Original Research Report

WORKLOAD INDICATORS OF STAFFING NEED (WISN) FOR THE REQUIRED ESTIMATION OF NURSING STAFF IN A HEMODIALYSIS UNIT

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ABSTRACT

The number of hemodialysis patients continues to increase almost every month, while the number of nurses in the Hemodialysis Unit at Rasyida Renal Specialist Hospital, Medan, Indonesia, remains constant. This situation has increased the nurses' workload and responsibilities. Therefore, it is necessary to examine the balance between the workload and the number of required nursing staff in the Hemodialysis Unit at Rasyida Renal Specialist Hospital. This study aimed to identify the optimal number of nursing staff required in the Hemodialysis Unit at the hospital in 2022. This study used a mixed-methods approach using the Workload Indicators of Staffing Need (WISN) method. This study included 44 nurses working in the Hemodialysis Unit at Rasyida Renal Specialist Hospital. Primary data included questionnaires, observations, and interviews during working hours, while secondary data included document reviews and staffing data. WISN calculations showed that the Hemodialysis Unit required a total of 65 nursing staff. In other words, an addition of 21 nursing staff was needed to meet the current workload. In conclusion, the current human resources available are not sufficient, and the workload is beyond the capacity of the nursing staff at the hospital.

Keywords: Health system; human resources; nursing personnel; workloads; workload indicators of staffing need (WISN)

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Highlights:
1. This article presents an understudied topic of nursing workloads in a hemodialysis unit and concludes that directly and indirectly productive activities occupied the majority of the nurses' working time.
2. An analysis using the Workload Indicators of Staffing Need produced a general report that may prompt re-evaluation of nursing staff requirements and policy-making for workload distribution.

INTRODUCTION

Human resource planning according to the needs and service functions in each unit, section, and department affects the success and development of a hospital (Elarabi & Johari 2014). Data from the Development and Empowerment Agency for Health Human Resources (Badan Pengembangan dan Pemberdayaan Sumber Daya Manusia Kesehatan/BPPSDMK) revealed that the percentage of nurses (29.66%) was the largest among other health workers in Indonesia as of December 2016. In 2016, the national ratio of registered nurses per 100,000 people was 113.40. The national rate in 2016 was significantly higher than in the previous year, although it did not reach the target for 2014, which was 158 per 100,000 people (Ministry of Health 2013). The 2019 goal was increased to 180 per 100,000 people. The evaluation of the nurse-to-patient ratio is important because a nurse is required to provide appropriate nursing care despite the heavy workload and responsibility (Destiani et al. 2020, Moghadam et al. 2021, Maghsoud et al. 2022). It should be noted that a heavy workload can result in work deviations. It is possible for a nurse's performance to decline, resulting in suboptimal nursing care (Kokoroko & Sanda 2019, Rifani & Djamil 2022).

In the late 1990s, the World Health Organization (WHO) developed the Workload Indicators of Staffing Need (WISN) method. This method

provides guidelines to estimate staffing needs, including population-to-staff ratio calculations (World Health Organization 2010). The Ministry of Health of the Republic of Indonesia has been using this method as a reference for calculating the required number of nursing staff since 2004. It has been legalized through the Decree of the Minister of Health Number 81/MENKES/SK/2004. Several studies, including Bonfim et al. (2016), Joarder et al. (2020), and Nuruzzaman et al. (2022), used the WISN method to quantitatively estimate nursing staff requirements based on activity standards and workloads. Furthermore, the WISN method was also used in a study to assess the imbalance in the distribution of nursing staff at Burdwan District Hospital, India. The average WISN results for the entire Burdwan District showed that only 35% of the required nurses were available, indicating a 65% shortage of nurses (Shivam et al. 2014).

