INTERNATIONAL JOURNAL OF SOCIAL HEALTH
https://ijsh.ph/index.php/rp
Volume 2 Number 11 November 2023 E-ISSN: 2984-7079

MODEL OF CALCULATING WORKLOAD AND PREPARING HUMAN RESOURCE NEEDS (HR) OF RADIOGRAPHERS

Novita Wijaya[1], Sudiyono[2], Lutfi Rusyadi[3]
Politeknik Kesehatan Kemenkes Semarang, Central Java, Indonesia
novitawijaya3@gmail.com

KEYWORDS
Radiographers; Workload; Human Resource (HR)

ABSTRACT
Minister of Health Decree Number 24 of 2020 Health About planning clinical radiology service standards, currently Radiotherapy Installation at RSUD. Dr. H. Abdul Moloek of Lampung Province has 12 (twelve) radiographers and has operational modalities in 4 (four) Radiotherapy Installations. This study aims to compile standard guidelines for workload calculation models and preparation of Radiographer needs in the radiotherapy unit of Dr.H. Abdul Moeloek Hospital, Lampung Province. This type of research was carried out in two stages: the first stage of research and development using Research and Development (R&D) and the second stage, the mixed methods method with the Focus Group Discussion (FGD) technique. The research respondents used a purposive sampling method; the respondents in collecting information were 5 (five), and the samples were taken from 12 (twelve) radiographers in the radiotherapy installation. The results of the research show that the NOVITA Formula after testing the 12th (twelfth) product of the radiometer using the Likert scale validity test (Likert interval 1-4) and the reliability test using the Cronbach's alpha method produces a value of 8.3% valid and 0.628 reliable, which shows The model instrument for calculating workload and preparing Radiographer needs using the NOVITA Formula is suitable for implementation or use at RSUD Dr. H. Abdul Moeloek Lampung Province in Radiotherapy at the Linear Accelerator (LINAC) unit. The NOVITA formula can be applied in Radiotherapy in Linear Accelerator (LINAC) units and needs further development for other units.

DOI: 10.58860/ijsh.v2i10.118

Corresponding Author: Novita Wijaya
Email: novitawijaya3@gmail.com

INTRODUCTION

Health workers are people who devote themselves to the health sector with a sense of responsibility, have high ethics and morals, have knowledge, skills, expertise and authority that must constantly be improved through continuous education and training, as well as certification, registration, licensing, coaching, supervision, monitoring and must meet service standards, standard operational procedures and provisions of codes of ethics and professional standards that refers to the professional organization of health workers (Undang-undang RI No 36 Tahun 2014, 2014).

According to Law Number 36 of 2014, health workers are divided into medical groups, clinical psychology, nursing, midwifery, pharmacy, public health, environmental health, nutrition, physical therapy, medical engineering, biomedical engineering, traditional health, and other health. Furthermore, based on the judicial review of Law Number 36 of 2014, through the Constitutional Court Number 82 / PUU-XII / 2015 decision, medical groups are not included in health workers. The biomedical engineering staff comprises radiographers, electronics, medical laboratory technologists,

medical physicists, radiotherapists, and prosthetic orthotics (Undang-undang RI No 36 Tahun 2014, 2014) (82/PUU-XIII/2015, 2015).

Radiographers are health workers who are given the task, authority and responsibility to carry out radiographic and imaging activities in health care units, as well as a health professional in diagnostic imaging technology who has been trained in higher education institutions and works with advanced technology for X-ray examination, CT examination (computed tomography), MRI examination (magnetic resonance imaging) and produce medical images that can Assist radiologists in establishing their diagnoses (Nurvan et al., 2023). In some special diagnostic imaging techniques, radiographers perform radiation therapy and medical symmetric activities in radiology services. Hence, the community wants to improve the quality of radiology services, which requires every Radiographer to work professionally and have standard competencies that every Radiographer must possess in working in health service facilities. The planning of health workers has been regulated in Government Regulation Number 36 of 2014 concerning Health Workers. In this Government Regulation, it is stated that the procurement and placement of health workers are carried out to meet the equitable needs of health workers for the community (Undang-undang RI No 36 Tahun 2014, 2014).

By the Decree of the Minister of Health of the Republic of Indonesia Number 33 of 2015 concerning Guidelines for the Preparation of Health Human Resources at the Province, Regency / City and Hospital levels, it is necessary to improve and solidify, plan, procure health workers, utilize and empower health professions. The management of health human resources, especially the planning of health human resource needs, has not been managed professionally, is still top-down (from the centre), not bottom-up (from the bottom), and has not been by organizational needs and real needs in the field and has not been long-term orientation (Made Yoga Putra, 2015).

