(RESEARCH ARTICLE)

Analysis of the need for nursing staff in inpatient rooms based on the douglas formula: A case study at a private hospital in Sidoarjo, Indonesia

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Abstract

This study was conducted to analyze the need for nursing staff based on patient dependency level using the Douglas formula. A descriptive-analytical design was used and the sample size was 2,938 patients taken by total sampling. The instrument used was a patient dependency level scale adapted from the self-care deficit theory by Dorothea Orem, categorized into three, namely minimal, partial, and total care. Data were analyzed using descriptive analysis, and needs for nursing were assessed with the Douglas formula. The results showed that 50% of inpatient rooms had less than the required number of nursing staff, specifically pediatric and adult rooms. Meanwhile, NICU (Neonatal Intensive Care Unit), as well as rooms C, D, and ICU (Intensive Care Unit) had more nursing staff than needed. These results implied that the number of nursing staff was not evenly distributed, underscoring the need for an increase based on patient dependency level, to optimize care.

Keywords: Nurses; Douglas Method; Patient Dependency; Nursing Care

1. Introduction

According to the 2006 World Health Organization (WHO) report, Indonesia was among 57 countries facing a health crisis in human resources, both in terms of inadequate numbers and distribution. A 2009 study conducted in several Southeast Asian countries, including Indonesia, found that hospital nursing staff faced increased workloads while still experiencing shortages.[1]

The ratio of health workers per 100,000 population has not met the target set in 2010, and according to a report in 2008, the current value was 157.75 compared to the target of 158. Considering the existing standards, in 2010, there was a shortage of staff in government hospitals (Ministry of Health and Regional Government), where only 6,677 nursing staff or midwives were recorded.

Based on data from PERSI Data Center (*Perhimpunan Rumah Sakit Seluruh Indonesia*/Indonesian Hospital Association) in October 29, 2013, hospital beds in East Java were not ideal compared to a population of 37 people. The number of beds in 2013 was only 35,656 units, while the ideal need ranged from 37,000 - 40,000 units[2]. This condition was also experienced by a private hospital in Sidoarjo, East Java, Indonesia where a total of 145 nursing staff and 148 beds were recorded with an average bed occupancy rate (BOR) of 56-67%. This implied that the density of nursing activities was not yet supported by the condition of patients with various levels of dependency.

Failure to address the need for nursing staff based on patient dependency level will lead to an imbalance in the number available and the workload carried out, subsequently affecting the quality of services[3]. Therefore, this study was conducted to analyze the need for nursing staff based on patient dependency level using the Douglas formula.

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2. Material and methods

A descriptive-analytical design was used, and the sample comprised patients treated at a private hospital in Sidoarjo, East Java, Indonesia, taken by total sampling. The inclusion criterion was individuals willing to be studied, and the sample size was 2,938. Furthermore, the instruments used were observation sheets and patient dependency level checklists adapted from Dorothea Orem's self-care deficit theory, categorized into three, namely minimal, partial, and total care. In this context, minimum care (1-2 hours/24 hours) has the criteria; personal hygiene, bathing, and changing clothes carried out individually. Eating and drinking were carried out alone, ambulation was supervised, vital signs were observed every shift and natural treatment with stable psychological status. Partial care (3-4 hours/24 hours) has the criteria; assisted personal hygiene, eating and drinking, observation of vital signs every 4 hours, assisted ambulation, treatment more than once, client with urinary catheter, *intake* and *output* recorded, clients with infusions, as well as medication preparations requiring procedures. Total care (5-6 hours/24 hours) has the following criteria; help with all patient needs, change of position, observation of vital signs every 2 hours, feeding through Nasogastric Tube (NGT), intravenous (IV) therapy, mucus suction, restlessness, or disorientation.

Data were analyzed using descriptive analysis and nursing needs were calculated with the Douglas formula. The classification of patients based on the degree of dependency used the minimum dependency level formula. For minimal dependency in the morning: 0.17 times the number of patients, in the afternoon: 0.14 times the number of patients, and evening 0.07 times the number of patients. Partial dependency in the morning: 0.27 times the number of patients, afternoon: 0.15 times the number of patients, and evening: 0.10 times the number of patients. Total dependency in the morning: 0.36 times the number of patients, afternoon: 0.30 times the number of patients, and evening: 0.20 times the number of patients. Subsequently, the number of nursing staff needed on each shift for each patient dependency.

This study received an Ethics Permit Certificate No. 003570923 from Muhammadiyah University Surabaya and signed informed consent was obtained from participants. Initially, participants received information regarding the objectives, benefits, advantages, methods, and procedures to be carried out in this study. Participation was voluntary and did not result in physical or mental harm. Furthermore, participants were allowed to withdraw and the information provided was kept confidential.

3. Results

Based on Table 1, 806, 1568, and 265 patients had minimum, partial, and total dependency, respectively. The total number of patients treated at a private hospital in Sidoarjo, East Java, Indonesia for 22 days was 2,639.

