Optimal Nursing Workforce and Financial Cost to Provide Comprehensive Nursing Service in the National Health Insurance System

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국민건강보험 간호·간병통합서비스의 전면 도입을 위한 간호인력 및 재정비용 추계

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Abstract This study estimated the optimal nursing workforce and financial costs of providing comprehensive nursing services at hospitals under the national health insurance system. Data on registered nurses, nursing aids, medical institutions, and number of patients were obtained from the Health Insurance Review and Assessment Service. The optimal size of the nursing workforce was calculated using the workload model. A bottom-up approach was used to estimate the annual total financial cost of comprehensive nursing services. The number of registered nurses and nursing aids would need to be increased by 81.75% and 83.23%, respectively, in order to fully apply comprehensive nursing care on a national scale. The additional financial costs for comprehensive nursing services at all hospitals was estimated to be as much as 110.39% of the current cost. For the comprehensive nursing service, nurses with a career and newcomers need to be retained at their hospitals, and the validity of the nurse-patient ratio should be continuously checked. The financial shock to the national health insurance system could be minimized by gradually extending the system to all hospitals.

요 약 본 논문은 병원에서 간호·간병통합서비스가 전국에 확대 적용되었을 경우 필요한 간호인력과 재정비용을 추계한 연구이다. 연구자료는 건강보험심사평가원으로부터 받은 2012년 기준 간호사 수, 간호조무사 수, 의료기관 수, 환자 수를 이용하였다. 간호 인력의 규모는 결정론적 방법으로 개발된 작업부하모델에 의해 추정되었다. 간호간병통합서비스 연간 총 재정비용을 계산하는데 상향식 추정방법이 사용되었다. 간호사 및 간호조무사 수는 각각 81.8%, 83.2% 더 증가되어야 간호·간병통합서비스가 전국 규모로 적용가능한 것으로 추정되었다. 전국의 모든 일반병동에 간호·간병통합서비스가 적용되기 위해 필요한 재정적 비용은 110.4% 더 증가해야 할 것으로 추정되었다. 이 새로운 시스템을 성공적으로 구현하려면, 인력공급의 양적확대 전략뿐만 아니라 숙련된 간호사와 신규간호사의 이직을 최소화해야 한다. 또한 간호사-환자 비의 타당성을 지속적으로 확인할 필요가 있다. 새로운 시스템을 모든 병원에 단계적으로 확대하여야 국민건강보험의 재정부담을 최소화할 수 있을 것이다.

Keywords : comprehensive nursing care, nursing fee, nurse staffing level, nurse-patient ratio, health insurance

1. Introduction

The current nurse shortage in hospitals is related to historical staffing levels, resources, and the demand for health services of each country [1-2]. Each country has its own unique nursing delivery system depending on their social needs. So, it is expected that the role of nursing staffs and their scope of responsibilities vary from country to country. In Asian countries, the primary caregiver is typically family members because of the cultural emphasis on strong family-ties [3-5]. The family-oriented caregiving culture in Korea has been one of the major contributors to the prevalence of family caregiving at home and in acute care hospitals. If a family member is unable to provide care, a common option is to hire a private caregiver. Family caregiving in hospitals is affected by the shortage of available nurses. The lack of nursing professionals is a common problem in Korea and elsewhere [3,5]. This lack of nursing care can be compensated for in part by the presence of family or informal caregivers [5-7]. Which is called 'Missed Nursing Care' [6], Family caregivers or informal caregivers have become 'shadow workforces' [7].

It causes several problems that 'shadow workforces' make up for 'missed nursing care' in acute nursing care. The first, it makes unnecessary burdens on patients and family. Family members of patients are experiencing not only burdens related to physical health, emotional state, and psychological well-being but also severe economic expenses [3,5,8]. Second, hiring private informal caregivers exacts a huge societal burden. Patient care delivered by privately employed caregivers represents 72.0% of the care in tertiary hospitals, 49.75% in general hospitals, and 51.1% in small hospitals. The socioeconomic burden of these caregiving services is estimated as KRW 2 trillion (USD 1.7 billion) [9]. A third problem concerns patient safety. Family/private patient care undermines the quality of nursing services. As highlighted in Korea by the 2015 outbreak of Middle East Respiratory Syndrome (MERS), the use of uncertified caregivers can be detrimental to both patients and their families. A 2015 study by the Korea Centers for Disease Control and Prevention (KCDC) revealed that 32.8% of 168 people diagnosed with MERS were family guardians and caregivers [10].

