Factors Related to Nurse Staffing Levels in Tertiary and General Hospitals

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Background. Adequate staffing is necessary to meet patient care needs and provide safe, quality nursing care. In November 1999, the Korean government implemented a new staffing policy that differentiates nursing fees for inpatients based on nurse-to-bed ratios. The purpose was to prevent hospitals from delegating nursing care to family members of patients or paid caregivers, and ultimately deteriorating the quality of nursing care services.

Purpose. To examine nurse staffing levels and related factors including hospital, nursing and medical staff, and financial characteristics.

Methods. A cross-sectional design was employed using two administrative databases, Medical Care Institution Database and Medical Claims Data for May 1-31, 2002. Nurse staffing was graded from 1 to 6, based on grading criteria of nurse-to-bed ratios provided by the policy. The study sample consisted of 42 tertiary and 186 general acute care hospitals.

Results. None of tertiary or general hospitals gained the highest nurse staffing of Grade 1 (i.e., less than 2 beds per nurse in tertiary hospitals; less than 2.5 beds per nurse in general hospitals). Two thirds of the general hospitals had the lowest staffing of Grade 6 (i.e., 4 or more beds per nurse in tertiary hospitals; 4.5 or more beds per nurse in general hospitals). Tertiary hospitals were better staffed than general hospitals, and private hospitals had higher staffing levels compared to public hospitals. Large-sized general hospitals located in metropolitan areas had higher staffing than other general hospitals. Occupancy rate was positively related to nurse staffing. A negative relationship between nursing assistant and nurse staffing was found in general hospitals. A greater number of physician specialists were associated with better nurse staffing.

Conclusions. The staffing policy needs to be evaluated and modified to make it more effective in leading hospitals to increase nurse staffing.

Key Words : Hospital, Nurse, Staffing

INTRODUCTION

Nurse staffing has been an important issue in terms of the quality of patient care and nurses' working conditions. Adequate staffing is necessary to meet patient care needs and provide safe, quality nursing care. Recent empirical studies reported that staffing adequacy is related to patient outcomes, such as hospital mortality and adverse events (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002; Cho, Ketefian, Barkauskas, & Smith, 2003; Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002; Tucker, Parry, McCabe, Nicolson, & Tarnow-Mordi, 2002). Staffing and workload is also a critical

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work condition of particular concern to nurses, oftentimes more important than pay (Brooks & Anderson, 2004; Richards, 2000; Trueland, 2004). Research findings support the negative effects of inadequate staffing on nursing organizational outcomes including increased job dissatisfaction, burnout, turnover, and workplace injuries (Aiken et al., 2002; Clarke, Sloane, & Aiken, 2002; Cline, Reilly, & Moore, 2003; Shamian, O'Brien-Pallas, Thomson, Alksnis, & Kerr, 2003).

Despite the significant effects of nurse staffing on patients and nurses alike, concern over staffing adequacy persists in hospital settings. In reports from nurses in five countries, less than 40% answered that there were enough registered nurses to provide high-quality care and enough staff to get the work done (Aiken et al., 2001). Causes of inadequate staffing may be different in countries that have different health care systems. Methodological challenges to quantify nursing workload and determine staffing requirements can be a barrier to adequate staffing. However, the main reason for inadequate staffing would be attributed to increased competitions among hospitals and restructuring. Hospital restructuring generally seeks to reduce nursing labor costs by decreasing nurse staffing levels and substituting unlicensed nursing personnel for nurses (Aiken & Fagin, 1997). Hospitals in Korea are no exception. Since universal health coverage was achieved in 1989, Korea has experienced a rapid increase not only in health care utilization, but also in the number of hospitals and subsequent hospital competition.

Nurses in many countries have taken various actions to improve staffing levels. Policy tools that nurses can choose to ensure staffing adequacy range from self-regulation of individual hospitals to mandatory national or regional staffing norms, depending on the characteristics of the health care environments. Recently, mandatory minimum nurse-to-patient ratios have been recognized as a strong alternative. In 2001 and 2004 hospitals in Victoria, Australia and California, USA implemented mandatory minimum staffing ratios (Parish, 2002; Seago, Spetz, Coffman, Rosenoff, & O'Neil, 2003). In spite of anticipated disadvantages of minimum staffing ratios, this policy is expected to be effective in providing safe and quality patient care (International Council of Nurses, 2003).