Table 1 Data on the Number of Patients Treated on 1-22 April 2015 in a Room at a Private Hospital in Sidoarjo, East Java, Indonesia

Room	Σ average patient based on dependency level			Σ all patients
	M	**P**	**T**	
NICU	0	0	86	86
A	81	88	0	169
B	71	612	47	730
C	286	191	0	477
D	0	235	21	256
E	242	212	0	454
F	126	230	0	356
ICU	0	0	111	111
Total	806	1568	265	2938

Table 2 shows that the average number of patients based on the level of needs was 38, 72, and 10 for minimum, partial, and total care, respectively. For the number of nursing staff, 19, 39, and 14 nursing staff were needed respectively.

Table 2 Need for Nursing Staff Based on Patient Dependency Level on 1-22 April 2015 in a Private Hospital in Sidoarjo, East Java, Indonesia

Room Name	Σ patients based on dependency level			Σ average need for nursing staff based on dependency level			Σ need for nursing staff	Σ Nursing staff at the hospital
	M	**P**	**T**	**M**	**P**	**T**		
NICU	0	0	4	0	0	3	7	10
A	4	4	0	3	3	0	11	10
B	3	28	2	3	15	3	30	21
C	14	9	0	5	4	0	14	17
D	0	11	1	0	6	3	14	15
E	11	10	0	5	5	0	16	15
F	6	10	0	3	6	0	14	12
ICU	0	0	5	0	0	5	9	11
Total	38	72	10	19	39	14	115	111

M= Minimal, P=Parsial, T= Total

4. Discussion

This study analyzed patients' dependency level per room, including NICU (Neonatal Intensive Care Unit) in a private hospital in Sidoarjo, East Java, Indonesia. Based on the results, in NICU room, there was an average of 4 patients with a total dependency level, specifically neonate patients aged less than 31 days.

Room A is the maternal section for patients experiencing the birth process and the postpartum period. During the observations, 8 patients on average were found daily including 4 each with minimum and partial dependency levels. The characteristics of patients with minimum dependency level include being capable of mounting or leaving the bed, walking alone to the bathroom, and defecating or urinating independently, as well as eating and drinking without assistance from nursing staff or family members. On the other hand, patients with a partial dependency level were in the acute phase of postpartum and cesarean section. These patients required assistance when walking to the bathroom, as well as during eating and dressing.

Room B is an inpatient room with the characteristics of post-operative patients, as well as those having complications and non-infectious diseases. The average number of patients in the room was 33, including 3, 28, and 2 requiring minimum, partial, and total dependency, respectively. Based on observations, patients with minimum dependency level were independent, able to ambulate themselves, and treated for diagnostic examinations. Meanwhile, patients in partial dependency level category were those who had undergone minor surgery and entered the beginning of the recovery phase. Patients with total dependency level were those experiencing post-operative fractures and others with unstable conditions.

Room C is an inpatient room for those having diabetes mellitus, heart disease, and other comorbidities. The average number of patients was 23, 14, and 9 with minimum, partial, and total dependency levels, respectively. Patients with minimum dependency level were able to carry out personal hygiene independently, fulfill food needs without being fed, and ambulate independently. In partial dependency level, patients were mostly in bed and needed nursing staff to help fulfill *Daily Living Activities*. For teenage patients, parents always help with feeding.

Room D is an inpatient room with the characteristics of various medical diagnoses. During observation, patients in the room averaged 12 daily, including 11 and 1 with partial and total dependency, respectively. Patients in partial dependency category had a catheter partially installed, the fluid needs were met intravenously, and the condition still required further monitoring. Meanwhile, patients having total dependency level were unconscious, required the help of NGT to fulfill food needs, and had IV installed to meet fluid needs with oxygenation installed.

Room E is an inpatient room used for pediatric patients diagnosed with DHF (Dengue Hemorrhagic Fever), fever, seizures as well as other blood diseases. On average, there were 21 pediatric patients in the room, including 11 and 10

with minimum and partial dependency levels, respectively. In this context, patients with minimal dependency level were already in the recovery phase, ready to be discharged from the hospital, and required monitoring regarding symptoms of the disease. Partial dependency level included those who have IV installed and others experiencing symptoms of the disease such as fever and seizures.

Room F is an inpatient room with an average number of 16 patients diagnosed with respiratory tract disorders as well as other complications. Based on the results, a total of 6 and 10 patients had minimum and partial dependency levels, respectively.

ICU (Intensive Care Unit) room is an inpatient room with total dependency level where patients are in critical condition, thereby requiring equipment that supports lives. On average, there were 5 patients in ICU room daily. In general, 1 or 2 patients in this room are cared for by 1 nursing staff.

4.1. Analysis of the Need for Nursing Personnel in a Private Hospital in Sidoarjo, East Java, Indonesia

The number of nursing staff needed can be calculated using the Douglas formula by classifying patients according to dependency level. Based on observations carried out for 22 days, several inpatient rooms were in line with the number of nursing staff available and the number of nursing staff needed according to the Douglas formula. Therefore, it is necessary to plan the number of nursing staff in line with dependency level and the number of patients in each room.

Some rooms had an insufficient number of nursing staff, namely A, B, E, and F. Meanwhile, NICU, as well as rooms C, D, and ICU had more nursing staff than the number needed. None of the rooms had the number of nursing staff according to the level of patient needs.

