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Analysis of Radiographer Requirements in the Radiology Department of Bhayangkara Hospital, Semarang

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ABSTRACT
Radiology, as a supporting tool in establishing a diagnosis, must maintain the quality and quality of service. Therefore, it requires support from human resources.One of the human resources (HR) in the Radiology Installation is the radiographer. According to Minister of Health Regulation No. 24 of 2020 concerning clinical radiology services, the number of radiographers required for full-service, primary, and intermediate clinical radiology services is two people per unit. Meanwhile, for primary clinical radiology services, the requirement is one person per unit. According to the SNARS radiology accreditation success book, edition 1, the number of human resources required can be calculated based on the workload. The number of radiographers must be met to maintain the quality of service.This research aimsThe research was to determine the number of radiographers needed in the Radiology Installation of Bhayangkara Hospital.This research is a descriptive qualitative study. Data collection was conducted through observation, interviews, and documentation of hospital data. The data obtained will be processed and calculated to determine the number of radiographers needed in accordance with Minister of Health Regulation No. 24 of 2020 and SNARS Edition 1 of 2018. Subsequently, an analysis will be conducted to determine the number of radiographers needed.The results of the study show that the number of radiographers needed based on the equipment is 10, while based on the number of radiographers needed based on the equipment is 10.The workload is 24-hour service, divided into three shifts, totaling nine radiographers. Currently, the number of radiographers is sufficient, but Bhayangkara Hospital lacks human resources and administrative staff.The conclusion of the research is that there is a need to review the human resource needs in radiology installations to ensure they comply with standards

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INTRODUCTION

Hospital health services are a system consisting of various sub-services, one of which is the Radiology Installation, which functions as a diagnostic support service area. The Radiology Installation is a facility used to carry out radiology services using both ionizing and non-ionizing radiation equipment. Its role in the diagnostic field also influences the hospital's image, thus requiring good and professional processing and service.(Health Ministry, 2008b).

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Therefore, it is necessary to have the support of qualified human resources in terms of both scientific capacity and skills and work abilities.

One of the human resources (HR) in the Radiology Installation is the radiographer. Radiographers are healthcare workers with the competence to perform diagnostic and interventional radiology tasks with full authority and responsibility.(Agency and Energy, 2011). Radiographer's duties according to(Jurusan et al., 2020), competence is to conduct radiographic patient examinations including examinations for radiodiagnostics and imaging including nuclear medicine and ultrasonography (USG), perform radiation irradiation techniques in radiotherapy, guarantee the implementation of health services in the field of radiology or radiography within the limits of their authority and responsibility, guarantee the accuracy and safety of radiation protection measures in operating radiology equipment and/or radiation sources, carry out Quality Assurance measures for radiography equipment. According to(Minister of Health of the Republic of Indonesia, 2020)Regarding clinical radiology services, the number of radiographers required for comprehensive, primary, and intermediate clinical radiology services is 2 people per unit. Meanwhile, for primary clinical radiology services, the requirement is 1 person per unit. According to the 1st edition of the Snars radiology accreditation success book,(Ahmad Hariri, 2018), the number of human resources needed can be calculated based on the workload.

Based on the author's observations, Bhayangkara Semarang Hospital is classified as a medium-sized radiology service. Patient services at the Bhayangkara Semarang Hospital radiology installation are 24 hours a day, with nine radiographers. Research shows that the hospital's minimum radiology service standards are well-established, but an evaluation has not been conducted because the results meet the standards and a quality assurance team has not yet been formed due to limited human resources.

Excellent service in a Radiology Installation must have established service standards to ensure satisfactory service for customers. To achieve good and excellent service, professional staff and equipment that meet standards are needed. One of the workers working in a Radiology Installation is a radiographer. To achieve good performance, the number of radiographers must be adjusted to the needs and workload. In this study, researchers will conduct an analysis and evaluation study related to the number of radiographers in radiology installations to ensure the reliability of services in order to provide the best health services for patients.

METHODS

This research is a descriptive qualitative research. Data collection was carried out through direct observation, interviews, and documentation of existing data at the hospital. The data obtained will be processed and calculated to determine the number of radiographers needed in accordance with Minister of Health Regulation No. 24 of 2020 and SNARS edition 1 of 2018. Then, an analysis will be carried out by referring to Minister of Health Regulation No. 24 of 2020 and SNARS edition 2 of 2018 to determine the number of radiographers needed.

