

ORIGINAL ARTICLE

Impact evaluation of nurse staffing policy reform in Korea: A quasi-experimental study

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Abstract

Aim: This study aims to evaluate the new nursing policy's effect on improving overall nurse staffing levels in Korean acute care hospitals.

Background: The Korean government introduced the Integrated Nursing and Care Service policy, which adopted advanced staffing standards. Under the new scheme, reimbursement of nursing fees was differentiated by the patient-to-nurse ratios, and financial incentives were provided to policy participating hospitals to promote additional employment in overall hospitals.

Methods: We analysed 1362 acute care hospitals. The probability and degree of improving nurse staffing levels for each hospital were examined using a two-part model. Whether policy participation had affected to improve nurse staffing levels was evaluated by the difference-in-difference approach.

Results: Policy participating hospitals were 3.89 times more likely to enhance nurse staffing levels compared to non-participating hospitals. The policy participation effect was found to improve average nurse staffing levels by 1.12 grades.

Conclusion: Korean nurse staffing policy reform was successful to encourage hospitals to improve their overall nurse staffing levels.

Implication for Nursing Management: Nursing leaders and policymakers should understand that providing incentives could affect hospitals' employment behaviour change under the market-oriented healthcare system. For developing future nursing policies, these strategies should be considered appropriately.

KEYWORDS

evaluation, healthcare reform, health policy, nurse staffing, staffing level

1 | BACKGROUND

Adequate nurse staffing is essential to provide safe and qualified nursing care. Numerous studies supported the positive relationship between nurse staffing levels in acute care hospitals and patient outcomes (Kane et al., 2007), but fewer studies were concerned with how to elevate the hospitals' nurse staffing levels.

Characteristics of hospitals, such as the magnitude (e.g. number of beds, medical equipment, physicians and nurses), ownership (public), location (metropolitan area) and bed occupancy rate, showed association with high staffing levels in hospitals (Cho et al., 2008; Choi et al., 2015; Hong & Cho, 2017). However, the magnitude of the hospital is not directly an associated factor, but the case mix of patients and nursing care needs tends to be high for bigger

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hospitals, resulting in the difference in nurse staffing levels (Mark et al., 2000).

From a macro perspective, the market structure of the healthcare system where hospitals belong should be considered (Kim et al., 2007; Robinson, 1988). In the market-oriented healthcare system, hospitals highly tend to reduce the labour costs for nurses, which account for the majority of hospital expenditure (Kim & Kim, 2012). Accordingly, there is no choice but to take care of the maximum number of patients with the minimum number of nurses. Such a poor working environment not only adversely affects the care quality but also affects nurses to increase job dissatisfaction, exhaustion and intention to leave (Nantsupawat et al., 2017). To break the vicious cycle, regulations and public interventions that encourage hospitals to recruit and retain more nurses are needed.

Policies to secure a sufficient number of nurses in hospital have been a challenge in many countries. In 2004, California state in the United States introduced mandated minimum patient-to-nurse ratios in acute care hospitals (e.g. 5:1 for medical/surgical, 4:1 for specialty care and 2:1 for critical care per shift). This strong legal regulation had led California hospitals to elevate nurse staffing levels to meet the legal standard and increased the direct nursing hours of registered nurses (RNs) (Donaldson & Shapiro, 2010). Other than mandating policy, economic incentives that reimburse higher nursing fees to hospitals with higher nurse staffing could be an effective strategy. Japan adopted the inpatient nursing fee schedule, which is differentiated by the nurse staffing standards for each functional category of inpatient wards and the proportion of RNs among nursing staff. The two times revisions of the nurse staffing standard in 2000 and 2006 were successful to increase the overall nurse staffing levels in Japanese hospitals (Noguchi, 2015).