The Korean government has previously identified such problems, and formed the Korean comprehensive nursing service (KCNS), which undertook a pilot program with the goals of enhancing patient safety and surmounting the various problems arising from family and informal caregiving. A government-private sector committee, tasked with introducing comprehensive nursing services in acute care hospitals, was established in 2009. A variety of government, labor, physicians, nurses, and non-governmental organizations (NGOs) participated and propelled the progressive expansion of the service. The KCNS that was covered by the National Health Insurance was introduced in 2014. The aim of the KCNS policy is to fairly subsidize private caregiving expenses through the national health insurance benefits. Patients will receive around-the-clock skilled nursing care and caregiving services by registered nurses (RNs) and nurse aids (NAs). In principal, family guardians will not be allowed to provide residential caregiving, if patient care does not involve specific medical instructions [11-12]. This new nursing policy will be gradually extended to the whole nation, starting from rural hospitals and public hospitals to urban and private hospitals by 2018. Participating hospitals have more than one operate comprehensive nursing ward. Thirty-eight (88.4%) tertiary hospitals, 149 (50.5%) general hospitals, and 126 (10.3%) hospitals participate in the program as of 2017 [13]. The number of comprehensive nursing service beds represents only 6.0% of all beds [13]. So, while the size of the participating medical institutions is considerable, but secured rate of beds is not.

On the other hand, RNs and NAs have expressed concern that the current standards and criteria of staffing do not fully reflect the nursing demands and

Table 1. Number of institutions, inpatients per institution per day, RNs, and NAs in 2012

(unit: number, person)

Types	Number of institutions	Average inpatients per institutions per day	Total RNs	Total NAs
Tertiary hospitals	44	905.94	17,435	3,203
General hospitals	279	265.68	29,281	7,691
Small hospitals	1,415	81.58	23,344	12,583
Total or Weighted average	1,738	132.01	70,060	23,477

* Long-term care hospitals, oriental medicine hospitals and dental hospitals are excluded from this data.

workloads, and reasonable labor costs [9,14]. Nursing Association concerns that the new working conditions could increase the turnover rate of nurses and decrease retention of nurses, which could aggravate hospitals' chronic problems [14]. More profound solutions could involve overall improvement in pay scales, reasonable nurse-to-patient ratio, and improved working environment. A more sustainable patient-centered system requires the re-evaluation of the consolidated nursing system with the goal of providing an adequate balance of nursing care and healthcare costs.

1.1 Purpose

The study are to estimate the optimal number of RNs and NAs when the comprehensive nursing service becomes extended nationwide and to estimate the annual financial cost of the comprehensive nursing service covered by national health insurance.

2. Methods

2.1 Data collection

2.1.1 Optimal Nursing Workforce

We used the database of the Health Insurance Review & Assessment Service (HIRA) in 2012 (Table 1). The data provides information about the number of RNs, NAs, beds, and inpatients per medical institution. To estimate required RNs and NAs, we used presented staffing ratios of KCNS in 2015 (Table 2).

2.1.2 Annual Financial Cost

For calculating of the annual financial burdens of health care insurance related to the induction of KCNS nationwide, we used hospitalization fees and nurse staffing levels of KCNS. Those data were announced by Ministry of Health and Welfare in 2015 (Table 2). The data of HIRA included that number of facilities, average number of patients per day, hospitalization fees and nurse staffing levels according to the Graded Nursing Fee Policy (GNFP) (Table 3). The GNFP is the differentiation scheme for hospitalization fees applied since November, 1999 before the KCNS system.

2.2 Data analyses

2.1.1 Optimal Nursing Workforce

The size of the required nursing workforce was measured by a workload model developed using a deterministic method. Considerations in determining the number of staff to employ include the hours for which coverage is required, vacations, holidays, and absenteeism [15].