The problem that frequently arises in nurse staffing is an imbalanced distribution of nurses. It may be because the directors have a difficult time identifying the workload in each unit (Spurgeon et al. 2012). If the problem is recognized, it is typically due to subjective complaints. The distribution of nurses has become one of the primary concerns of the nursing industry in order to provide better health programs and services to the Indonesian population (Gunawan 2016, Efendi et al. 2018). It is essential to provide prospective nurses with training and education to accommodate the demand for health personnel in hospitals and other types of health services. However, nurse staffing requirements, including the number of required nurses, are a prevalent issue in the health systems of many countries, especially in low- and middle-income countries (Martono et al. 2019, Frota et al. 2020, Efendi et al. 2022). Ekawati (2018) and Jayanti (2018), who conducted their studies in Yogyakarta and Medan, Indonesia, respectively, found a shortage of nursing staff according to the analysis results using the WISN method. There was a shortage of six nurses each in the Al-Kausar Inpatient Ward of Hospital X in Yogyakarta and the Inpatient Ward of Bunda Thamrin General Hospital, Medan, Indonesia. Only 72 nurses were available in the Inpatient Ward of Bunda Thamrin General Hospital, while 78 nurses were needed.

In research conducted by Pangaribuan (2015), it was concluded that the comparison of productive and non-productive time in the Hemodialysis Unit of Dr. Djasamen Saragih General Regional Hospital, Pematang Siantar, Indonesia, was 85%:15%. The findings indicated that the nurses in the Hemodialysis Unit had a heavy workload. The calculation of staffing requirements using the WISN showed that the required number of staff was 13 people. However, the nurses available were only 11 people, so there was a shortage of 2 nurses. In this study, the WISN method was also used to assess staffing requirements for nurses in the Hemodialysis Unit of Rasyida Renal Specialist Hospital, Medan, Indonesia. The idea for this research came from nurses' complaints that working in the Hemodialysis Unit entailed a relatively heavy workload because the number of patients was large and increasing every month while the number of nurses remained constant. This study was conducted during the COVID-19 pandemic, when the nurse staffing requirements in relation to the nurses' workload had never been evaluated. Therefore, the purpose of this study was to determine the actual number of nurses required in the Hemodialysis Unit of Rasyida Renal Specialist Hospital.

MATERIALS AND METHODS

The research was conducted at the Hemodialysis Unit of Rasyida Renal Specialist Hospital, Medan, Indonesia, from August to November 2022. In 1995, the hospital was originally a kidney and hypertension specialist clinic. In 2016, the hospital changed its name to Rasyida Renal Specialist Hospital, with class C classification, in order to meet the demand for improved and broader services in the fields of kidney and hypertension. The hospital has 69 active hemodialysis machines spread over six rooms. This research was a mixed-methods study that combined qualitative and quantitative methods using the Workload Indicators of Staff Need (WISN). The WISN is a method for calculating staffing requirements in healthcare facilities based on the actual workload in each work unit. The WISN method is highly dependent on the accuracy and completeness of workload data (McQuide et al. 2013). All active nurses in the Hemodialysis Unit of Rasyida Renal Specialist Hospital were included in this study. The sample consisted of 44 nurses, who were also the total population.

This study was conducted by paying attention to research ethics considerations, including: (1) Ethical approval by the Health Research Ethics Committee at Universitas Prima Indonesia, Medan, Indonesia; (2) Permission and recommendations from the Faculty of Public Health, Universitas Prima Indonesia, and Rasyida Renal Specialist Hospital were obtained prior to conducting the research; (3) All respondents provided informed consent; (4) Before distributing the consent forms, the researchers explained the research objectives to prospective respondents; (5) The researchers safeguarded the respondents' anonymity by omitting their names from the observation sheets; and (6) The researchers guarantee the confidentiality of all

information provided by respondents (Kieft et al. 2014).

Quantitative data were obtained using an observational approach and work sampling by observing the nurses' work activities. The amount of time they spent working on productive and non-productive activities indicated the workload categories. The data obtained were used to analyze labor requirements using the WISN method (Joarder et al. 2020). We also collected qualitative data by interviewing several respondents to support the results of the quantitative data analysis and to explore the respondents' responses in accordance with the objectives of this study. The respondents interviewed in this study were one human resources staff member, the head of the Hemodialysis Unit, and eight nurses of the Hemodialysis Unit.