The Korean Medical Service Act clearly stated the minimum number of patients per RN in acute care hospitals (2.5:1 daily patient census per RN). Due to lack of substantial penalties and reimbursing fees to hospitals that could not meet the legal standards, the compliance rate was very low, and only 63% of general hospitals and 19% of hospitals had complied as of 2013 (Cho et al., 2016; Kim et al., 2007; Shin et al., 2020). Therefore, the National Health Insurance Service (NHIS) introduced the nursing fee differentiation policy (hereafter, NFDP) in 1999. Under the NFDP, hospitals get economic rewards according to the nurse staffing grades determined by bed-to-RN ratios (Kim & Kim, 2012). After 10 years of implementing the NFDP, most tertiary hospitals and 45% of general hospitals improved their nursing grades, but only 7% of small/medium-sized hospitals improved (Cho et al., 2008). The effect of the NFDP had fragmented, but it was notable that hospitals started to take measures to secure more nurses responding to the financial incentives.

In 2007, the disincentive system was added to prevent hospitals with low competitiveness from not reporting their nursing grade, rather motivate them to elevate their nurse staffing level. In hospitals with the lowest nursing grade or lower, a 5% reduction in nursing fees were applied in the metropolitan areas and a 2% reduction in other areas except for medically vulnerable areas. For the results, 32% of hospitals improved the overall nurse staffing levels in 2016 compared

to 2008, as well as 59% of general hospitals and 70% of tertiary hospitals improved (Hong & Cho, 2017). Moreover, hospitals that have experienced forced cut-offs were more likely to enhance nursing grades than non-reduced hospitals. However, the policy effect was still insignificant in small/medium-sized hospitals (Kim et al., 2010). With these results, it was argued that incentives should be increased to encourage small/medium-sized hospitals to reinvest their surpluses for additional employment. In addition, the need for subdivided classification of nursing grades reflecting the patient's severity and changing the calculation criteria from bed-to-RN ratios to patient-to-RN ratios was suggested (Hong & Cho, 2017; Kim & Kim, 2015).

Reflecting the preceding needs for nurse staffing policy reforms, the NHIS launched a pilot project of integrated nursing and care service (hereafter, INCS) in 2015. The INCS adopted an advanced standard of staffing level than NFDP and reimbursed higher nursing fees including additional incentives. Furthermore, the staffing standards not only for RNs but also for nursing assistants and ward staff were specified. All nursing fees were differentiated according to the hospital type and combination of patient-to-RN ratios and patient-to-NA or ward staff ratios (Kim et al., 2018; NHIS, 2020). Participation in the INCS was optional. Thus, hospitals with sufficient nursing workforce were motivated to transform the general wards into INCS wards to receive higher fees under the new policy. The biggest difference from the existing policies was that hospitals with below minimum staffing level cannot participate in the policy and therefore cannot receive the policy incentives too (Kim et al., 2020; NHIS, 2020).

Before introducing INCS, the Korean nursing system had heavily relied on informal caregivers, such as families, friends and paid caregivers. However, INCS spurred a change towards the full nursing system (Yi & Kim, 2021). Although the policy participation rate has steadily increased since 2015, it was still 20.6% as of 2020 (Kim et al., 2020). To expand the INCS to all hospitals nationwide, nursing workforces in the clinical field should be supplemented. Therefore, it is time to evaluate whether the benefits provided to the INCS policy participating hospitals have been properly allocated into the employment of additional nurses in general wards in Korean hospitals. To evaluate the policy effect, this study compared the changes in the level of nurse staffing in general wards between policy participating and non-participating hospitals during 2017–2019. Furthermore, factors associated with nurse staffing level improvement and the causal effect of policy participation on hospitals' general nurse staffing levels were evaluated.

2 | METHODS

2.1 | Data sources

The NHIS provided acute care hospitals' general characteristics and participation status of the INCS scheme. Each hospital's nursing grade in general wards was obtained with the cooperation of the Health Insurance Review and Assessment (HIRA).

2.2 | Study subject

Every acute care hospital eligible to participate in the INCS policy, according to Article 4-2 of the Korean Medical Service Act, was considered as the study population. Among them, the following hospitals with special purposes were excluded: (a) long-term care hospitals, (b) dental hospitals, (c) oriental medicine hospitals, (d) mental hospitals and (e) military health and medical service institutions. Additionally, hospitals that have less than 30 beds, closed, not reimbursed from the NHIS and in the bond foreclosure states were excluded. After eliminating hospitals without the nursing grade data, 1362 hospitals were finally selected as study subjects.