There is a cycle of changes in the number of nursing staff needed for each room due to the erratic number of patients being treated at this hospital. At the time the observations were made, there were inpatient rooms that experienced a decrease in the number of patients and an increase in the level of needs, thereby affecting the number of nursing staff. According to Douglas's (1984) formula, several factors that influence the need for nursing staff are based on the type of dependency level and the number of existing patients.

Planning the number of nursing staff needed for each room should be carried out by the Head of the Room every 22 days by analyzing the number and classifying patients according to dependency level[4]. Sari (2009) stated that human resource planning should be carried out based on the results of analysis and data, information, and forecasting[5, 6] to reduce the incidence of potential risks. Moreover, it can optimize energy, costs, and time, as well as direct the achievement of goals, namely improving the quality of hospital management.[7-10]

When a hospital experiences a shortage or excess of nursing staff to provide care, the Head of the Department should move staff from rooms with excessive numbers to a room with a shortage. Similarly, Rakhmawati (2008) stated that when a hospital faces a shortage or excess of nursing staff, the solution is to organize and maximize the number available.[11, 12].

To manage nursing staff in hospitals, planning is needed to determine the number needed and divide tasks according to needs. Good planning and organization have an impact on the quality of hospital services.[11, 13]

The Douglas formula has several advantages, including performing calculations according to the level of patient needs. Therefore, it can reduce the burden among patients with minimal, partial, and total dependency levels. The formula can also be synchronized with the working time of nursing staff, and the results obtained from calculations do not have a large difference compared to other formulas. The disadvantages of the Douglas formula include the inability to determine dependency level of neonates or infant patients. It is also not suitable for use in ICU, and the criteria for the level of partial and total dependency remain unclear. Furthermore, the treatment hours for entering patient criteria according to dependency level do not exist. In the Douglas formula, there are no criteria for outpatients, and nursing staff are equated with no gaps between primary and associate nurses, as well as the Head of the Room. This leads to a lack of understanding regarding nursing staff duties for neater room management. Moreover, the calculation period of 22 days (effective working hours of nursing staff) has not been able to meet the needs of nursing staff for 1 year. There are nursing tasks that have not been carried out due to the limited number of rooms.[4, 13, 14]

5. Conclusion

In conclusion, the number of nursing staff present in the Inpatient Room of a Private Hospital in Sidoarjo, Indonesia was 111, while the required number based on patient dependency level was 115. The average number of nursing staff needed based on dependency level was 19, 39, and 11 for minimum (28%), partial (56%), and total (16%), respectively. Therefore, it was concluded that the number of nursing staff in the hospital was insufficient.

Compliance with ethical standards

Acknowledgments

References

[1] Wisnu D. Evaluation of the Utilization of Health Services for Participants in the National Health Insurance Program 2014-2015: Universitas Gadjah Mada; 2016.

[2] Hermawan A. Analysis of the distribution of health workers (doctors, nurses and midwives) in Indonesia in 2013 using the Gini Index. Buletin Penelitian Sistem Kesehatan. 2019;22(3):200–7-–7.

[3] Adiba AL, Alimul A, Agustin R. Analysis of the Need for Nursing Personnel in Inpatient Rooms Based on the Douglas Formula at Siti Khodijah Hospital: Universitas Muhammadiyah Surabaya; 2015.

[4] Huber D. Leadership and nursing care management-e-book: Elsevier Health Sciences; 2017.

[5] Sari E. Human Resources Planning. Jakarta: Jayabaya University Press; 2009.

[6] Widajanti E. Effective Human Resource Planning: Strategies for Achieving Competitive Advantage. Jurnal ekonomi dan kewirausahaan. 2007;7(2).

[7] Aditama TY. Manajemen Rumah Sakit. Penerbit Universitas Indonesia, Jakarta. 2003.

[8] Brajer-Marczak R, Wiendlocha A. Lean Management concept in hospital management–possibilities and limitations. Nauki o Zarządzaniu. 2018(vol. 23 no. 1):4-12.

[9] Rego A, Araújo B, Serrão D. The mission, vision, and values in hospital management. Journal of Hospital Administration. 2016;5(1):62-72.

[10] Weimann E, Weimann P. High performance in hospital management. A guideline for developing and developed countries Almanya: Springer Berlin Heidelberg. 2017:177-91.

[11] Griffiths P, Saville C, Ball J, Jones J, Pattison N, Monks T, et al. Nursing workload, nurse staffing methodologies and tools: A systematic scoping review and discussion. International journal of nursing studies. 2020;103:103487.

[12] Unruh LY, Fottler MD. Patient turnover and nursing staff adequacy. Health services research. 2006;41(2):599-612.

[13] Hoi SY, Ismail N, Ong LC, Kang J. Determining nurse staffing needs: the workload intensity measurement system. Journal of nursing management. 2010;18(1):44-53.

[14] Marquis BL, Huston CJ. Leadership roles and management functions in nursing: Theory and application: Lippincott Williams & Wilkins; 2009.