime work (ref. No overtime)				
≤30 min	0.042	0.018	2.31	0.021***
30–≤60 min	0.072	0.022	3.33	0.001**
>60 min	0.097	0.031	3.19	0.001**
Hospital level of care (ref. Hospital)				
Tertiary hospital	−0.095	0.022	−4.17	<0.001*
General hospital	−0.049	0.021	−2.29	0.022**
Ownership (ref. Public)				
Private	−0.022	0.016	−1.38	0.167
Region (ref. Capital city)				
Metropolitan area	0.026	0.015	1.71	0.087
Province	0.014	0.018	0.77	0.442
Intercept	0.848	0.085	10.02	<0.001*

Note: The values in RA ratio of over 2.0 or under 0.5 were excluded in the regression analyses to avoid the effect of outliers (N = 2132). The number of beds was excluded due to multicollinearity.

Abbreviation: SE, standard errors.

<sup>a</sup>Regression model statistics:  $F(p) = 27.45 (<0.001)$ ,  $R^2 = 0.186$ .

\*p < 0.001; \*\*p < 0.01; \*\*\*p < 0.05.

to-patient ratio. While teamwork is essential, the primary roles of head and charge nurses involve administrative tasks and overseeing overall nursing care rather than directly caring for assigned patients. It is necessary to establish separate staffing regulations or excluding head nurses or charge nurses who do not directly care for patients, when estimating the nurse-to-patient ratio (Cho, Song, et al., 2017). Victoria state's nurse staffing requirements (Health and Human Services of Victoria State Government, 2015), which differentiate between direct care nurses and charge nurses, thereby establishing specific guidelines for each role, could serve as a reference for consideration. On the other hand, the relatively large differences reported in general hospitals and small hospitals were derived from the nursing delivery system. According to the nursing delivery system of the ward, the response to the nurse-to-patient ratio may vary. Generally, nurses' responses regarding the number of assigned patients per nurse in a functional delivery system tend to be larger than in other nursing delivery systems (Kim et al., 2010). Due to the challenges in hiring nurses, general hospitals and small hospitals located in small cities or rural areas have adopted a functional nursing delivery system instead of team nursing to enhance nursing efficiency (Kim & Choi, 2017). As we demonstrated above, there is a possibility of measurement bias in the data reported by nurses. However, we cannot rule out the risk that the actual number of patients per nurse exceeds the number of patients per nurse designated by NHIS as hospitals could over-report the number of employed nurses to receive higher payments (Morioka et al., 2017). In fact, between 2019 and 2022, seven institutions were discovered to have falsely exaggerated the INCS nursing staff (Park, 2022). As the compliance status of INCS nurse staffing is primarily based on employment and inpatient data submitted by medical institutions, it is important to consider the potential for adverse effects such as false or inflated reporting (Kim et al., 2022). To prevent false claims, strong legal sanctions are necessary (Morioka et al., 2017). Currently, institutions under the INCS policy face a 10% reduction in nursing fees for noncompliance with nurse-to-patient ratios (NHIS, 2023). This disincentive policy is ineffective because the cost recovery rate for INCS nursing fees is set at a minimum of 120% (Park, 2023). We recommend enforcing fines or penalties more rigorously and implementing practical on-site staffing level monitoring to ensure compliance.

### 5.3 | Discrepancy between the designated maximum number of patients and AP

Another interesting result pertains to various findings comparing the appropriate number to the maximum number based on designated staffing standards across different levels of care in hospitals. In tertiary hospitals, appropriate nurse staffing generally aligns with designated levels. This aligns with previous research, indicating that the appropriate number of patients per INCS ward in tertiary hospitals ranges between 4.6 and 6.1 (Cho, Song, et al., 2017). General hospitals showed diverse results due to varying patient compositions and institutional characteristics. Nurses under the 1:7 staffing standard