2.3 | Measurement

2.3.1 | Outcome variable

We used the nurse staffing levels in general wards as an outcome variable to examine whether policy incentives led to overall additional employment of nurses in Korean acute care hospitals. The nurse staffing level in general wards was measured with the scale of adjusted nurse staffing grade (hereafter, nurse staffing grade) borrowing the NFDP standards (Kim & Kim, 2015) (Table 1). In NFDP, the bed-to-RN ratios in general wards (dividing the total number of beds by the total number of full-time equivalent RNs working in hospitals) were categorized into six grades—tertiary hospitals—and seven grades—general hospitals and hospitals. To compensate for the one-grade difference between tertiary hospitals and others, we unified the scale based on the bed-to-RN ratios as follows: Grade 1 (less than 2.0), Grade 2 (2.0 to less than 2.5), Grade 3 (2.5 to less than 3.0), Grade 4 (3.0 to less than 3.5), Grade 5 (3.5 to less than 4.0), Grade 6 (4.0 to less than 4.5), Grade 7 (4.5 to less than 6.0) and Grade 8 (6.0 and more). If the hospital did not report the nurse staffing grade, it is classified as the lowest grade.

TABLE 1 Adjusted nurse staffing grade scale

Adjusted nurse staffing grade (bed-to-RN ratios)	Existing nurse staffing grade in NFDP (bed-to-RN ratios)	
	Tertiary hospitals	General hospitals/Hospitals
Grade 1 (<2.0)	Grade 1 (<2.0)	N/A
Grade 2 (<2.5)	Grade 2 (<2.5)	Grade 1 (<2.5)
Grade 3 (<3.0)	Grade 3 (<3.0)	Grade 2 (<3.0)
Grade 4 (<3.5)	Grade 4 (<3.5)	Grade 3 (<3.5)
Grade 5 (<4.0)	Grade 5 (<4.0)	Grade 4 (<4.0)
Grade 6 (<4.5)	Grade 6 (≥4.0)	Grade 5 (<4.5)
Grade 7 (<6.0)	N/A	Grade 6 (<6.0)
Grade 8 (≥6.0)	N/A	Grade 7 (≥6.0)

Abbreviations: NFDP, Nursing Fee Differentiation Policy; RN, registered nurse.

2.3.2 | Independent variable

The participation status of the INCS policy was dichotomized into participation and non-participation as of 2019.

2.3.3 | Covariates

Hospital type (tertiary hospital/general hospital/hospital), ownership (public/private), number of beds and geographical locations (metropolitan/nonmetropolitan area, urban/rural area) were selected as covariates. Hospitals located in Seoul, Incheon, and Gyeonggi province were classified as metropolitan areas, and rural areas are categorized as the medically vulnerable area designated in Article 12 of the Public Health and Medical Service Act.

2.4 | Statistical analysis

Descriptive statistics were calculated using frequency, percentage, mean and standard deviation to explain the characteristics of the sample hospitals and nurse staffing levels. The chi-square test and *t*-test were conducted to compare the hospital characteristics and nurse staffing grades by policy participation status. The distribution of nurse staffing grades in the fourth quarter of 2017 and 2019 were displayed in histograms with mean and standard deviation.

We used a two-part model (TPM) to identify the factors predicting the improvement of nurse staffing levels. The difference in nurse staffing grades between 2017 and 2019 was used as the dependent variable in the analysis. In the first part, the probability of nurse staffing grade improvement was estimated by logistic regression with a binary outcome of positive-versus-zero (improved vs. sustained/worsen). In the second part, conditional on positive outcomes, an ordinary least square regression analysis was conducted to estimate the factors affecting the degree of improvement (Belotti et al., 2015).

$$\text{Model 1 (1st part)} : \text{Ln}\left(\frac{P}{1-P}\right) = \beta_1 + \beta_2 P_i + \beta_3 X_i + \varepsilon_i$$

$$\text{Model 2 (2nd part)} : (Y|Y > 0) = \beta_1 + \beta_2 P_i + \beta_3 X_i + \varepsilon_i$$