These can be calculated by multiplying the number needed on duty by the number of days per year for which coverage is required and dividing by the number of days each employee works per year to determine the number of personnel needed for coverage. We regarded this number of personnel needed for coverage as a coefficient to employ a nursing workforce. The calculation formula is shown as formula 1. No differences in the formula between RNs and NAs were evident, except for staffing level on duty according to

standard criteria (Table 2).

$$Wd = (365 - Od) - Vd - Ld$$
$$C\ (NW) = 365/Wd$$
$$N\ (NW)/year = C\ (NW) \times SR \times 3 \times 365 \quad (1)$$
$$Shortage\ (NW) = N\ (NW)/year\ in\ KCNS$$
$$\qquad\qquad - N\ (NW)/year\ in\ GNFP$$

Wd = annual total workdays per nursing workforce
Od = annual total off-days per nursing workforce (in the five-day workweek & 8-hour system)
Vd = annual vacation days per nursing workforce
Ld = legal holidays per nursing workforce
C (NW) = needed nursing workforce coefficient
N (NW) = number of nursing workforces
SR = Staffing ratio on duty = patients/nursing staff
Shortage (NW) = additionally required nursing workforces
KCNS = Korean Comprehensive Nursing Service
GNFP = The Graded Nursing Fee Policy is existing system before KCNS

Estimating the required annual full-time nursing workforce necessitated examining the labor coefficient needed to retain the nursing workforce. It was impossible to suggest the sole ideal labor coefficient because each medical institution sets its own work standard policy. We tried to apply common labor standards. We assumed that nursing staff worked a 5-day, 40-hour schedule according to current Labor Standard Act. [16]. The annual business working days are 365 days minus 15 Korean statutory holidays (Ld), and 12 average vacation days (Vd). The coefficient to employ a nursing workforce would be 4.8 (rounded up to 5). This number indicated that the optimal annual nursing workforce per year would require an additional four RNs and four NAs per institution. We substituted the representative value in the number of staff needed on duty among standard staffing ratios of KCNS (Table 2). Median ratios were used for general and small hospitals, with the upper ratio used for tertiary hospitals. Additionally required nursing workforces were calculated by the difference of nursing staffs between in KCNS system and in the GNFP.

2.2.2 Annual Financial Cost

A bottom-up estimation method was used to calculate total financial cost of KCNS. This approach is generally used in most countries to estimate finances. This method estimates government spending based on population and economic variables induced by current schemes and spending programs [17]. In this study, the population variable was the total number of

Table 2. Standard staffing ratios and hospitalization fee for comprehensive nursing services (June 1, 2015)

(unit: KRW, USD, %)

Types	Staffing ratio		Comprehensive nursing services		
	Pts : RN	Pts : NA	Nursing fee (A)	Medical management fee (B)	Hospitalization fee (C=A+B)
Tertiary hospitals	**7:1**	**30:1**	**66,640 55.5 (36%)**	49,900 41.6 (43%)	**116,540 97.1 (100%)**
		40:1	63,510 52.9 (36%)	49,900 41.6 (44%)	113,410 94.5 (100%)
General hospitals	8:1	30:1	65,100 54.3 (37%)	45,650 38.0 (41%)	110,750 92.3 (100%)
		40:1	62,110 51.8 (37%)	45,650 38.0 (42%)	107,760 89.8 (100%)
	10:1	25:1	57,230 47.7 (36%)	45,650 38.0 (44%)	102,880 85.7 (100%)
		30:1	**54,840 45.7 (35%)**	45,650 38.0 (45%)	**100,490 83.7 (100%)**
		40:1	51,860 43.2 (35%)	45,650 38.0 (47%)	97,510 81.3 (100%)
	12:1	25:1	50,390 42.0 (34%)	45,650 38.0 (48%)	96,040 80.0 (100%)
		30:1	48,000 40.0 (34%)	45,650 38.0 (49%)	93,650 78.0 (100%)
		40:1	45,020 37.5 (33%)	45,650 38.0 (50%)	90,670 75.6 (100%)
Small hospitals	10:1	30:1	51,300 39.4 (35%)	39,980 33.3 (46%)	91,280 72.7 (100%)
		40:1	48,460 37.5 (35%)	39,980 33.3 (47%)	88,440 70.8 (100%)
	12:1	25:1	47,240 35.1 (34%)	39,980 33.3 (49%)	87,220 68.4 (100%)
		30:1	**44,970 35.6 (34%)**	39,980 33.3 (48%)	**84,950 68.9 (100%)**
		40:1	42,130 33.7 (33%)	39,980 33.3 (50%)	82,110 67.0 (100%)
	14:1	25:1	42,730 31.3 (33%)	39,980 33.3 (52%)	82,710 64.7 (100%)
		30:1	40,450 40.0 (34%)	39,980 38.0 (49%)	80,430 78.0 (100%)
		40:1	37,610 37.5 (33%)	39,980 38.0 (50%)	77,590 75.6 (100%)

* Pts = Patients

** Bolded data indicates the representative values among standard staffing ratios for estimating optimal nursing workforce and annual financial cost.

