Website: http: jebhpme.ssu.ac.ir
EBHPME 2019; 3(4): 250-8 pISSN: 2538-5070

EBHPME

ORIGINAL ARTICLE

Evidence Based Health Policy, Management & Economics
Health Policy Research Center, Shahid Sadoughi University of Medical Sciences

Estimating Required Number of Nurses in Emergency Department of Imam Ali Hospital Affiliated by Alborz Province Using WISN Method

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ARTICLEINFO

Article History:
Received: 19 Jun 2019
Revised: 5Oct 2019
Accepted: 27 Dec 2019

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ABSTRACT

Background: The provision of manpower is one of the effective factors on the improvement in the coverage of health services and the realization of the highest community health level and a considerable part of the health budget is devoted to the production and update on human resources. Therefore, the current study aimed to estimate the number of nurses required in the Emergency Department (ED) of Imam Ali hospital based on the proposed method of the World Health Organization, in which the manpower is calculated based on the workload Workload Indicators of Staffing Need (WISN).

Methods: This was a cross-sectional descriptive study. The study population was all the nurses working in the emergency department of Imam Ali hospital affiliated by Alborz University of Medical Sciences and their duties in the hospital which was performed using the proposed method of the World Health Organization i.e. WISN in 2018. Determination of their duties and the time and number of times for performing them were carried out during the group discussion session.

Results: Based on the research findings, 40 standard nurses were calculated. The studied hospital had 4 nursing staff shortages. The working pressure ratio is 0.91in this study.

Conclusion: In the current study, the nursing staff shortage is observed and this shortage caused a high working pressure on the nurses working in the study area. Considering the vital role of nurses in the emergency department, it is recommended to employ and distribute the manpower based on the requirement and workload in the department.

Key Words: Nurse, Workload, Emergency Department

Citation

This paper should be cited as: Ghorbani A, Vaziri Seta M, Rajaee R, Jamaly Z, Najafi M, Najafi M. **Estimating Required Number of Nurses in Emergency Department of Imam Ali Hospital Affiliated by Alborz Province Using WISN Method.** Evidence Based Health Policy, Management & Economics. 2019; 3(4): 250-8.

[DOI: 10.18502/jebhpme.v3i4.2064]

Introduction

Manpower is the most valuable strategic source of the organization, the origin of changes (1) and the core source of organizations and certainly the most important source of the health system(2). Without manpower, the health systems have no meaning, the improvement in the coverage of health services and the realization of having the highest attainable standard of health for people depends on the provision, availability, acceptability and the high quality of manpower in the health sector. The provision of health sector staff alone is not enough, but the equitable distribution of staff with the competence, motivation and power of presenting the high quality services suited to the cultural and social requirements and expectations of the people and the sufficient support of these staff by the health system can change the health services coverage to the effective services coverage (3). Manpower opens the way of the organization's development and promotion. Undoubtedly, neglecting it will also provide a reverse effect on the organizational yard and the stagnation of activities which is by no means acceptable and justified (4). From the viewpoint of the World Health Organization, the performance of any system depends on the combination of its skills, availability and the performance of manpower. In the world, 35 million people are working in the health sector and a significant part of the health budget is devoted to the production and update on human resources. Consequently, human and economic costs of the weak manpower management in the health sector are very high and because of the weakness of the manpower management in the health sector in some countries, the international financial resources are dedicated with difficulty and restriction (5).

Hospitals as the largest health service center, the highest resources and credits of the health sector in any countries are dedicated to this unit (6); nurses make the majority of the hospital manpower which provide an essential role in the quality of the care and health promotion and they have a great workforce (62 percent of the total staff and 36 percent of the total hospital costs) (7).

Based on researches, the nursing staff shortage or its inadequate distribution is one of the most important problems of the hospitals in the country (8). Therefore, standardizing the number and the way of distributing the nursing staff in the clinical sector, especially the emergency department, is the necessity of the efficiency and quality improvement of the services presented to patients, better utilization of the existing facilities and the productivity improvement in the hospitals (9). A review of the studies represented that the estimation of nursing staff in the emergency department is calculated using the hours per patient visit (HPPV) which is not without disadvantages. Important factors including the severity of illness in the patients, length of stay and the workload are not considered in this method (10). In the method proposed by the World Health Organization (WISN), the staff workload is considered which makes it more distinct and realistic than other methods (11). In a field review study in 2019, four fundamental points were identified for this method, including: service delivery time, geographic features, workload and supply and demand. This method is applicable to any health care organization and can be more applicable and faster in the smaller institutes. In some cases that the staff shortage was obvious and there was not any possibility to increase the number of staff, work shifts can be used. WISN can be used to calculate the manpower required for the future models based on some assumptions such as staff training results, demographic changes and illness profiles and staff turnover (12).