(*P* : probability of improving the adjusted nurse staffing grade by more than one grade, *Y* : degree of improvement of adjusted nurse staffing grade, *P_i* : participation in the INCS policy, *X_i* : control variables, ε_i : error terms)

To evaluate the causal effect of the INCS policy participation on improving the hospital's nurse staffing levels, the difference-in-difference (DID) approach was applied. Applying the non-equivalent control group study design, 120 hospitals that consistently participated in the INCS policy from 2017 to 2019 were selected as a treatment group from the 427 participating hospitals. Nine hundred thirty-five non-participating hospitals were selected for the control group. The nurse staffing grade in general wards in the fourth quarter of

TABLE 2 Study subject's characteristics and policy participation status

Variable	Total (N = 1362)	Participating hospitals (n = 427)	Non-participating hospitals (n = 935)	X ² /t	p
Hospital type				412.4	.000
Tertiary hospital	42 (3.1)	42 (9.8)	0 (0.0)		
General hospital	279 (20.5)	204 (47.8)	75 (8.0)		
Hospital	1041 (76.4)	181 (42.4)	860 (92.0)		
Ownership				129.2	.000
Public	89 (6.5)	76 (17.8)	13 (1.4)		
Private	1273 (93.5)	351 (82.2)	922 (98.6)		
Number of beds				509.0	.000
30–49 beds	265 (19.4)	0 (0.0)	265 (28.3)		
50–99 beds	436 (32.0)	58 (13.6)	378 (40.4)		
100–299 beds	494 (36.3)	215 (50.4)	279 (29.8)		
300–999 beds	151 (11.1)	138 (32.3)	13 (1.4)		
≥1000 beds	16 (1.2)	16 (3.7)	0 (0.0)		
Metropolitan areas				3.9	.050
Non-metropolitan	840 (61.7)	247 (57.8)	593 (63.4)		
Metropolitan	522 (38.3)	180 (42.2)	342 (36.6)		
Medical vulnerability				24.8	.000
Urban area	1205 (88.5)	405 (94.8)	800 (85.6)		
Rural area	157 (11.5)	22 (5.2)	135 (14.4)		
Nurse staffing grade					
4th quarter of 2017	6.6 ± 2.0	5.1 ± 2.2	7.3 ± 1.4	23.2	.000
4th quarter of 2019	5.4 ± 2.6	3.6 ± 1.9	6.3 ± 2.3	20.6	.000

2017 and 2019 was used as the dependent variable in the analysis. Regression analysis with dummy variables was performed (Abadie, 2005).

$$y_{st} = \beta_1 + \beta_2 D_s + \beta_3 D_t + \beta_4 D_s D_t + \varepsilon_{st}$$

(y_{st} : adjusted nurse staffing grade, β_2 : selection bias, β_3 : time effect, β_4 : policy effect), ε_{st} : error terms

In the above equation, D_s is a dummy variable representing the INCS policy participation (1 = participation, 0 = non-participation), D_t indicates the pre-and post-policy period (1 = 2019, 0 = 2017), and $D_s D_t$ is the interaction term between the group dummy and the time dummy.

2.5 | Ethical consideration

Hospital identification was provided with meaningless serial numbers to protect sensitive information. Using hospital-unit data and not targeting human beings for study obtained the exemption of the ethical review from the Seoul National University Institutional Review Board (IRB No. E2012/001-008).

3 | RESULTS

Table 2 shows the characteristics of the study subjects. Majority of the hospitals were privately owned (93.5%), had less than 100 beds (51.4%) and were located in the non-metropolitan (61.7%) and urban areas (88.5%). Four hundred twenty-seven out of 1362 hospitals participated in the policy. All tertiary hospitals participated in INCS. The proportion of general hospitals to hospitals was almost the same in participating hospitals (47.8% and 42.4%, respectively), but 92% of hospitals are accounted for non-participating hospitals. Compared to non-participating hospitals, the participating hospitals had higher proportion of public-owned (17.8% vs. 1.4%), with larger scale, and located in the metropolitan (42.2% vs. 36.3%) and urban (94.8% vs. 85.6%) area. The overall nurse staffing level was higher in participating hospitals than in non-participating hospitals. The average nurse staffing grades in participating hospitals were 5.1 in 2017 and 3.6 in 2019, while non-participating hospitals were 7.3 in 2017 and 6.3 in 2019 (Table 2).