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RESULTS AND DISCUSSION

From the results of observations, documentation interviews that have been conducted, results were obtained regarding human resources, modalities, and the number of patient visits at Bhayangkara Hospital during 2023. The workforce in the Radiology Installation of Bhayangkara Hospital Semarang consists of radiology specialists, radiographers, radiology nurses and medical physicists who also serve as PPR, with the following details:

Table 1. Employment in the Radiology Installation of Bhayangkara Hospital Semarang

No	Position	Amount
1.	Radiology Specialist Doctor	3
2.	Radiographer	9
3.	Radiology Nurse	1
4.	Medical Physicist and PPR	1
5.	Administration	-

Based on the table above, Bhayangkara Hospital Semarang does not have administrative staff, so radiographers provide patient services, from registration and equipment preparation to examinations, image processing, and radiograph capture. The radiographers also serve as medical physicists.

The modalities owned by the Radiology Installation of Bhayangkara Semarang Hospital consist of mobile X-ray machines, conventional X-ray machines, CR film processing, USG, Phanoramic and CT Scan, with the following details:

Table 2. Radiology Modalities at the Radiology Installation of Bhayangkara Hospital Semarang

No	Types of Tools	Amount (Unit)	Condition
1.	Mobile Aircraft	1	Good
2.	Computed Radiography Machine	1	Good
3.	Panoramic Aircraft	1	Good
4.	MSCT 128 Slice Aircraft	1	Good
5.	Ultrasonography (USG) machine	1	Good
6.	Conventional Radiography Machine	1	Good

Radiology services include non-contrast radiography, contrast radiography, panoramic radiography, dental radiography, non-contrast CT scans, contrast CT scans, and ultrasounds. The following data shows the number of examinations during 2023.

Table 3. Types and Number of Examination in the Radiology Installation of Bhayangkara Hospital in 2023

Type of Examination	Number of inspections in 2023
Cranium	24
Vertebre	533
Upper and lower extremities	1446
Thoracic 1 projection	7014
Thoracic 2 Projection	130

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Plain BNO	52
BNO 2-3 positions	56
Teeth (Panoramic and cephalometric)	705
Teeth (TMJ)	20
Contrast Examination of the Digestive and Reproductive Tract	12
Urinary Tract Contrast Examination	2
Ultrasonography Assistance	966
MSCT without Contrast	670
MSCT with Contrast	340

To determine the average number of patient visits, we determined the average number of patient visits per day and grouped them according to the radiology examination. Data on the number of patient visits to the radiology installation in one year was grouped and then divided by the effective working days to determine the number of patients per day. To determine the service time for each examination, researchers conducted observations, interviews, and discussions. From this data, we can calculate the time required to complete each task (workload) in radiology each day. Data on the number of examinations and task completion times per day are shown in the following table:

Table 4. Number of Inspections and Task Completion Time per day

Type of Examination	Number of Inspections		Service/examination time (minutes)	service time/day (minutes)
	per year	per day		
Non-Contrast Examination	9199	37	8	296
Teeth and Panoramic	725	3	8	24
Contrast Examination and Ultrasound Examination Assistance	1036	4	35	140
MSCT without Contrast	670	3	20	60
MSCT with Contrast	340	1	45	45
Image Processing	11970	49	5	245
Registering Patients	11970	49	5	245
Prepare tools and tidy up tools		6	5	30
Radiograph Taking	11970	49	2	98
Task completion time per day (minutes)				1183

We can determine the number of personnel/radiographers needed after calculating the daily task completion time and determining the effective working hours in a day. From the available data, the number of personnel (radiographers) needed can be calculated as follows:

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∑ Task completion time= 1.183 = 4.02 (1)
∑ Effective Working Time 294

Based on the calculation above, the total number obtained is 4.02 = 4 radiographers (rounded to 4). Nearly 90% of radiology patients undergo examinations during the morning shift, and the Bhayangkara Hospital radiology installation provides 24-hour service. Therefore, the ideal number of radiographers required is 4 in the morning shift, 2 in the afternoon shift, 1 on duty, and 1 on holiday. Therefore, the total number of radiographers needed is 9..