Table 3. Hospitalization fees for nurse staffing grades, facilities, and inpatients per day (June 1, 2015)

(unit: KRW, USD, n, %)

Nurse staffing grade	Beds : RN		Nurses								
	Tertiary hospitals	General hospitals	Tertiary hospitals (n= 43)			General hospitals (n= 281)			Small hospitals (n=2,683)		
1 (highest)	~2.5:1	~2.5:1	54,840	45.7	4 (9.1)	56,640	47.2	6 (1.7)	49,560	41.3	9 (0.6)
2	2.5:1~3.0:1	2.5:1~3.0:1	51,240	42.7	18 (40.9)	51,480	42.9	43 (12.5)	45,120	37.6	27 (1.9)
3	3.0:1~3.5:1	3.0:1~3.5:1	47,520	39.6	22 (50.0)	46,800	39.0	59 (17.2)	41,040	34.2	53 (3.7)
4	3.5:1~4.0:1	3.5:1~4.0:1	43,920	36.6	0 (0.0)	40,680	33.9	46 (13.4)	37,320	31.1	49 (3.5)
5	4.0:1~4.5:1	4.0:1~4.5:1	40,200	33.5	0 (0.0)	36,960	30.8	21 (6.1)	33,840	28.2	51 (3.6)
6 (base)	4.5:1~6.0:1	4.5:1~6.0:1	36,600	30.5	0 (0.0)	33,600	28.0	65 (19.0)	29,520	24.6	107 (7.6)
7 (substandard)	6.0:1~	6.0:1~			-	32,460	27.1	25 (7.3)	28,440	23.7	48 (3.4)
unreported								38 (11.1)			1,070 (75.7)
Total								343(100.0)			1,414(100.0)
No. inpatients per day			946.8			245.9			31.4		

KRW 1,200 = USD 1

inpatients and the economic variable was hospitalization fees. The population variable was a result multiplied by number of facilities, average number of patients per day per facility, during a year. The economic variables used median hospitalization fees of general hospitals and small hospitals, and upper hospitalization fees of tertiary hospitals. Many countries use median as a representative value when they estimate financial projections of social security [17]. The method of calculating annual total financial cost is as following (Formula 2). The annual total financial cost was a result multiplied by comprehensive nursing care fee per day, number of facilities, and the average number of patients per day. Additional financial costs were calculated by difference of total cost between in KCNS system and in GNFP system.

$$TC = Fn \times N(f) \times N(pt) \times 365 \qquad (2)$$
$$AC = TC \text{ in KCNC} - TC \text{ in GNFP}$$

TC= annual total financial cost
Fn= comprehensive nursing care fee per day
N(f)= number of facilities
N(pt)= average number of patients per day per facility
AC = Additional financial costs
KCNS = Korean comprehensive nursing service
GNFP=The graded nursing fee policy is existing system before KCNS

3. Results

3.1 Optimal Nursing Workforce

The estimated results in case when KCNS is fully applied nationwide are as follows; the number of RNs should increase by 66.14% for tertiary hospitals, 58.33% for general hospitals, and 122.79% for small

Table 4. Optimal number of nurses and nursing aids for providing comprehensive nursing services

(unit: n, %)

Types	Number of institutions	RNs			NAs		
		Current	Optimal	Shortage	Current	Optimal	Shortage
Tertiary hospitals	44	17,435	28,966	11,531 (66.14%)	3,203	6,759	3,556 (111.00%)
General hospitals	279	29,281	46,361	17,080 (58.33%)	7,691	15,454	7,763 (100.90%)
Small hospitals	1,415	23,344	52,007	28,663 (122.79%)	12,583	20,803	8,220 (65.30%)
Total or Weighted average	1,738	70,060	127,334	57,274 (81.75%)	23,477	43,016	19,539 (83.23%)

hospitals. The number of NAs should increase by 111.00% for tertiary hospitals, 100.90% for general hospitals, and 65.30% for small hospitals. In total, the increase was calculated as 81.75% for RNs and 83.23% for NAs (Table 4).