Workload analysis was carried out to understand the description of the workload using observation, questionnaires, and interviews. The observed nursing activities were categorized as directly productive, indirectly productive, and non-productive. First, directly productive nursing activities are those directly related to patient care. Direct productive activities in the Hemodialysis Unit include the installation of hemodialysis equipment on patients, the administration of heparin injections, the measurement of blood pressure, the management of hemodialysis treatment, the explanation of hemodialysis procedures to new patients, and the observation of patients. Second, indirectly productive nursing activities include preparations and activities in complete nursing care that are not directly related to patient care. In the Hemodialysis unit, these tasks include activating the hemodialysis machine, filling in medical records, reusing the dialyzer, and disposing of infectious waste. Third, non-productive activities are those unrelated to nurses' duties and responsibilities, such as eating, praying, using the restroom, chatting, and preparing for personal hygiene (Spurgeon et al. 2012).

The variables observed in this study included available working time, work units, human resource categories, standard workloads, allowance standards, and staff requirements per work unit. Observation sheets were used in this study to measure the workload. As reported by the World Health Organization (2010), the formula for calculating available working time was A–(B+C+D+E)xF, with A representing working days, B representing annual leave, C representing education and training, D representing national holidays, E representing absence from work, and F representing working time. In order to determine the standard workloads, the amount of available work time was divided by the average time required to complete each task. Category allowance standards were observed to obtain data on support activities that are not directly related to or influenced by the quality or amount of the directly productive activities. The formula used for calculating allowance standards was dividing the total working time for each type of activity by the available working time. In addition, category allowance factors were also observed to determine the total number of nurses required for both directly productive health services and other activities. The formula for determining staff requirements was dividing the total workload for each workload component by each respective standard workload, then adding the allowance standard. A staff requirement ratio of <1 indicated that there were insufficient human resources.

RESULTS

The participants in this study were 44 practical nurses in the Hemodialysis Unit of Rasyida Renal Specialist Hospital in August 2022. All nurses in the unit had received hemodialysis training. Among the respondents, there were more male nurses than female nurses (23:21). Nurses aged <35 years were the majority (35:9), and nurses with a level 3 diploma were more common than those with a bachelor's degree (25:19), with an average of >3 years of experience working in the Hemodialysis Unit.

Table 1. Percentage of workload based on work sampling in the Hemodialysis Unit.

Types of activities	Percentage
Directly productive activities	36 %
Indirectly productive activities	46 %
Non-productive activities	18%
Total	100 %

Table 1 shows the observation results, which describe the types of activities carried out by nurses in the Hemodialysis Unit of Rasyida Renal Specialist Hospital. The nurses used their time mainly to carry out productive activities (82%), with 36% of their time spent on directly productive activities and 46% on indirectly productive activities. The proportion of their time spent on non-productive activities was only 18%.

Analysis of staffing requirements using the WISN

Workers in the Hemodialysis Unit must work six days per week in shifts. There were two shifts in a day, and each shift is 7 hours long. Nurses in the

Hemodialysis Unit of Rasyida Renal Specialist Hospital must have 312 working days per year. The policy in this hospital was that the staff had an annual leave of 14 days per year. Education and training were set for 20 hours per year, or 3 working days per year. According to the Joint Ministerial Decree in 2022, there were 16 days for national holidays and 4 days for collective leave. However, Rasyida Renal Specialist Hospital only provided 14 days of public holidays. As shown in Table 2, the available working time in the Hemodialysis Unit of Rasyida Renal Specialist Hospital was 1,932 hours per year, or 115,920 minutes per year.

Table 2. Available working time for nurses in the Hemodialysis Unit.

Code	Factors	Amount
A	Weekdays (6x52)	312 days/year
B	Annual leave	14 days/year
C	Education and training	3 days/year
D	Public holidays and collective leave	14 days/year
E	Absence from work	5 days/year
F	Working time	7 hours/day
Available working time = [A-(B+C+D+E)]×F		
1,932 hours/year or 115,920 minutes/year		

Table 3. Standard workloads for directly productive activities.