Korean nurses work in a health care system which is dominated by the private sector and which has a laissez faire policy toward regulating private medical institutions (Organisation for Economic Co-operation and Development, 2003). Under those circumstances, a new staffing policy was developed and implemented by the Korean government in November 1999. This policy requires the national health insurance (NHI) system to differentiate inpatient nursing fees based on the nurse staffing level of hospitals. The purpose of the policy was to prevent hospitals from delegating the provision of nursing care to patients' family members or paid caregivers, and ultimately deteriorating the quality of nursing care services (Ministry of Health and Welfare, 2001).

Differentiated Inpatient Nursing Fees by Nurse Staffing Level

Under the current NHI program, nursing services routinely provided for inpatients are paid as a part of the hospitalization fee, while most medical services are paid on the basis of fee-for-service. Other specific nursing care duties, including about 40 interventions such as injections and wound dressing, are charged separately from nursing fees. A hospitalization fee is charged for every inpatient day and consists of three management components: medical (40%), nursing (25%), and hospital management (35%). Hospitalization fees are differentiated by the type of medical institution. Medical facilities in Korea consist of clinics and hospitals. Hospitals are further classified into three levels: hospital, general hospital, and tertiary hospital. Hospitals have a minimum of 30 inpatient beds and are the lowest level of hospital classification in Korea. General hospitals are institutions that have a minimum of 100 inpatient beds and provide physician specialist services in major areas (e.g., internal medicine, surgery, and pediatrics). Tertiary hospitals indicate general hospitals that are approved to provide most types of advanced medical care and treat severely ill patients. Clinics are mainly focused on outpatient care but are legally allowed to provide inpatient services. Hospitalization fees increase for hospitals that are at a higher level. For example, the hospitalization fee of tertiary hospitals was 18.13 US dollars (USDs) per day as of May 2002, whereas that of hospitals was 14.73 USDs per day, when applying an exchange rate of 1,200 Korean Won for one USD.

Under the policy instituted in 1999, nursing fees, which compose 25% of the fee, are differentiated by hospital nurse staffing level. The other components of the fee (i.e., medical and hospital management) are kept the same regardless of nurse staffing levels. The policy

provides for 6 grades of nurse staffing levels based on the nurse-to-bed ratio of hospitals. The ratio calculation includes nurses and beds only for general care units, excluding those for emergency, delivery, nursery, recovery, and intensive care units. Nurses who are not involved in direct patient care, such as nurse administrators, are excluded from the calculation.

Specific criteria for each grade are shown in Table 1. The criteria are different by the type of medical institution. Tertiary hospitals require a staffing ratio one grade higher than the other institutions (i.e., general hospitals, hospitals and clinics), which takes into consideration their different case-mix. For instance, an institution whose nurse-to-bed ratio is 1: 2.8 is classified into Grade 3 if it is a tertiary hospital, and Grade 2 if a general hospital. With Grade 6, the lowest grade, being treated as a base, nursing fees increase by 40% for each advancing grade. This increase is equivalent to a 10% increase in hospitalization fees because nursing fees accounts for 25% of the fee (40% * 0.25 = 10%).

Aim

The purpose of this study is to examine nurse staffing levels and related factors including hospital, nursing and medical staff, and financial characteristics.

METHODS

Design

A cross-sectional design was employed using two administrative databases maintained by the Health Insurance Review Agency, the Medical Care Institution Database and Medical Claims Data for May 1–31, 2002. The Medical Care Institution Database provides information on nurse staffing grades as well as general characteristics, personnel, facilities, and equipment of all medical institutions. The database included 42 tertiary and 234 general hospitals. The Medical Claims Data included patient days and revenues of NHI beneficiaries who were treated at those hospitals. In 2002, 97% of the total population of Korea was a beneficiary of NHI. The rest were covered by the Medical Aid program which is public assistance for low-income households (National Health Insurance Corporation, 2003).

Sample

This study targeted all tertiary hospitals and general acute care hospitals included in the Medical Care Institution Database. Excluding long-term and special care hospitals, the study sample consisted of 42 tertiary and 186 general acute care hospitals.

Measures

Hospital characteristics such as ownership, area, size, and occupancy rate were included. In grouping hospitals by ownership, public hospitals indicated those established by the central or local governments and public corporations. Areas where hospitals were located were categorized into three groups: Seoul (capital of Korea), metropolitan cities except for Seoul, and other. Hospital size was determined by the number of beds. The occupancy rate of a hospital was computed by dividing the total inpatient days during May 2002 by the number of beds and 31 days.