Considering the important role of nurses in promoting the objectives of the health care organizations such as promoting the quality of presented services and promoting the community health level, we are therefore supposed to estimate the number of nurses required in the ED of Imam Ali hospital based on the method proposed by the World Health Organization about the workload-based manpower estimation (WISN) to improve

[DOI: 10.18502/jebhpme.v3i4.2064]

the processes of this unit and decrease the costs related to the human resources management by the standard staffing distribution.

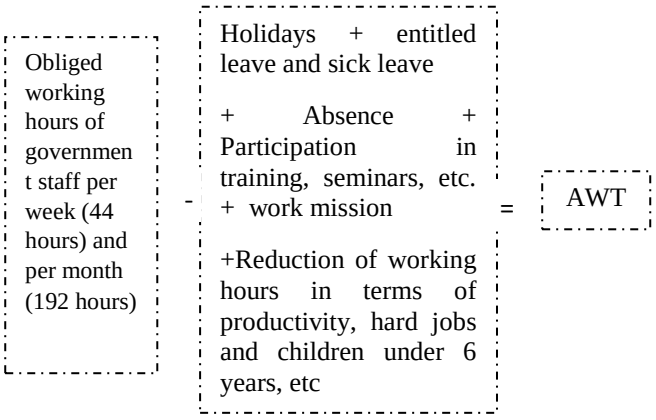
Materials and Methods

This was a cross-sectional descriptive study. Population in this study was all the nurses working in the emergency department of Imam Ali hospital affiliated by Alborz University of Medical Sciences and their duties in the hospital which was performed using the proposed method of the World Health Organization (WISN) in 2018. The hospital has two emergency departments, i.e. the children and adult emergency departments and considering the fact that the objective of the study is to distribute the staff according to the existing workload in the emergency department, all the nurses working in both departments were studied. For research, the hospital administrator, the nursing manager, the heads of nursing in the emergency department of children and adults and their second were selected using the purposive sampling. Determination of their duties and the time and number of times for performing them were carried out during the group discussion session.

The method steps are described as follows:

1.Prioritizing the staff or unit / sector for the method study: Considering the importance of the emergency department and nurses as one of the most important forces of the treatment team for providing care to patients, the nurses of this department were evaluated.

2.Estimating the available working time (AWT):



Calculating the annual working hours of the nurses according to the standards of working hours in the public hospitals in 2018 is described as follows:

Working hours per month: 192 × 12 = 2304

Reduction of working hours with the productivity rule of 8 hours per week, 52 weeks per year in 2018 is as follows: 52 × 8 = 416

24 days of legal holiday in 2018: 24 × 7 = 168

Entitled leave for 30 days per year: 30 × 7 = 210

Annual available working time per a nurse (AWT): 2304 – (416 + 168 + 210) = 1510

3.Determining working components:

- Main activities of health care services (Activity A)
- Supportive activities (Activity B)
- Additional activities (Activity C)

Determining activity standards: The hours required performing correctly and in accordance with the endemic professional standards (and in the local conditions) an activity is provided by a skilled and motivated person. Considering the mentioned specifications for a person who determines the standards, the purposive sampling was performed for people who have adequate information about all the emergency department activities (the heads of nursing in the emergency department of children and adults and their second in the department, the nursing manager, the hospital administrator and the human resources distribution appointee). First, the required explanations regarding the study method and the way of determining the main, supportive and additional duties and the importance of mentioning all the duties and its real times were presented by the researcher. Afterwards, in a group discussion session and with the presence of all the studied individuals, the duties of nurses and the time required for performing them were determined in the emergency department of the studied hospital and they were divided into the main, supportive and additional duties as well as the number of repetitions per month and per year. The researcher as the session leader provided challenges among individuals for expressing the duties until reaching the consensus. In the meantime, considering the

[DOI: 10.18502/jebhpme.v3i4.2064]

specific conditions of the emergency patients and the necessity of attending to them based on the triage levels, the hours of performing any activities for patients were collected at three emergency levels of 1, 2 and 3 and the average obtained from three levels were used for the calculations.