Figure 1 presents the distribution of nurse staffing grades for 2017 and 2019 was distinguished by hospital type. Tertiary hospitals had the highest staffing level that densely clustered in high grades of Grade 1 (bed-to-RN ratio = less than 2.0) to Grade 3 (bed-to-RN ratio = 2.5 to less than 3.0). On the other hand, general hospitals and

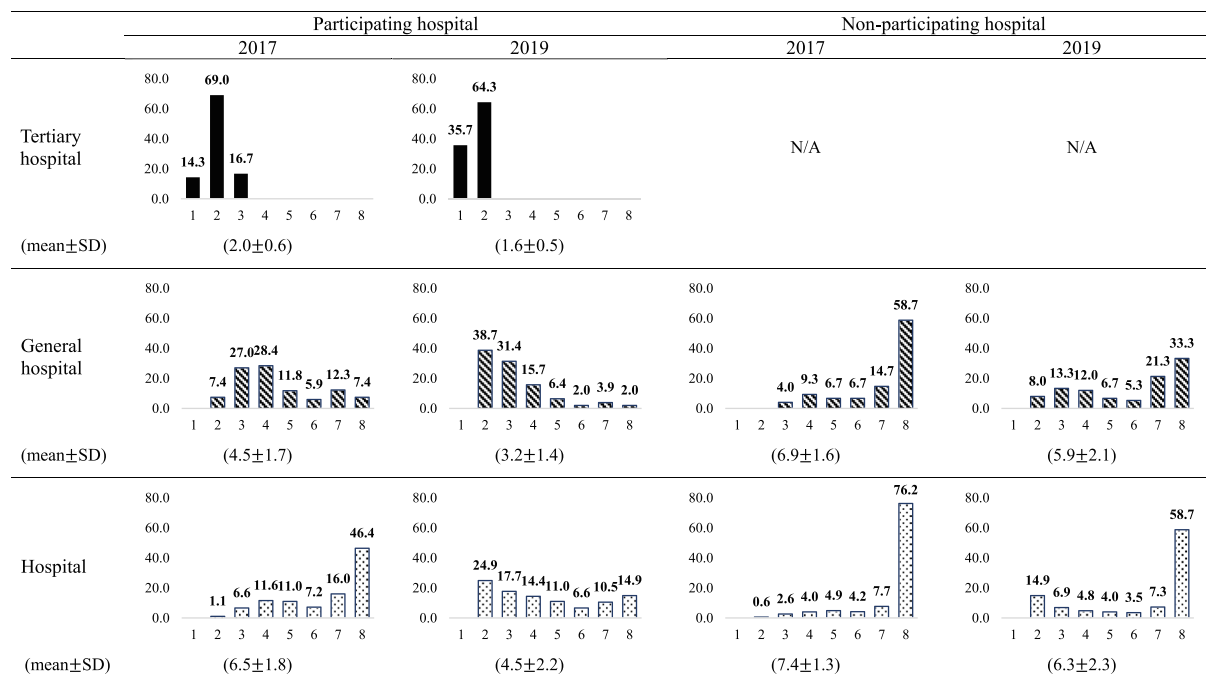


FIGURE 1 Distribution of nurse staffing grades by hospital type and policy participation [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

hospitals were widely spread from Grade 2 (bed-to-RN ratio = 2.0 to less than 2.5) to Grade 8 (bed-to-RN ratio = more than 6.0). We found the average nurse staffing grade in 2019 was higher than in 2017 in all types of hospitals, regardless of policy participation. Notably, the proportion of the lowest grade (Grade 8; bed-to-RN ratio = more than 6.0) had significantly declined for both participating and non-participating hospitals. But the degree of nurse staffing grade improvement was higher in participating hospitals (Figure 1).

The TPM results exhibited that policy participation increased the odds of improving the nurse staffing grades in hospitals by 3.89 times. Among the medical institutions that improved their nurse staffing levels, the degree of improvement was higher for participating hospitals by 0.28 grades compared to non-participating hospitals; however, it was not statistically significant with a 95% confidence interval ($p = .056$). Besides, hospital type (being a hospital) and regional locations (located in non-metropolitan or urban areas) were strongly related to an increment in nurse staffing levels, even after controlling for policy participation status (Table 3).