3.2 Annual Financial Cost

If all tertiary hospitals, general hospitals, and small hospitals implement KCNS in its general wards, additional costs would be estimated to increase by 138.70% for tertiary hospitals, 111.67% for general hospitals, and 94.01% for small hospitals. The total expense of KCNS was estimated to be KRW 6,879.1 billion (USD 5,732.6 million), which is an increase of 110.4% from the previous amount of KRW 3,269.7 billion (USD 2,724.7 million) (Table 5). Assuming that 15% of this cost was levied onto the patient, the financial burden imposed onto the national health insurance would be KRW 5,847 billion (USD 4,873 million) (Table 5).

4. Discussion

4.1 Optimal Nursing Workforce

The present data indicate that the nursing workforces should be increased by about 80% to provide KCNS that would be totally delivered by accredited RNs and NAs. A previous study indicated that RNs and NAs should be increased by 77.11%, and 317.41% respectively [12]. The number of RNs in this study echoes the prior study, whereas the number of NAs does not. This difference might be due to its uncertainty of raw data on the currently employed NAs in Korean hospitals. The data used for nursing workforces estimation are voluntarily reported by the medical institutions agency for GNFP system review. The number of nurses must be reported in GNFP system, and it is clear because the fee is paid according to the number of RNs employed. However, the GNFP does not prescribe the number of NAs in a general ward. In many hospitals, NAs are often non-regular workers [18]. Administrative managers of hospitals do not want to inform the number of secured NAs if they work for replacing RNs [19]. Those reasons might make omissions of NA workers.

The other reason concerning the differing results of the number of required NAs might be the difference in the method of estimation. The workload model is a macroscopic approach to nursing workforce estimation [20]. The workload model has the advantage of clearly illustrating the estimation results by simply plotting the fixed relationship between the input labor force and the output [20]. However, there is a drawback that the assumption of the fixed coefficient production function is not consistent with the reality [20]. More studies using original data on the level of securing clear NAs are necessary. Further studies will be needed to clarify the cause of the large differences of the number of required NAs.

4.1.1 Nursing Workforces Supply Policy

The Korean government has prioritized the expansion of the comprehensive nursing system. The

Table 5. Costs estimated for providing comprehensive nursing services

Types	Number of Institutions (n)	Annual total Pts per facility (n)	Total Financial Cost (KRW, USD)		Additional Costs (KRW, USD, %)	
			in GNFP	in KCNC		
Tertiary hospitals	43	345,584.7	725.5 (604.6)	1,731.8 (1,443.2)	1,006.3 (838.6)	138.70%
General hospitals	281	89,739.3	1,197.2 (997.7)	2,534.0 (2,111.7)	1,336.8 (1,114.0)	111.67%
Small hospitals	2,683	11,465.8	1,347.0 (1,122.5)	2,613.3 (2,177.7)	1,266.3 (1,055.3)	94.01%
Total or Weighted average	3,007	23,558.3	3,269.7 (2,724.7)	6,879.1 (5,732.6)	3,609.5 (3,007.9)	110.39%

* KRW billion (USD million)
  KRW 1,200 = USD 1

problem is how to supply RNs and NAs. So far, the government has enforced mainly to encourage the increases in nursing graduates to meet the nursing workforce demands. The numbers of nursing graduates in Korea are at the top by 94.9 per 100,000 in all of the OECD nations, twice as many as the average number of the OECD nations [21]. However, merely boosting the number of nursing graduates has not resolved the lack of nurses in practice. Only 70% of the newly graduated nurses have relevant jobs in practical settings[22]. Thirty percent of those resign from their employments within a year and the average turnover rate of RNs in Korea is 17% [22]. Although the having-license RNs may be oversupplied and plentiful, it is hard to find nurses who are willing to work in the current environment for a long time [23].

The nursing workforce-supplying policy has focused on increasing the number of the nursing qualification holders sustainedly. Nevertheless, the number of available registered nurses has not increased noticeably. Governmental policy direction should be changed to improve working conditions and work environment. Those changes make a good career nurse and retain in the field to work.

4.1.2 Improving Staffing Levels

Nurse staffing levels and the hospitalization fees are classified according to the type of medical institutions in the KCNS. It is not appropriate to determine the nurse staffing levels on a bedside scale or simplified type of hospitals. The American Nurses Association (ANA) has suggested several decisive contributors to the nurse staffing level, which include patient complexity, acuity, or stability; number of admissions, discharges, and transfers; professional nursing and other staff skill level and expertise; physical space and layout of the nursing unit; and availability of or proximity to technological support or other resources [24]. The Korean government provides additional incentives in consideration of nursing service needs, senior patient ratio, length of stay, surgical patient rate.