Staff characteristics included the number of nursing assistants and physicians as well as nurses. Nurse staffing indicated the staffing grade for the second quarter of 2002, based on nurse-to-bed ratios (see Table 1). Staffing levels of nursing assistants were measured as the number of nursing assistants per 100 beds. Because the database did not provide the number of nursing assistants by care unit (e.g., general or intensive care units), this measure indicates the hospital average across all units. Physician staffing was further divided into physician specialists and trainees (i.e., interns and residents) per 100 beds. It is most common in Korea that physicians are employed by

Table 1. Differentiated Inpatient Nursing Fees by Staffing Grades

	Nurse-to-Bed Ratio		Differentiation	Nursing Fee per Patient Day (USD)	
	Tertiary Hospital	General Hospital	of Nursing Fee	Tertiary Hospital	General Hospital
Grade 1	< 1: 2.0	< 1: 2.5	300%	13.60	12.50
Grade 2	< 1: 2.5	< 1: 3.0	260%	11.78	10.83
Grade 3	< 1: 3.0	< 1: 3.5	220%	9.97	9.17
Grade 4	< 1: 3.5	< 1: 4.0	180%	8.16	7.50
Grade 5	< 1: 4.0	< 1: 4.5	140%	6.34	5.83
Grade 6	≥ 1: 4.0	≥ 1: 4.5	100%	4.53	4.17

hospitals on a salary basis.

Inpatient revenue per patient day was used as a financial characteristic and was calculated by dividing total inpatient revenues by the total patient days for May 2002. Revenues were converted to USDs with the exchange rate of 1,200 Korean Won for one USD.

Data Analysis

A descriptive analysis was conducted to examine the distribution of hospitals by characteristics. Statistical analyses examined staffing levels of tertiary and general hospitals separately due to their distinct functions and different staffing grade criteria. For tertiary hospitals, univariate comparisons were conducted between low and highly-staffed hospitals by using chi-square and t-tests. Due to the small number of tertiary hospitals (n=42), multivariate regression analysis was not favoured. In the case of general hospitals, factors associated with nurse staffing were explored by employing multivariate logistic regression that contrasted hospitals with low and high staffing.

RESULTS

Table 2 shows the distribution of the study hospitals by characteristics. About 84% were owned by the private sector. A quarter of the hospitals were located in Seoul and another quarter in metropolitan areas. The number of beds ranged from 100 to 2,140 beds, with the majority (69%) having less than 500 beds. The median and average occupancy rate was 63%. None of the general and tertiary hospitals had the highest staffing of Grade 1, and 56% earned the lowest of Grade 6. The average number of nursing assistants per 100 beds was 9.2 with a median of 7.4. The means of physician specialists and trainees were 10.3 and 7.5 per 100 beds, respectively. On average, hospitals gained inpatient revenues of 89.4 USDs per patient day.

The hospital, staff, and financial characteristics differed by hospital type. About half of the tertiary hospitals were located in Seoul whereas 58% of general hospitals were in non-metropolitan areas. Tertiary hospitals had

Table 2. Distribution of Hospitals by Characteristics

	Tertiary Hospital (n = 42)	General Hospital (n = 186)	Total (n = 228)
Hospital Characteristics			
Ownership (%)			
Public	21.4	14.5	15.8
Private	78.6	85.5	84.2
Area (%)			
Seoul	47.6	20.4	25.4
Metropolitan	31.0	22.0	23.7
Other	21.4	57.5	50.9
Size (number of beds, %)			
< 250	0.0	39.8	32.5
250–499	4.8	43.5	36.4
500–749	35.7	13.4	17.5
750–999	38.1	3.2	9.6
1000 +	21.4	0.0	3.9
Occupancy (%, mean ± SD)	83.6 ± 12.6	58.4 ± 21.4	63.0 ± 22.3
Staff Characteristics			
Nurse-to-bed ratio (%)			
Grade 1	0.0	0.0	0.0
Grade 2	4.8	0.5	1.3
Grade 3	19.0	4.3	7.0
Grade 4	31.0	18.3	20.6
Grade 5	31.0	11.3	14.9
Grade 6	14.3	65.6	56.1
Nursing assistants per 100 beds (mean ± SD)	9.6 ± 7.0	9.1 ± 6.1	9.2 ± 6.2
Medical staff per 100 beds (mean ± SD)			
Specialists	14.6 ± 3.2	9.3 ± 4.3	10.3 ± 4.6
Interns and residents	22.3 ± 5.6	4.1 ± 5.2	7.5 ± 8.8
Financial characteristics			
Revenue per patient day (USD, mean ± SD)	128.1 ± 17.8	80.7 ± 24.7	89.4 ± 29.9

more than 500 beds with the exception of two cases, and nine hospitals had more than 1,000 beds. The average occupancy rate of tertiary hospitals was higher than that of general hospitals by 25%. Twenty-three tertiary hospitals (55%) earned nurse staffing ratings between Grades 2 and 4. While 14% of tertiary hospitals remained at Grade 6, about two thirds of general hospitals had the lowest staffing of Grade 6. As expected, tertiary hospitals had more medical staff per bed than general hospitals, with a greater difference found in trainees. On average, inpatient revenue per patient day for tertiary hospitals was greater than general hospitals by 59%.