suggested a 1:6.3 ratio, aligning with previous studies advocating for an improved ratio of 1:6. (Cho, Song, et al., 2017). On the other hand, when designated nurse staffing is set at a ratio of 1:10 and 1:12, the appropriate number of patients exceeds the maximum number of patients. In small hospitals, the appropriate number of patients per nurse also exceeds the maximum number recommended in the designated nurse staffing standard of 1:10 to 1:12. This might be caused by measurement bias resulting from the use of functional nursing delivery service, which is prominently used in small- and medium-sized hospitals. Another potential explanation for this could be attributed to the characteristic of patients primarily admitted with higher caregiving needs rather than nursing needs. Kim et al. (2018) found that INCS wards in small hospitals primarily consist of musculoskeletal patients who require greater assistance from nursing assistants in activities of daily living, in contrast to tertiary hospital patients, who are predominantly cancer patients who need registered nurses' assistance. Further, nurses and patients at the medical institution reported that patients who are unable to manage their urinary and bowel functions or require regular suction are excluded from being hospitalized in the INCS ward (Kim, 2023). Based on the regulation, there are no exclusion criteria for INCS admission, which is possible with the physician's order and the patient's consent (NHIS, 2023). In some cases, medical institutions may exclude certain patients from admission to INCS wards for operational convenience. This may include patients who are relatively unstable, unable to use call bells, or require the presence of a guardian due to conditions like delirium or dementia. This highlights the need to examine operational practices in healthcare institutions, such as excluding admissions based on certain standards like patient severity. In addition to assessing operational practices, further research is needed to investigate the effectiveness of staffing levels exceeding 1:10 in delivering safe nursing care in INCS.

### 5.4 | Strengths

One of the key strengths of this study is its status as the largest investigation to date concerning INCS nurse staffing standards, encompassing approximately 20% of the participating institutions. Additionally, we introduced the RA ratio, which quantifies the level of understaffing perceived by nurses and subsequently incorporates it into nursing research efforts.

### 5.5 | Limitations

This study has certain limitations. Due to the cross-sectional design of the study, it is not possible to establish causal relationships. Additionally, there may be bias in measuring nurse staffing due to the reliance on self-reported survey data. The medical institution data used in our analysis were obtained from the second quarter of 2020, whereas the nurse survey was conducted during the third quarter of the same year, from August 17 to September 11. Originally, data

collection was planned for the second quarter, but delays due to the COVID-19 pandemic disrupted collaboration with medical institutions, leading to a temporal mismatch between datasets. While institutional variables such as the number of beds and geographical location are less prone to temporal fluctuations, which minimizes the likelihood of compromising the robustness of research outcomes, future studies may benefit from aligning the timing of combined data sets.

## 6 | CONCLUSIONS

Our research evaluated the adequacy of INCS nurse staffing levels by comparing AP and RP. The findings showed that nurses perceive staffing as inadequate as RP exceeds AP. Remarkably, RP even surpasses the NHIS's maximum limit. Closing this gap is crucial to preventing negative impacts on nurse and patient outcomes.

## 7 | RELEVANCE FOR CLINICAL PRACTICE

Our study suggests that nurses perceive that hospitals are not meeting appropriate staffing levels, as indicated by a mean RA ratio of 1.45. To prevent potential negative effects on nurse and patient outcomes, policymakers should strive to reduce the disparity between the assigned number of patients and the number of patients per nurse that nurses perceive as appropriate. A solution to this problem involves establishing a robust monitoring system within healthcare institutions to ensure compliance with designated staffing levels. The other way is to focus on the factors that are associated with the RA ratio, such as wage satisfaction, workload, and overtime work hours. Policymakers should improve reward policies and implement measures to prevent excessive workloads and overtime.

### AUTHOR CONTRIBUTIONS

**Hyunjeong Kwon:** Conceptualization; methodology; data curation; formal analysis; validation; visualization; writing – original draft; writing – review and editing. **Jinhyun Kim:** Conceptualization; methodology; validation; supervision; funding acquisition; writing – review and editing; writing – original draft; project administration; resources.

### ACKNOWLEDGMENTS

The authors would like to acknowledge and thank all the nurses and institutions who participated in the study. Also, all authors appreciate the cooperation of National Health Insurance Service and grateful to the anonymous reviewers and editors for their considerate reviews and suggestion for this manuscript.

### FUNDING INFORMATION

This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (No. 2021R1A2C200662511) and funded by National Health Insurance Service (NHIS).

### CONFLICT OF INTEREST STATEMENT

The authors declare that there are no conflicts of interests.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

### ETHICS STATEMENT

This secondary research work received ethical approval from the Institutional Review Board at Seoul national university (No. E2112/003-005).

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**FORMULA 1.** The discrepancy between the reported number of assigned and perceived appropriate number of patients per nurse (RA ratio)

$$RA\ ratio = \frac{RP}{AP}$$

RP = the number of assigned patients per nurse reported by nurses.

AP = the number of appropriate patients per nurse by nurses' perception.

#### SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Kwon, H., & Kim, J. (2024). A comparative analysis of nurses' reported number of patients and perceived appropriate number of patients in integrated nursing care services. *Nursing & Health Sciences*, 26(3), e13156. <https://doi.org/10.1111/nhs.13156>