There are two types of activity standard: service standard and allowance standard

The former is the activity standard related to the services provision and health cares (service standard): The time required to perform the activities related to the provision of health cares to patients which is reported in two ways.

- Unit time: The minutes or hours spent performing the work.

- Rate: The number of services a person can perform in an hour.

The latter is the activity standard related to the supportive and additional activities (allowance standard), the time required to perform the supportive and additional activities, which has two types:

- The time required to perform the supportive / additional activities (CAS): The average real time per activity is determined and converted to a percent of working time and finally, the percent are added together to convert to Total CAs. (It should be expressed in percent.)

- The time required to perform the additional activities (IAS): it is expressed in hours per year and counts the number of staffs involved in performing the activity. Listing the number of personnel who performs the additional work by mentioning the activity title and the average time of performing them and the number of personnel is multiplied by the average time of performing them per additional activity. Finally, the results are added together.

4.Standard workload calculation: For any main health care activities, the related workload is standardized. The workload or the standard is the rate of working related to the main activities that a person is capable of performing in a year (assuming that a person spends all his time in a year performing a particular type of activity). The formula for calculating the standard workload based on two units mentioned in the step 4 is as follows:

Standard workload = AWT in a year / unit time

Standard workload= AWT in a year * rate of working

In the previous step and in the group discussion, the numbers of times for performing the activities were determined by a nurse during a year. For calculating the workload performed in a year, the number of repetitions per activity in the time required to perform it was calculated at all three levels and their average was used. The number of repetitions per activity was considered 2.5 times at level one, 1.9 times at level two and 2.8 times at level three.

5.Allowance factors calculation: It is only calculated for the additional and supportive activities. It is a factor used to estimate the number of forces required to perform the supportive works.

CAF calculation:

CAF = 1 / {1- (total CAS / 100)}

LAS calculation: Total IAF divided by AWT (Both have the same unit)

LAF = LAS / AWT

6.Determining the required personnel:

Individual allowance activities + factor of allowance class activities × (standard workload / annual workload)

Steps 5 and 6 were performed in the form of formulation in Excel using the results of previous steps.

7.Analysis and interpretation of results: The number of personnel was compared to the estimated number of personnel in the form of ratio. If the ratio is greater than one, there are additional personnel and if it is lower than one, there is personnel shortage. Whatever it is lower than one, the working pressure is higher. This step was also performed in Excel using the results of previous steps.

The criteria of selecting individuals in the purposive sampling were to have at least five years of nursing or management working experience in the emergency department and the agreeableness of people to participate in the study. Before

[DOI: 10.18502/jebhpme.v3i4.2064]

holding the session, the objectives of the research were explained to the selected members and all of them were entered into the study with permission and informed agreement.

In this research, ethical considerations such as explaining the purposes of the research to participants, obtaining oral consent to participate in the study from them, keeping their information anonymous, allowing them to withdraw from the study whenever they wished, and maintaining the interview transcripts in a safe place were observed.

Results

According to the results, 16 duties were recognized as the components of the main activity or the therapeutic care. The same standard workload provision was estimated for the main activity components of 207233.30 hours per year and according to the statistics in 2017 and the number of patients who were 2096, 298569.00 hours per year were determined for performing the activities. By dividing the workload performed in 2017 by the obtained standard workload, 33.61 nurses were estimated (Table 1).

8activities were recognized as the supportive activities. The real time for performing the work was estimated 35.84 minutes which contains 12 % of the person's daily working time (Table 2). CAF was estimated to be 1.14.

Nine activities were recognized as the additional activities. The annual working hours of nurses for performing the additional activities were 1927.52 hours (Table 3) and LAF was estimated to be 1.34.

The number of nurses in the children and adults emergency department of Imam Ali was 36 in total. Considering the fact that the standard nurse number was estimated 40, it can be said that there are 4 staff shortages in the studied hospital and considering the fact that the ratio is 0.9, there is a working pressure (Table 4).