Workload components	t	AWT	SW
Installation of the device and administration of heparin injection	15	115,920	7,728
Measurement of blood pressure	7	115,920	16,560
Patient observation	8	115,920	14,490
Observation of patients with complications	6	115,920	19,320
Consultation with patients regarding their complaints	6	115,920	19,320
Treatment of patients with complications	14	115,920	8,280
Hemapoethrin injection for patients with indications	5	115,920	23,184
Injection of medications or multivitamins for patients with indications	3	115,920	38,640
Finishing hemodialysis treatment	8	115,920	14,490
Explanation of the hemodialysis procedure for new patients	8	115,920	14,490

Notes: Time average (t), available working time (AWT), and standard workloads (SW) were measured in minutes.

Table 4. Standard workloads for indirectly productive activities.

Workload components	t	AWT	SW
Activation of the hemodialysis machine	13	115,920	8,916
Preparation of tools and materials for hemodialysis	14	115,920	8,280
Reuse of dialyzers	115	115,920	1008
Preparation of the bed, including the bed sheets and pillows	4	115,920	28,980
Preparation of acid and new bicarbonate	5	115,920	23,184
Disposal of infectious waste	3	115,920	38,640
Reactivation of the machine if a malfunction occurs	6	115,920	19,320
Logistics management in the warehouse	10	115,920	11,592
Filing medical records	22	115,920	5,269
Data entry in the hospital management information system	20	115,920	5,796
Preparation of materials for patients	4	115,920	28,980
Preparation of intravenous (IV) injections for patients	5	115,920	23,184
Folding dirty linens	3	115,920	38,640

Notes: Time average (t), available working time (AWT), and standard workloads (SW) were measured in minutes.

Table 5. Standard workloads for non-productive activities.

Workload components	t	AWT	SW
Meal periods	19	115,920	6.101
Restroom breaks	7	115,920	16,560
Personal time (prayers, phone calls)	12	115,920	9,660
Chatting	13	115,920	8,916
Personal preparations	9	115,920	12,880

Notes: Time average (t), available working time (AWT), and standard workloads (SW) were measured in minutes.

Table 6 shows the percentage of category allowance standards for each type of activity based on the working time in the Hemodialysis Unit of Rasyida Renal Specialist Hospital. The nurses spent most of their working time on indirectly productive activities (61.5%). As shown in Table 7, the category allowance factor was 0.061. The largest proportion of the nurses' time for indirectly productive activities was spent on preparing consumables. This task required about 10 minutes, or 2,880 minutes a year.

Table 6. Percentage of category allowance standards for each type of activity.

Types of activities	Total time (minutes)	Percentage
Directly productive activities	80	22%
Indirectly productive activities	224	61.5%
Non-productive activities	60	16.5%
Total	364	100%

The analysis results of staff requirements using the WISN method revealed that the required number of nurses was 65.131 people, or rounded up to 65 people. The actual number of available nurses in the Hemodialysis Unit of Rasyida Renal Specialist Hospital was 44. Therefore, there was a shortage of 21 people on the nursing staff. The difference between the required number of nurses and the actual number of nurses in the Hemodialysis Unit produced a ratio of staff requirements. Comparison of these numbers resulted in a ratio of 0.67, indicating that the staff requirements were not met. The existing number of nurses in the Hemodialysis Unit was not sufficient.

Table 7. Category allowance factors for nursing staff in the Hemodialysis Unit of Rasyida Renal Specialist Hospital.

Workload components	t	AWT	CAF (t/AWT)
Nursing audit meeting	1,440	115,920	0.012
Arrangement of drugs and equipment	1,440	115,920	0.012
Arrangemen of essential consumables	2,880	115,920	0.025
Reecording and reporting	1,440	115,920	0.012
Total			0.061

t: Time average (minutes per year); AWT: Available working time; CAF: category allowance factor (CAF).

DISCUSSION

The work activities of nurses in the Hemodialysis Unit of Rasyida Renal Specialist Hospital showed that directly and indirectly productive activities for care services required more time than non-productive activities. Indirectly productive activities include documentation, communication, meetings, reporting, and administrative work (Sharma & Rani 2020, Yulliswandi et al. 2022,

Table 8. Analysis of the staff requirements in the Hemodialysis Unit of Rasyida Renal Specialist Hospital.