The result of the DID analysis proved the causal relationship between the INCS policy participation and the increase in nurse staffing levels in Korean acute care hospitals. After controlling the selection bias and time effect, the net effect of the policy was found to improve the overall nurse staffing levels by 1.12 grades on average (Table 4).

4 | DISCUSSION

This is the first study to explore how the INCS policy affected the overall nurse staffing levels in Korean acute hospitals. The Korean government has implemented various policies for years, such as

expanding the quota of nursing schools, increasing re-employment through the education of idle nurses and differentiating the inpatient nursing fees. However, past policies have failed to secure appropriate nursing personnel in the clinical field and only showed partial effects by leaving small medical institutions in remote areas vulnerable (Cho et al., 2008; Hong & Cho, 2017; Kim & Kim, 2015). This study has significance in proving the INCS policies: Adopting a mixture of the financial incentive system and strict regulation for reimbursement had successfully increased the overall nurse staffing levels for policy participating hospitals.

It was estimated that the financial surplus caused by policy incentives was returned to use for employing additional nurses in general wards; in the end, it had elevated overall nurse staffing grades in INCS participating hospitals. The hospitalization fee system for INCS consists of the 'hospitalization fee (53%)' and 'nursing fee (47%)', and policy incentives are added to each fee. In addition, special incentives are provided to hospitals hiring night-shift dedicated nurses (30%) or hospitals located in medically vulnerable areas (8%–8.5%) (NHIS, 2020). The cost preservation rate of the INCS scheme was reported as 129.6%–139.4% for tertiary hospitals, 121.4%–132.0% for general hospitals and 120.4%–132.6% for hospitals (Kim et al., 2020). Therefore, it was expected that the revenue from the INCS scheme sufficiently exceeds the hospitals' expenses including labour costs, material costs and management costs. Besides, this policy incentive was also effective to expand INCS wards in acute care hospitals, which in turn increased the number of RNs and NAs who were directly employed in INCS wards. The total effect of employment-inducing of INCS was found to be 3.1–6.1 times higher than those in similar industries (Kim et al., 2021).

TABLE 3 Associated factors for improving the nurse staffing levels and degree of improvement

Variables	Improvement probability of nurse staffing grade ^a (n = 1362)			Degree of improvement ^b (n = 653)		
	OR	(95% CI)	p	β	(95% CI)	p
Constant	0.10	(0.03–0.31)	0.000	1.12	(0.60–1.82)	.000
Policy participation (ref. non-participation)						
Participation	3.89	(2.80–5.40)	0.000	0.28	(–0.01–0.56)	.056
Hospital type (ref. Hospital)						
Tertiary hospital	0.47	(0.18–1.23)	0.124	–0.75	(–1.17 to –0.34)	.000
General hospital	2.16	(1.42–3.29)	0.000	–0.36	(–0.68 to –0.03)	.030
Ownership (ref. Public)						
Private	0.73	(0.40–1.33)	0.302	–0.22	(–0.57–0.14)	.239
Number of beds (ref. ≥ 1000 beds)						
300–999 beds	1.58	(0.46–5.40)	0.465	0.34	(0.03–0.65)	.034
100–299 beds	2.54	(0.67–9.57)	0.168	1.04	(0.62–1.45)	.000
50–99 beds	3.64	(0.93–14.21)	0.063	1.93	(1.39–2.48)	.000
30–49 beds	2.88	(0.73–11.43)	0.132	2.25	(1.64–2.86)	.000
Metropolitan area (ref. Metropolitan)						
Non-metropolitan	1.68	(1.31–2.15)	0.000	0.34	(0.11–0.57)	.004
Medically vulnerable area (ref. Urban)						
Rural area	0.36	(0.24–0.53)	0.000	–0.50	(–0.98 to –0.03)	.037
LR chi-square (p)/F (p)	191.9 (0.000)			16.5 (0.000)		
Adjusted R-square	-			0.192		
Pseudo R-square	0.102			-		
–2 log pseudo likelihood	1693.9			2325.5		

Abbreviations: CI, confidence intervals; OR, odds ratios.