Table 1. Main activity components of nurses in emergency department of Imam Ali hospital

Row	Main Activity (A)	Standard activity (Min/hrs)	Standard workload	Total statistics in 2017	Estimated number of personnel
1	Patients visit	4.45	19336.45	9888.30	0.51
2	Controlling vital symptoms	5.87	14667.14	13478.00	0.92
3	Angiocut replacement	10.40	8273.77	19144.50	2.31
4	Micro set replacement	5.07	16983.00	11042.80	0.65
5	Serum bottle replacement	2.40	35853.00	5230.80	0.15
6	Giving intravenous medicines	7.60	11322.00	16963.20	1.50
7	Giving muscular medicines	12.53	6865.47	28806.00	4.20
8	in vivo desensitization observation	10.53	8169.04	24048.00	2.94
9	Oxygen therapy	11.20	7682.79	26166.00	3.41
10	Lung physiotherapy	11.07	7775.35	25104.00	3.23
11	Footbath	13.40	6421.43	30655.00	4.77
12	Suctioning	11.20	7682.79	26166.00	3.41
13	Patients training	11.20	7682.79	26166.00	3.41
14	hand washing	5.20	16547.54	11519.60	0.70
15	Sampling education	5.33	16133.85	12209.20	0.76
16	I / O control and record	5.43	15836.91	11981.60	0.76
17	Total	132.88	207233.30	298569.00	33.61

[DOI: 10.18502/jebhpme.v3i4.2064]

Table 2. Supportive activity components of nurses in the emergency department of Imam Ali hospital

Row	Supportive activities (B)	Real working time CAS	Daily working time (percent)
1	Checking and writing medication card	4.90	1.64
2	Clinical delivery and transformation	1.73	0.58
3	Monitoring department	4.74	1.59
4	Recording and report writing	9.68	3.24
5	Writing kardex	5.40	1.81
6	Checking trolley code	9.40	3.15
7	Checking department equipment	6.90	2.31
8	Management areas, etc.	38.80	12.99
Total CAS Percent		35.84	12.00

Table 3. Additional nurse activities LAS of nurses in emergency department of Imam Ali hospital

Row	Additional activity (C)	Number of performing personnel	Real working time per Individual (LAS)	Annual hours All personnel LAS
1	Hospital discharge	1	5.90	141.02
2	Ultrasonography follow-up	1	39.43	942.34
3	Writing serum label	1	2.25	53.78
4	Writing working division notebook	1	1.20	28.68
5	Follow up on patient counseling	1	7.19	171.92
6	Classifying medicine room	1	5.63	134.45
7	Medicine request	1	4.05	96.80
8	Follow up on answer to medical test	1	10.00	239.02
9	Entering medical test request	1	5.00	119.51
Total IAS per year			80.64	1927.52

Table 4. Estimating the staff surplus or shortage and working pressure ratio in emergency department of Imam Ali medical training complex

	Standard force	Existing force	Surplus or shortage	Problem	Ratio	Working pressure
Emergency department of Imam Ali complex	40	36	- 4	Shortage	0.91	Has it

Discussion

According to the results of the current study, the number of nurses working in the emergency department was 36 and the standard number of nurses was estimated 40 using WISN method and therefore, the staff shortage is 4 and the working pressure was 0.91 in the studied sectors which indicates a high workload existence in the studied sector. In the study of Mohebbifar et al. (13) in Qazvin hospitals, they have estimated the number of emergency nurses using this method and the staff shortage of the emergency department was 4 in Bu Ali Hospital, 2 in Qods Hospital and 7 in Velayat Hospital and the staff surplus of the emergency department was 14 in Rajaee Hospital and 5 in Kosar Hospital. The working pressure was 0.93 for Bu Ali Hospital, 0.92 for Qods hospital and 0.89 for Velayat Hospital, which indicates a high workload and Shahid Rajaee Hospital with 1.28 and Kosar Hospital with 1.26 represent the lack of workload. In the study of Nayebi (14) in Qazvin, they investigated the number of nurses in the emergency department using the same method and the results represented a staff shortage in the department; the required number of nurses was 63 and there was 55 nurses. The working pressure was 0.87, which indicated a medium workload in the current nursing staff. Sadeghifar et al. (7) investigated the number of nursing staff according to the model proposed by the Ministry of Health. The results represented a severe shortage in the number of nurses working in ED. The results of Nouri Hekmat et al. (6) on the number of manpower in the emergency department in one of

[DOI: 10.18502/jebhpme.v3i4.2064]

the hospitals of Kerman represented that the emergency department of the studied hospital has a nursing staff shortage, especially at night shift.