Workload components	SW	Required nurses
Installation of the device and administration of heparin injection	7,728	5
Measurement of blood pressure	16,560	2.3
Patient observation	14,490	2.7
Observation of patients with complications	19,320	2
Consultation with patients regarding their complaints	19,320	2
Treatment of patients with complications	8,280	2.3
Hemapoethrin injection for patients with indications	23,184	1.6
Injection of medications or multivitamins for patients with indications	38,640	0.27
Finishing hemodialysis treatment	14,490	2.7
Explanation of the hemodialysis procedure for new patients	14,490	0.9
Activation of the hemodialysis machine	8,916	4.3
Preparation of tools and materials for hemodialysis	8,280	4.7
Reuse of dialyzers	1,008	0.3
Preparation of the bed, including the bed sheets and pillows	28,980	1.3
Preparation of acid and new bicarbonate	23,184	0.1
Disposal of infectious waste	38,640	0.3
Reactivation of the machine if a malfunction occurs	19,320	0.5
Logistics management in the warehouse	11,592	1.7
Filing medical records	5,269	7
Data entry in the hospital management information system	5,796	6
Preparation of materials for patients	28,980	0.6
Preparation of intravenous (IV) injections for patients	23,184	0.8
Folding dirty linens	38,640	0.5
Meal periods	6,101	6
Restroom breaks	16,560	0.8
Personal time (prayers, phone calls)	9,660	4
Chatting	8,916	1.4
Personal hygiene preparations	12,880	3
Subtotal		65.07
Category allowance factor		0.061
Total		65,131

Note: Standard workloads (SW) is the quantity of workload for a year per workload component.

Hossny 2022). Indirectly productive activities are important and take up a great proportion of nurses' workload. However, nurses are most satisfied when they can devote more time to directly productive patient care activities (Raeissi et al. 2015). This study showed that nursing activities in the Hemodialysis Unit were quite busy. There were similarities between this study and another study conducted in a radiology unit where nurses spent more time on directly and indirectly productive care activities compared to non-productive activities (Farrasizdihar et al. 2021). Productive activities are the main activities in nurses' duties and responsibilities. Therefore, the nurses on duty are more occupied with carrying out productive activities, both directly and indirectly, than non-productive activities (Kieft et al. 2014, Leal & Melo 2018).

In hospital settings, a high workload poses a danger to patient safety. Unwanted occurrences may happen and endanger patients in precarious situations (Vaismoradi et al. 2020, Govasli & Solvoll 2020). One of the solutions that can prevent undesirable occurrences is meeting the staff requirements or hiring additional nurses. This solution is anticipated because patient visits tend to increase every month and will continue to rise in the coming years.

The findings of this study revealed that nurses in the Hemodialysis Unit of Rasyida Renal Specialist Hospital spent more time on indirectly productive activities than directly productive activities, with a comparison of 61.5% and 22%, respectively. The time spent on non-productive activities was only 16.5%. Indirectly productive activities required a great proportion of the nurses' workload because of the long process of reusing the dialyzer. The total productive time (83.5%) in the Hemodialysis Unit for one shift passed the optimal point (Gunawan 2016). A study showed that the optimal proportion of working time for productive activities is 80%. Therefore, it was necessary to consider hiring additional nurses.

In the analysis of working time, it was found that nurses in the Hemodialysis Unit had at least one day off per week. Nurses with less than three years of experience had only 12 days off per year, while those with more than three years of experience had 14 days off. In the Hemodialysis Unit, there were no minimum hours of training or seminars per year. However, there was a plan in 2022 to start allocating 20 hours per year, or three working days per year, for education and training. Another study found that the optimal working hours for nurses are divided into three shifts. Nurses are entitled to eight days off per month and three national holidays per year (Sharma & Rani 2020).

According to the results of the overall calculation, it was found that the amount of available working time for nurses in the Hemodialysis Unit was 115,920 minutes per year. However, a study conducted by (Farrasizdihar et al. 2021) found a greater amount of available working time in a radiology unit of a hospital. According to the ministerial decree of the Ministry of Manpower and Transmigration, the definition of overtime is working that exceeds the recommended working hours. Employers should adhere to the recommended working hours, i.e., 7 hours a day and 40 hours a week for 6 working days a week, or 8 hours a day and 40 hours a week for 5 working days a week. The working hours of nurses in the Hemodialysis Unit did not exceed the maximum working hours for workers with six working days a week. However, nurses on the afternoon shift might still have to work overtime. The interview showed that the nurses received bonuses or incentives from the hospital as rewards for providing excellent hemodialysis care services.