^aDependent variable of the first model (improvement of adjusted nurse staffing grade) ranged from 0 to 6. Zero means adjusted nurse staffing grade was not changed or worsened, and positive numbers mean adjusted nurse staffing grade was improved by Grades 1–6. It had a massive point at zero (no changed or worsened) and skewed to the right.

^bDependent variable of the second model (degree of improvement of adjusted nurse staffing grade) ranged from 1 to 6; only the positive numbers were selected from the first model's dependent variable.

TABLE 4 The effect of policy participation on nurse staffing levels in hospitals

	β	Standard errors	t	p
Constant	7.34	0.06	116.4	.000
Ds ^a (selection bias)	–1.02	0.19	–5.5	.000
Dt ^b (time effect)	–1.06	0.09	–11.9	.000
DsDt ^c (policy effect)	–1.12	0.26	–4.2	.000
Adjusted R-square	0.146			
F (p)	120.8 (0.000)			

^aDs: group dummy of policy participation (1 = participation, 0 = non-participation).

^bDt: time dummy of pre- and post-policy period (1 = 2019, 0 = 2017).

^cDsDt: interaction term between group dummy and time dummy.

Despite the economic benefits of policy participation, hospitals in small, privately owned, non-metropolitan areas and medically vulnerable areas had less participation in the INCS policy. This is consistent with the characteristics of hospitals with insufficient nursing

workforces (Choi et al., 2015). The INCS participation rate of hospitals and general hospitals was 11.2% and 5.5% in 2019 (Kim et al., 2020). Most hospitals with sufficient resources including nursing workforces participated (100% of tertiary hospitals), yet small and medium-sized hospitals had undergone difficulties in meeting the high standard of INCS and gave up their policy participation (Kim et al., 2020). The DID results showed that the initial nurse staffing grade of non-participating hospitals was 1.02 grade lower than participating hospitals and support the explanation that hospitals with low resources gave up policy participation.

The lack of nursing workforces in rural areas is a global issue. In Korea, the distribution of RNs is concentrated in tertiary hospitals in metropolitan areas. Nurses do not prefer local hospitals due to low income, poor working conditions and fewer career development opportunities, and this trend was especially evident in newly graduated nurses (Cho et al., 2012; Park & Kim, 2017). Although the impact of remuneration on the nursing labour market is controversial, current study in the United States showed that wage was associated with job dissatisfaction and intent to leave of nurses (McHugh & Ma, 2014). Korea has a distinct wage gap between the capital region and other

regions. Compared to Seoul (USD 3377), the monthly income of nurses in Incheon/Gyeonggi province was 90.1%; Daegu/Gyeongbuk, Gwangju/Jeonnam and Jeju provinces was 80.5%, 77.9% and 78.9%, respectively. In addition, the wage gap according to hospital type is also severe that the average monthly income of general hospitals and hospitals was only 85% and 75% of tertiary hospitals (Kim et al., 2019). Taking the initiatives by the government in determining the remuneration of nurses would be suitable for controlling the monopoly labour market such as for medical professionals (Shin et al., 2020). In this light, policy efforts to coalesce the wage structure of nurses across the nation and to improve working conditions are required.