Workload is the number of types of work that must be completed by professional health workers in one year in one health service facility, while workload analysis is an effort to calculate the workload in a work unit by adding up all workloads and then dividing by the individual work capacity per unit of time. In this analysis, the method used to calculate the need for health human resources is based on the workload carried out by each category of health human resources in each work unit in the health service facility. (Ministry of Health Regulation No. 81 of 2004).

The Radiology Installation of Bhayangkara Hospital Semarang has a range of modalities including 1 mobile X-ray machine, 1 panoramic machine, 1 128-slice MSCT machine, 1 ultrasound machine, 1 CR device, and 1 conventional radiography machine. All are in good condition. The equipment is used daily for diagnostic purposes, with an average of 40-50 patients coming for examination per day.

Human Resources (HR) in the Radiology Installation of Bhayangkara Semarang Hospital consists of 14 workers, with details of 3 radiology specialist doctors, 1 radiology nurse, 9 Radiographers, and 1 Medical Physicist who also serves as PPR officer and head of the room and manages the management of the Radiology Installation. For administrative officers at Bhayangkara Hospital there are no, so administrative activities are carried out by radiographers. Services in the Radiology Installation of Bhayangkara Semarang Hospital run 24 hours with a division of duty time in 3 shifts, namely the morning shift starts at (07.00-4.00), the afternoon shift at (14.00-21.00), the night shift (21.00-07.00). Each shift is enforced 7 working hours, the division of radiographers per shift is 4 morning duty radiographers, 2 afternoon duty radiographers and 1 night shift radiographer. On Saturdays and Sundays there is only 1 radiographer on duty per shift with the same schedule.

According to Health Ministerial Regulation No. 24 of 2020, intermediate clinical radiology services, such as those at Bhayangkara Hospital, should have two administrative staff. However, Bhayangkara Hospital does not have any. This increases the radiographer's workload, as all administrative activities, from patient registration and data entry to obtaining test results, are performed by the radiographer. Therefore, an evaluation and review of human resources is necessary to ensure that the primary duties and functions of each employee are aligned. Furthermore, radiographers can focus more on providing patient care and effectively ensure quality assurance in the radiology facility.

Analyzing the need for radiographers based on workload can be calculated using the method found in the 2018 edition of the SNARS book, using the WISN (word load staff need) method. This calculation involves several steps: determining available and effective working

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hours, calculating the number of patient visits, determining task completion times, and calculating human resource requirements.

From the data obtained by the author regarding the calculation of radiographer needs based on workload, the data obtained include effective working time in 2023 available as many as 243 days, effective working time per day is 294 minutes, the number of patient visits is around 49 patients per day and the task completion time is 1183 minutes per day.

After calculating the number of radiographers needed, 4.02 people were divided into 4. Almost 90% of patients in radiology undergo examinations on the morning shift and in the radiology installation of Bhayangkara Hospital, 24-hour service is provided which is divided into 3 shifts, namely the morning shift starting at (07.00-14.00), the afternoon shift at (14.40-21.00), and the night shift (21.00-07.00), so the ideal number of radiographers needed is 4 in the morning shift, 2 in the afternoon shift, 1 on duty and 1 on holiday. So the total number of radiographers needed is 9 radiographers. In the Radiology Installation of Bhayangkara Hospital Semarang, there are 9 radiographers, so the number of radiographers at Bhayangkara Hospital Semarang has been met.

According to KMK RI No. 1014 of 2008, the calculation of radiographer needs according to the existing examination modalities is 1 modality of equipment with a ratio of 2 radiographers, so 10 radiographers are needed, because in the Radiology installation of Bhayangkara Semarang Hospital there are 5 modalities of examination equipment. In this caseThis calculation of the need for radiographers based on equipment is also necessary for consideration, including the absence of administrative staff.

CONCLUSIONS

The research conclusions are: 1)The Radiology Installation of Bhayangkara Hospital Semarang is included in the category of intermediate clinical services that provide 24 hours and is divided into 3 shifts. The workload of radiographers at Bhayangkara Hospital increases because there are no administrative staff, so all administrative activities are carried out by radiographers. 2) The current need for radiographers at Bhayangkara Hospital based on the workload requires 9 radiographers divided into 3 shifts with details of 4 radiographers in the morning shift, 2 in the afternoon shift, 1 in the night shift, 1 on duty, and 1 on holiday. Research suggestions are: 1)Administrative staff requirements are adjusted to existing standards. 2) Adding radiographers based on equipment may also be considered, especially if the number of patients increases significantly.

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