But, detailed regulations, such as supportable nurses staffing and the amount of incentives, are not yet structured.

The Korean National Health Insurance provides adequate coverage in cost reimbursement, which allows hospitals to sustain the appropriate level of nursing staffs [25]. The Korean Medical Act established the daily patient to nurse ratio as 2.5 to 1. In reality, the number of patients that one RN provides daily care for is 12 [25-26]. Medical institutions that actually meet the Medical Act ratio are limited to 27% of tertiary hospitals, 3% general hospitals, and mere 1% of the small hospitals [26]. It means that the most of Korean RNs are burdened with excessively many patients. The staffing ratio of RNs became rationalized than before and staffing ratio of NAs was first mentioned in KCNS. The ratio of patients to RNs on duty ranges from 7:1 to 14:1, and the patient to staff ratio ranges from 5.7:1 to 10.4:1. These ratios are under levels of US and similar to Japan and European countries [27-28]. But, the frontline nursing workforce contends that the standards are insufficient to provide for all nursing care services including every daily-living activity [28]. The overall daily life activities of the patients, such as the excretion process, hygienic maintenance and other ad-hoc duties, can be fully assisted by certificated NAs and RNs in KCNS. Still, nurses appeal to improve supporting systems for patient transportation, delivery job, and improvement of the ward structure that considers the moving line for focus on better nursing care and caregiving [29]. Careful review and validation of the nursing workforce allocation rate is needed continuously the future.

4.2 Annual Financial cost

When the KCNS is fully applied, the gross hospitalization fees will be increased by of 110.39% in this results. It is estimated that the national health insurance would be financially burden with KRW 5,847 billion (USD 4,9 billion). The total estimated costs from the previous studies were projected to be

approximately KRW 2,472.9 billion (USD 2 billion) [12]and KRW 4,590 billion (USD 3.8 billion) [30]. The reasons for cost estimation in this study exceeding the total financial cost from previous research are explained as rise in fare. Fare list of comprehensive nursing service was revised in June 2015. We applied the raised hospitalization fees to estimate total cost. Announced fare were elevated about 35%. In addition, we used bottom-up estimating. Bottom-up approach is a method of estimating expenditure without imposing any restriction on financial expenditure in advance [17]. it is possible to assign the various combination of hospitalization fees depending on scenario to estimate total financial cost [17]. In this study, the economic variables used median hospitalization fees of general hospitals and small hospitals, and upper hospitalization fees of tertiary hospitals. And over the last five years, the number of medical institutions has increased by 1-2% per year and the number of hospitalization days has increased by 3-6.5% per year [31]. These might led to different total cost from previous research results.

4.2.1 Gradual Expension of Institutional Application

This study shows that the new nursing delivery system can increase the burden on the supply and demand of human resources and finance of Health Insurance. It may be necessary to increase the individual out-of-pocket payment for hospitalization fee and to let hospitals with the appropriate infrastructure and workforce establish comprehensive nursing wards. As it is now, it is reasonable to start with public hospitals and local hospitals first. In next, hospitals with substantial facilities and equipment should be selected so that they can participate selectively. This is because not only human resources but also facility investment and improvement are costly.

To designate a nursing ward as a project unit make difficult to judge the effectiveness of the new policy. For example, the institution might avoid the admission of severe patients in comprehensive nursing wards and transfer them to general ward where family caregiver can reside. To relieve the unequal distribution of severity of patients, it should be examined to make a hospital as a project unit to participate in KCNS.

Nursing quality will be improved if skilled nursing staffs provide care services, but more financial burden will spread on more people. This new policy inevitably increases the financial burden on health insurance. it is necessary to promote the reason why this project is necessary to the public and to lead social consensus.

4.3 Limitation and Recommendation

We analyzed nursing workforces from the big data of certified HIRA, it was possible to be uncertain on number of investigated NAs. For example, the number of NAs working in a general ward could be inaccurately ascertained from raw data. Further studies are needed to clarify the cause of the differences of the number of required NAs using original data on accurate securing NAs. And it is necessary to develop an estimation method that can reflect the detailed situation condition more precisely. The validity of the nursing staff ratio presented in the published standards is not comfirmed yet. Until the appropriate model is found the most cost-effective and optimal staffing ratio, fare framework of KCNS should be revised and modified.