We also found that the time effect was significant from DID result. As time passed, the average nurse staffing level of hospitals increased by 1.06 grades. This can be interpreted as the impact of NFD, which had continuously applied to all wards except for the INCS wards. In 2018, the NFD changed the criteria for calculating the nurse staffing grades from 'bed-to-nurse ratios' to 'patient-to-nurse ratios' in some hospitals to compensate for the low bed occupancy rate and difficulty of hiring nurses in local hospitals. Particularly, the government recommended that the additional revenue generated from changed criteria should be used to increase nurses' remuneration or hire additional personnel (Ministry of Health and Welfare, 2017, 2018). For the result, 56.9% of general hospitals and 40.5% of hospitals improved nurse staffing grades by one to two grades from 2018 to 2019 (Cho et al., 2021). In the initial 10 years of the NFD, the likelihood of improving nurse staffing grades was higher in hospitals in Seoul (OR 2.66) or metropolitan areas (OR 2.34) with more than 250 beds (OR 3.87 and 12.7 for 250–499 beds, 500+ beds, respectively) (Cho et al., 2008). Even after the introduction of discounted fees in 2007, the likelihood of increasing one grade of nurse staffing level was 80 times higher in tertiary hospitals than hospitals, and 1.07–1.50 times higher in metropolitan hospitals than in other regions (Kim et al., 2010). On the other hand, this study established that the odds of improving the nurse staffing grades were higher in non-metropolitan hospitals and hospitals, confirming that the mixture of various incentive-based nursing policies were effective in small and medium-sized hospitals in non-metropolitan areas. However, securing nursing workforces in hospitals located in medically vulnerable areas is still a policy task to be solved.

The introduction of INCS was an innovative reform of the nursing care system in Korea. The INCS policy includes the advantages of existing policies and compensates for the disadvantages. After implementing the INCS policy, the patients' satisfaction and safety increased, the burden of family care decreased, and the working environment for nurses improved (Kim et al., 2017; Yi & Kim, 2021). Thus, the Korean government expressed a will to expand the INCS scheme nationwide in the near future. Currently, two nursing care systems are used in hospitals. To institutionalize the INCS as a universal nursing care system in Korea, the gradual integration of nurse staffing standards and nursing fee system of NFD and INCS are essential. Furthermore, to promote recruiting

and retaining more nurses in acute care hospitals, monitoring and evaluation system that surveils whether policy incentives were actually used for the direct and indirect labour costs of nurses should be established.

Previous studies that explored the policy effect for improving nurse staffing levels only showed the changes in overall nurse staffing grades with aggregated data. However, this study is significant so that the causal effect of policy could be explored with a quasi-experimental design by constructing panel data for individual hospitals. To obtain an unbiased estimator in DID analysis, the parallel-trend assumption should be satisfied. Due to using data at two time points, the assumption could not be tested and is considered as the limitation of this study. Additionally, the present study used the status of policy participation as an independent variable to evaluate the policy effect. However, it can be considered that the policy effect would rely on the number of participating wards in hospitals because the larger the number of participating wards, the greater incentives were provided. Therefore, a further study exploring whether the policy effect depends on the number of participating wards is necessary.

5 | CONCLUSIONS

A newly introduced nurse staffing policy in Korea was effective to improve the nurse staffing levels in acute care hospitals not only in the ward where the policy was implemented but also in the overall wards in policy participating hospitals. Although the unequal opportunity for policy participation depending on the healthcare resources in hospitals was found, the net effect of policy participation was proved to enhance hospitals' nurse staffing levels over the past 3 years regardless of initial nurse staffing levels. In addition, the overall nurse staffing levels increased over time in both policy participating and non-participating hospitals, which was assumed to be influenced by the NFD, another nurse staffing policy based on the financial incentives according to nurse staffing levels.

6 | IMPLICATIONS FOR NURSING MANAGEMENT

Under the market-oriented healthcare system, the nurse staffing policy combining financial incentives for better staffing and strict restrictions on reimbursement for poor staffing successfully induced hospitals to employ more nursing workforces. Continuous monitoring and evaluation are needed to ensure the financial incentives are directly returned to nurses' additional employment and to improve working environments. It is worth mentioning that an increment in nurse staffing levels may also be affected by the existing nurse staffing grades in hospitals. Therefore, nursing leaders and policymakers should strive to develop more sophisticated nursing policies based on a financial incentive system, with considering the unequal distribution of nursing workforces among hospitals.

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CONFLICT OF INTEREST

None of the authors have any conflicts to report.

ETHICS STATEMENT

This study used the existing collection of data from hospitals and was exempted from ethical review by Seoul National University Institution for Review Board (IRB No. E2012/001-008).

AUTHOR CONTRIBUTIONS

Jinseon designed the study, conducted data analysis and completed the manuscript draft. Jinhyun supervised the whole process of the research and contributed administrative support for data collection, data analysis and interpretation of the study results. All authors have revised and approved the final manuscript.

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.

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