Table 3 presents comparisons between low and high staffing in tertiary hospitals. Based on the distribution of staffing grades, high staffing (n=23) was considered to be between Grades 2 and 4. Data shows that private hospitals located in Seoul were better staffed than other hospitals. Highly staffed hospitals had a higher occupancy rate but the difference was not statistically significant. Hospitals with high nurse staffing appeared to have more nursing assistants per bed (p=0.320). A greater number of physician specialists per 100 beds were also found in highly staffed hospitals, without a significant difference in medical trainees. Better staffed hospitals gained more revenues by 14.8 USDs per patient day on average.

The last investigation was factors related to staffing grades among 186 general hospitals. Table 4 shows the odds ratios (ORs) from logistic regression analysis con-

trasting low versus highly staffed hospitals. Low staffing was defined as Grade 6, which accounted for 65.6% of general hospitals, and high staffing was indicated as being between Grades 2 and 5. Ownership, area, size, occupancy rate, number of nursing assistants, and physician specialists demonstrated significant relationships with staffing grades. Private hospitals were more likely to be highly staffed than public hospitals. Hospitals located in metropolitan areas were better-staffed than nonmetropolitan areas (OR = 4.32), and showed the greatest proportion of highly staffed hospitals (49%). Hospitals

Table 4. Odds Ratios of Hospital, Staff, and Financial Characteristics on Better-Staffed General Hospitals (n = 186)

	OR (95% CI)	p Value
Hospital Characteristics		
Ownership (vs. public)		
Private	32.42 (2.45–428.79)	.008
Area (vs. other)		
Seoul	2.01 (0.60–6.73)	.260
Metropolitan	4.32 (1.26–14.86)	.020
Size (vs. < 250 beds)		
250–499	1.15 (0.34–3.92)	.825
500+	12.93 (1.86–90.04)	.010
Occupancy (%)	1.05 (1.01–1.09)	.006
Staff Characteristics		
Nursing assistants per 100 beds	0.90 (0.81–0.99)	.037
Medical staff per 100 beds		
Specialists	1.41 (1.11–1.78)	.005
Interns and residents	1.02 (0.89–1.18)	.751
Financial characteristics		
Revenue per patient day (USD)	1.00 (0.98–1.02)	.961

Table 3. Nurse Staffing Grade of Tertiary Hospitals by Characteristics (n = 42)

	Low Staffing (Grade 5–6) (n = 19)	High Staffing (Grade 2–4) (n = 23)	p Value
Hospital Characteristics			
Ownership (%)			.027
Public	77.8	22.2	
Private	36.4	63.6	
Area (%)			< .001
Seoul	15.0	85.0	
Other	72.7	27.3	
Size (number of beds, %)			.981
< 750	47.1	52.9	
750–999	43.8	56.3	
1000 +	44.4	55.6	
Occupancy (%, mean±SD)	80.0±9.6	86.5±14.2	.096
Staff Characteristics			
Nursing assistants per 100 beds (mean±SD)	8.4±4.9	10.5±8.4	.320
Medical staff per 100 beds (mean±SD)			
Specialists	13.4±2.6	15.6±3.3	.023
Interns and residents	20.9±5.8	23.4±5.3	.151
Financial characteristics			
Revenue per patient day (USD, mean±SD)	120.0±12.4	134.8±9.0	.006

having 500 or more beds increased the probability of being better staffed as compared to those with less than 250 beds. A one per cent increase in occupancy rate was associated with a 5% increase in the odds of being higher staffed. Having less nursing assistants per 100 beds was related to higher nurse staffing, whereas the number of physician specialists per 100 beds had a positive relationship with nurse staffing.

DISCUSSION

A major finding of this study was the great proportion of hospitals with the lowest staffing of Grade 6, particularly in general hospitals. Tertiary hospitals were better-staffed than general hospitals, which could be attributed to their distinct function of providing more complex tertiary care. However, the fact that only a quarter of the tertiary hospitals were at staffing Grades 2 and 3 leaves much room for improvement. In tertiary hospitals, assuming that the hospitals have average occupancy rates (83.6%) and 2,144 working hours per year for one full-time-equivalent, Grade 4 ($1: 3.0 \leq$ nurse-to-bed ratio < $1: 3.5$) translates into nurse-to-patient ratios between 1: 10.2 and 1: 11.9 (one nurse taking care of 10-12 patients per shift).