In this study, the observations and interviews showed a category allowance factor of 0.061. The working components that affected this factor included nursing audit meetings, preparation of medicines and equipment, preparation of consumables, and reporting. The category allowance factor in this study was smaller than in previous studies that showed category allowance factors of 0.183 and 0.39 (Ekawati 2018, Farrasizdihar et al. 2021). The small category allowance factor in this study might be because there were not many activities conducted outside of the Hemodialysis Unit of Rasyida Renal Specialist Hospital. The hospital did not set a schedule for all nurses to take part in these activities, but only for several representative nurses. It was done to prevent the Hemodialysis Unit rooms from being vacant if the nurses were away for activities outside the hospital. One skilled nurse is required for every two hemodialysis machines per shift. The nursing staff requirements for two shifts are 70 nurses (Afzal et al. 2021). There were only 44 nurses and 69 hemodialysis machines in the Hemodialysis Unit of Rasyida Renal Specialist Hospital. Each nurse in the Hemodialysis Unit should operate about three hemodialysis machines. Therefore, the number of nurses in the Hemodialysis Unit was insufficient.

The results of a previous study showed that there was a shortage of six nurses at Bunda Thamrin General Hospital. The number of available nurses in the hospital was only 72, while 78 nurses were required to equally distribute the nurses' workload (Jayanti 2018). In another study, the obtained results also showed insufficient human resources for the existing workloads, with a staff requirement ratio of 0.7. There were only 15 nurses in the

inpatient room of a hospital in Yogyakarta, Indonesia, while the required number of nurses was 21 (Ekawati 2018). In contrast, a study by Farrasizdihar et al. (2021) in a hospital's radiology department found that there was enough staff available. Both the existing and required number of nurses in the unit were 15 people, so the staff requirement ratio was 1.00. The staff requirement ratio in this study was 0.67. The low ratio indicated that the Hemodialysis Unit of Rasyida Renal Specialist Hospital had a shortage of nurses. This situation can affect the care services provided by the nurses, such as the increased potential for medication errors. This study suggests that the management of Rasyida Renal Specialist Hospital should consider planning a more balanced staffing by referring to the analysis results of staff requirements.

Strength and limitations

The strength of this study was that it provided insight into the heavy workloads of nurses that are often left unnoticed. This study may also serve as a prompt for a re-evaluation of staff requirements in the hospital. In addition, the data in this study were collected not only through interviews but also through observations, so the data obtained were objective. The respondents completed the instrument questionnaires under the supervision of the researchers in order to obtain accurate data. However, due to time constraints, it was challenging to gather information regarding current circumstances and standard operating procedures in the Hemodialysis Unit.

CONCLUSION

According to the Workload Indicators of Staffing Need (WISN) calculations, the current human resources at Rasyida Renal Specialist Hospital are not sufficient. The heavy workload, especially related to indirect productive activities, emphasizes the need for additional nursing staff to balance the workload. In addition, nursing management should consider the standard workload as well as implement effective and efficient strategies for planning and scheduling to estimate production costs, including the cost of nursing staff. The use of the WISN method is recommended to determine the number of staff and to reevaluate the distribution of nurses in both the Hemodialysis Unit and the inpatient rooms according to the specific requirements of each area.

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Conflict of interest

None.

Ethical consideration

This study was approved by the board of the Ethical Committee of Universitas Prima Indonesia, Medan, Indonesia, as indicated by registration No. 034/KEPK/UNPRI/2022 on 30/9/2022.

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None.

Author contribution

FCW contributed to the conception and design of this study, analyzed and interpreted the data, drafted the article, and collected and assembled the data. SLRN and CNG contributed to the critical revisions of the article for important intellectual content and provided the study materials and statistical expertise.

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