5. Conclusions

KCNS is expanding to hospitals of all over the nation. This study estimated the nursing workforces and annual total hospitalization fees due to induction of comprehensive nursing services in nationwide. It showed that the nursing workforce needed for the system to be successful is 80% more than the current. It estimates that approximately KRW 5,847 billion (USD 4,9 billion) for subsidizing 85% of gross hospital fees through the public health insurance.

Consequently, we found more RNs and NAs and

health insurance finances are expected to be needed in the near future. it is necessary that the government and hospitals should utilize the inactive nursing workforces and find diverse solutions to sustain the retention of the current and new nursing professionals. The increased cost of public health insurance would be very burdensome for the Korean government.

For the system to be successfully implemented, experienced nurses and newly graduated nurses need to be retained in addition to the quantitative expansion strategy of labor supply. The financial burden in the national health insurance would be minimized by incrementally extending the system to all the hospitals. The government should try to promote new nursing care delivery system more actively to people of nation. And it obtains consent to secure the costs for social benefit.

We hope this study could be helpful to prepare nursing labor supply and secure policy and to secure the health insurance fund for professional nursing care service without family or informal caregivers in acute hospitals.

References

[1] J. Buchan, L. Aiken, "Solving nursing shortages: a common priority", Journal of clinical nursing, vol. 17, no. 24, pp. 3262-8, 2008.
DOI: https://doi.org/10.1111/j.1365-2702.2008.02636.x.

[2] J. Buchan, "Evidence of nursing shortages or a shortage of evidence?", Journal of Advanced Nursing, vol. 56, no. 5, pp. 457-458, 2006.
DOI: https://doi.org/10.1111/j.1365-2648.2006.04072_2.x

[3] S. Jang, N. Avendano, M. Kawach,, "Informal caregiving patterns in Korea and European countries: A cross-national comparison", Asian Nursing Research, vol. 6, no. 1, pp. 19-26, 2012.
DOI: https://doi.org/10.1016/j.anr.2012.02.002

[4] J. Hui, Y. Wenqin, G. Yan, "Family-paid caregivers in hospital health care in China". Journal of nursing management, vol. 21, no. 8, pp. 1026-33, 2013.
DOI: https://doi.org/10.1111/jonm.12017

[5] S. H. Cho, H. R. Kim, "Family and paid caregivers of hospitalized patients in Korea", Journal of Clinical Nursing, vol. 15, no. 8, pp. 946-953, 2006.
DOI: https://doi.org/10.1111/j.1365-2702.2006.01342.x

[6] B. J. Kalisch, G. L. Landstrom, A. S. Hinshaw, "Missed

[7] nursing care: a concept analysis", Journal of advanced nursing, vol. 65, no. 7, pp. 1509-17, 2009.
DOI: https://doi.org/10.1111/j.1365-2648.2009.05027.x

[7] Bookman, A., & Harrington, M. "Family caregivers: a shadow workforce in the geriatric health care system?", Journal of Health Politics, Policy and Law, vol. 32, no. 6, pp. 1005-1041, 2007.
DOI: https://doi.org/10.1215/03616878-2007-040

[8] M. Bastawrous, "Caregiver burden−a critical discussion", International journal of nursing studies, vol. 50, no. 3, pp. 431-41, 2013.
DOI: https://doi.org/10.1016/j.ijnurstu.2012.10.005

[9] Y. K. Lee, "The political subject of comprehensive nursing services introduction", KIHM Issue Paper. Korean Institute of Hospital Management. 23, pp. 1-24, 2015.

[10] Korea Centers for Disease Control and Prevention. Middle East Respiratory Syndrome Coronavirus Outbreak in the Republic of Korea, 2015, Osong Public Health and Research Perspectives, vol. 6, no. 4, pp. 269-78, 2015.
DOI: https://doi.org/10.1016/j.phrp.2015.08.006

[11] Y. Koh, "Guidance for reorganising the nursing workforce structure to prevent nosocomial infection", issued in 2015, pp. 1-13, 2015.

[12] H. S. Ahn, H. J. Kim, "Tasks of comprehensive nursing services introduction", Journal of Hospital Management & Policy. Korean Institute of Hospital Management, vol. 4, no. 1, pp. 6-16, 2014.

[13] Y. Koh, "The progress report of comprehensive nursing service", National Health Insurance Service. 2017.

[14] W. H. Kwag, "Details and problems of a pilot comprehensive nursing care project", Healthcare Policy Forum. Research Institute of Healthcare Policy, Korean Medical Association, vol. 13, no. 2, pp. 50-55, 2015.