Consistent with previous studies reporting that investor-owned hospitals provided better nurse staffing (Becker & Foster, 1988; Hodge et al., 2004), this study reported higher staffing in private hospitals. Considering the salient feature of private sector domination in the Korean health care system, financial incentives toward nurse staffing would work better than regulations, such as the nurse requirements stated in Medical Law. Higher staffing of hospitals in Seoul and other metropolitan areas can be attributed to management strategies which placed them in a better position in the increasingly competitive health care market. Lower staffing found in general hospitals with less than 250 beds seems to be associated with economy of scale and shortage of nurses and physicians in small-sized rural hospitals (Park, Kim, & Kim, 2000). These findings suggest that financial and workforce policies need to be supported in order to improve nurse staffing in public, rural, and small-sized hospitals.

This study reported a positive association between occupancy rate and nurse staffing in general hospitals. This finding may indicate that nurse-to-patient ratio, rather than nurse-to-bed ratio, is a more reasonable guide for grading criteria because the former takes into account variations in hospital occupancy rates. This means that, in hospitals with the same number of beds, nursing requirements should be different by occupancy rates. Nurse-to-bed ratios would be preferred by NHI and hospital administrators because the variable of number of beds is relatively time-invariant and thus easy to collect. Reporting patient days requires more administrative work, but is necessary to make grading criteria more accurately reflect actual nursing workload.

Another highlight of this study was findings related to skill-mix in nursing assistants, nurses and medical staff. An inverse relationship between nurse and nursing assistant staffing in general hospitals may suggest the possibility of a substitution of nursing assistants for nurses. However, empirical evidence suggests that increased use of less qualified nursing personnel is not effective in all situations (Buchan & Dal Poz, 2002), therefore, substitution should be carefully evaluated and monitored. Contrary to nursing assistants, more physician specialists were related to higher nurse staffing in both tertiary and general hospitals. The relationship between nurses and physicians has been examined as to whether nurses substitute for or complement physicians (Buchan & Dal Poz, 2002; Wharrad & Robinson, 1999). Their relationships would be different by the types of nursing, medical staff, and clinical settings. For example, doctor-nurse substitution becomes an issue between nurse practitioners and general practitioners in primary care settings (Buchan & Dal Poz, 2002). The positive association of nurses with physician specialists in this study may reflect their complementary relationship. Also this finding can be interpreted that the greater number of physician specialists implies a higher complexity of services and advanced technology that the hospital provides, which consequently requires more nurses.

With these study findings in mind, the nurse staffing policy of Korea needs to be modified and its effect on improving staffing levels evaluated for the future. First, as previously addressed, nurse-to-patient ratios instead of nurse-to-bed ratios need to be considered as alternative criteria for assigning staffing grades. Second, staffing criteria for intensive care and other specialty units need to be developed and implemented to differentiate nursing fees by staffing levels. Third, as of July 1 2004 legal working hours have been reduced from 44 to 40 hours per week in organizations with 1,000 and more employees. This reduction in hours will require more nurses per

bed because of decreased working hours per one full-time-equivalent. This change may lead to modification of the current grading criteria. Finally, future studies are needed to examine the actual effect of the staffing policy on hospital nurse staffing. A longitudinal study can assess whether staffing grades have changed over time and if the policy has really worked as a financial incentive for hospitals to increase nurse staffing. Empirical studies using large-scale datasets that examine the relationship between nurse staffing and patient outcomes are pivotal in supporting and improving the staffing policy in the future.

Some limitations occurred due to the characteristics of the data analyzed in this study. First, because the Medical Claims Data set excluded the utilization of non-NHI beneficiaries, this study may have underestimated occupancy rates and misestimated inpatient revenues per patient day. Second, inpatient services not covered by the NHI were excluded from the claims data. This also may lead to an underestimation of inpatient revenues. Third, while nurse staffing grades reflected only the staffing levels of general care units, other characteristics that were analyzed, such as the number of nursing assistants and physician staffing, indicated the average of all care units of the hospitals, not just the general care units.

CONCLUSION

This study introduced a new staffing policy which was the fruit of continuous efforts and requests of patients and nurses for better nursing care. To make it more effective, the policy needs to be modified for the future and expanded to other care units. Particular attention is required for public tertiary hospitals and small-sized general hospitals in rural areas that showed lower nurse staffing in this study. Continuous monitoring and evaluation of nurse staffing will be essential to ensure staffing adequacy and ultimately provide safe and high quality nursing care.

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