In the study of McQuid (15), the number of health care staff in Namibia was investigated using WISN method. The results of study represented that the total number of nurses was in accordance with the country need, but its distribution was inadequate. Most of the nursing staff were employed in hospitals. The number of nurses was adequate in hospitals and in some regions, there was a little staff surplus compared to the workload of nurses. In the study of Wundavalli et al. (16) for determining the number of nurses required in the emergency departments of the training hospitals, 34 health services, 21 supportive and 3 additional activities were determined by 125 nurses. Available working time was 187.250 hours for 105103 patients per year. Patient was determined. WISN ratio reported 0.90 which represents that the current staff was inadequate and 13 nurses were required. Mohamed et al. (17) calculated the number of staff required in the primary health centers of Oman using WISN method. The results of the study presented that the workload stress of physicians (WISN 1.02) was lower than nurses in average.

Different studies expressed that the nursing staff shortage is an obstacle to the efficiency and quality of hospital cares (7 and 8). Furthermore, in ranking four stressful factors in the hospital working environment, the factors related to the disproportion of number of nurses to the workload are at the top (18). The results obtained from the study of Habibi et al. (19) presented that after the inaccessibility of physicians in the emergency cases, the most important stressful factor for nurses is the lack of nurse-patient ratio along with taking care of critically ill and emergency patients and the managers of nursing units have the highest responsibility and they can provide the situation for the promotion of the quality of nursing services by presenting the required facilities. Reviewing the results of other studies represents that the problem of human resources management in the emergency department and the unwillingness of nurses to serve in this department is common in most of the public hospitals in the country (20). The restrictions of being employed in the public sector, the rules and regulations of the employment and the high costs of employing and training the staff and the personnel salary payments, the unwillingness of nurses to work in the public sector, especially the emergency department, which is the most crowded sector of the hospital, are some of the reasons that prevent from employing the adequate forces in this sector. An increase in the workload of the existing force is not also without its drawbacks; a decrease in the quality of presented health cares, an increase in the patient and staff dissatisfaction, an increase in the staff willingness to move to another sector or quit the work, a decrease in the working motivation, an increase in the error possibility for presenting health cares, etc. will be provided. Considering the vital role of nurses in the emergency department, the adequate personnel utilization which is equal to the requirement will be effective in saving and preserving the resources of the organization.

Conclusion

In the present study, the nursing staff shortage is observed and this shortage is the cause of a high working pressure on the nurses working in the study area. Considering the vital role of nurses in the emergency department, it is recommended to employ and distribute the workforce according to the requirements and workloads in the department. The staff shortage, in addition to providing the discouragement and exhaustion in the staff, can reduce the efficiency and quality of the presented services and finally, provide the dissatisfaction in the patient. On the other hand, since the employment and utilization of workforce in the public sectors is a time consuming process, therefore increasing the comfort facilities and developing the motivational programs, including the determination of moral and physical encouragements, strengthening and empowering the communication skills of the staff working in this sector in order to provide an

[DOI: 10.18502/jebhpme.v3i4.2064]

appropriate communication and minimizing the patients dissatisfaction, training and employing the nurses from other sectors of the hospital who volunteer the overtime shifts is recommended until the determination of an adequate number of staff.

Some cases such as the system failure to record information and discharge the patient, the unpreparedness of medical tests and imaging, the absence of a resident physician or the consultants who requires to follow up and report to the higher authorities were not included in the calculations. It is recommended to perform this estimation for all the nurses of the studied hospital to identify the sectors with the staff surplus and a plan should be prepared for the adequate workforce distribution.

Acknowledgments

The authors are thankful of all those who assisted the researchers in performing this research.

Conflict of Interests

No conflict of interests has been stated.

Authors' Contributions

Najafi M and Ghorbani A designed research; Najafi M and Vaziri Seta M collected data; Najafi M and Ghorbani A analyzed data; Najafi M and Rajaee R wrote manuscript. All authors read and approved the final manuscript.

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[DOI: 10.18502/jebhpme.v3i4.2064]