[15] A. M. Tomey, Nursing management and leadership. Eighth Edition, Elsevier, Missouri, pp. 413-415, 2009.

[16] National Assembly Law Information. Chapter 4 Clause 50 of the Korean Labor Standard Act. Retrieved March 15, 2017, from http://likms.assembly.go.kr/law/lawsLawtInqyDetl1010.do

[17] H. Y. Shin, J. U. Won, Y. J. Chun, S. J. Lee, Modelling for Long-term Financial Projections of Social Security, pp. 13-31, pp. 54-60, p. 135, Korea Institute for Health and Social Affairs, 2013.

[18] I. Y. Choi, "Actual condition and Problems of Female Non-regular Workers in the Healthcare Industry : with focus on S Hospital", Korean Sociological Association, pp. 59-80, 2007.

[19] H. J. Yoo, T. G. Lee, "A Study on the Condition of the Work of Nurse Assistants at Hospitals and Clinics", Journal of the Korean Academy of Health and Welfare for Elderly, vol. 8, no. 1, pp. 117-135, 2016.

[20] S. Y. Jeong, J. H. Kim, "A Critical Review of Nurse Demand Forecasting Methods in Empirical Studies 1991~ 2014", Perspectives in Nursing Science, vol. 13, no. 2, pp. 81-87, 2016.
DOI: https://doi.org/10.16952/pns.2016.13.2.81

[21] Organization for Economic Co-operation Development :Health at a glance 2013. OECD Publishing Paris, 2013.

[22] Hospital Nurses Association, "The hospital nurse's actual working conditions research", Annual report of hospital nurses association in 2013, 2013.

[23] M. Kingma, "Nurses on the move: a global overview", Health services research, 42(3 pt 2), pp. 1281-98, 2007. DOI: http://doi.org/10.1111/j.1475-6773.2007.00711.x

[24] M. Jo, M. Artz, J. Haebler, P. McMenamin, C. Peterson, "Optimal Nurse Staffing to Improve Quality of Care and Patient Outcomes", American Nurses Association, 2015.

[25] S. J. You, "Policy implications of nurse staffing legistlation", Journal of Digital Contents Society, vol. 13, no. 6, pp. 380-389, 2013.

[26] S, Kim, J, Kim, "Financial projection of the nursing fee differentiation policy improvement proposal in the national health insurance: using a break-even analysis model for the optimal nursing fee", Journal of Korean Academy of Nursing Administration, vol. 19, no. 5, pp. 565-77, 2013.
DOI: https://doi.org/10.11111/jkana.2013.19.5.565

[27] L. H Aiken, W. Sermeus, K. Van den Heede, D. M. Sloane, R. Busse, M. McKee, L. Bruyneel, A. M. Rafferty, P. Griffiths, M. T. Moreno-Casbas, C. Tishelman, A. Scott, T. Brzostek, J. Kinnunen, R. Schwendimann, M. Heinen, D. Zikos, I. S. Sjetne, H. L. Smith, A. Kutney-Lee, "Patient safety, satisfaction, and quality of hospital care: cross-sectional surveys of nurses and patients in 12 countries in Europe and the United States", BMJ. 344, e1717. 2012.
DOI: https://doi.org/10.1136/bmj.e1717

[28] S. K. Park, "A Study on Reorganization of Nursing Workforce", pp. 105-112, Korea Health Industry Development Institute, 2013.

[29] K. O. Park, Y. M. Kim, J. K. Kim, "Experience of Nurses Participating in Comprehensive Nursing Care" The Journal of Korean Nursing Administration Academic Society, vol. 23, no. 1, pp. 76-89, 2017.
DOI: https://doi.org/10.11111/jkana.2017.23.1.76

[30] N. M. Hwang, "Expansion plans of comprehensive nursing care for a quality assurance of hospitalization service", Issue & Focus. 286, pp. 1-8, 2015.

[31] Health Insurance Review & Assessment Service "Medical expenses statistical index", Retrieved March 1, 2017, from
http://khiss.go.kr/board/bbs_read.jsp?tname=MINBOARD358&bbsid=B301&bbs_seq=466&htxt_code=125369780626590502190615168969 64&reverseNum=214&forwardNum=1

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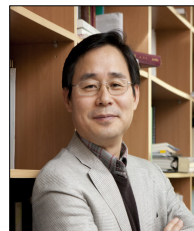
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