Kepmenkes Number 24 of 2020 Health concerning Clinical Radiology Service Standards is a Hospital providing health services for the community, where patients can get the desired health services, including Promotive, Preventive, Curative and Rehabilitative Services. Hospitals are one health service facility that provides health services to improve public health. Therefore, hospitals are required to provide quality services by established standards and can reach all levels of society (P. RI, 2020). The results of research conducted by An Australian Graduate School of Management on 541 organizations show that only 37% have HR planning based on scientific analysis, 41% still need a sound HR planning system, and the remaining 12% still need HR planning. The results of this study illustrate that even in developed countries, only one-third of organizations perform HR planning functions, which ultimately affects the low quality of hospital performance and productivity (Hartawan & Ilyas, 2020)

Radiogarfer power in Indonesia is a profession that still needs to be improved and is needed for its existence in public and private hospitals. Improve services when performing X-ray examinations, including radio diagnostic examinations, imaging, nuclear medicine and ultrasonography (USG) examinations (Rani, 2018). Repetitive activities must be adequately completed, namely having a good human resource planning (HR) system, which affects the low quality of hospital performance and productivity (Mahawati et al., 2021).

This situation causes services to patients to be hampered. Therefore, it is necessary to review the needs of human resources (HR) in the Radiology Installation, and this is the starting point and the key to the quality of products produced by the Hospital. Human resources (HR) skills and expertise are needed to support quality health services. Determining the quality and quantity of human resources (HR) requires human resource planning (HR), namely planning the workforce to suit the needs and effectively and efficiently in helping to realize goals (Hartawan & Ilyas, 2020).

The needs and qualifications of resources in radiology installations must be carefully planned by looking at the services we provide to patients. The division of working hours must be determined precisely for each day within 24 hours, and there is a definite and even division of hours by not ruling out clinical services. To avoid mistakes in the course of procedures, there are still many hospitals that feel a lack of energy (Radiology HR) or maybe excess radiology personnel (Waluyo et al., 2018) Because they do not understand the job description or job description of each section, for that it is necessary to conduct a further review on it.

The Ministry of Health adopts a method of calculating labour needs based on the workload carried out by each category of human resources, namely the WISN (Work Indicator Of Staffing Need) method. This Method calculates the needs of each category of health workers needed at health offices and hospitals at the provincial, district/city levels. It has been ratified through the decree of the Minister of Health of the Republic of Indonesia Number 33 / Menkes / SK / 2015. The Method of calculating needs based on workload WISN (Work Indicator of Staffing Need) is an indicator that shows the amount of power needed in health facilities based on workload so that the allocation/relocation of energy will be more straightforward and rational. The advantages of this method are that it is easy to operate, easy to use, technically easy to implement, comprehensive and realistic (Peraturan Pemerintah, 2015).

Ilyas' Formula explains that the workload is based on the available working time to perform a series of jobs. The workload can be seen from the activities or activities carried out by staff at work time, both direct and indirect activities, and other activities such as personal and unproductive activities. This working time is seen from the conformity with Indonesian working time standards issued by Law Number 13 of 2003 concerning employment. Namely, the average working time per day is 8 hours (5 working days). The workload is high if a staff/officer works above 80% of his productive time. The advantages of using this Ilyas formula are easy, cheap, fast and precise. In addition, scientifically, it has a high level of validity and reality and has been well-tested by organizational management (Ilyas, 2013).

The WISN (Work Indicator of Staffing Need) method has a significant drawback, which is highly dependent on the accuracy and completeness of data related to workload. As a result of this weakness, the Number of energy needs generated from the WISN (Work Indicator of Staffing Need) method was not by the workload. Objective workload calculations need to be done to determine the accuracy of the WISN (Work Indicator of Staffing Need) Method to ensure the correct interpretation of results. The Ilyas formula has the disadvantage that the labour needed is less produced, and the workload is higher (Peraturan Pemerintah, 2015).

Healthcare facilities that provide clinical radiology services must have equipment and human resources. Radiology services are the modality capabilities of limited radiology tools in the form of mobile X-ray aircraft, dental X-ray, panoramic or cephalometry, ultrasonography (USG), mammography, fluoroscopy, CT Scan, Magnetic Resonance Imaging (MRI), Positron Emission Tomography Scan (Pet CT), C-arm and Radiotherapy (K. RI, 2020). Radiotherapy is a technique that uses high-energy radiation to kill cancer cells in the patient's body. Radiotherapy is usually given every day (5 times in 1 week) with a total of 20-35 times depending on the type of cancer and the purpose of treatment (Purwani et al., 2022).

Currently, Radiotherapy Installation at RSUD Dr. H. Abdul Moeloek of Lampung Province has 12 radiographers, of which 1 is in charge. It has 4 operational modality tools in Radiotherapy Installations, including Linear Accelerator (LINAC), Brakhiterapi, CT Simulator and C-Arm. Each operational modality has a license. At the time of primary data collection, namely in the 2022 performance and quality report in the quality indicators, the patient waiting time ≥80% never reached

the target, namely on the Linear Accelerator (LINAC), Brakhiterapi, and CT Simulator tools. This was due to the number of new patient visits increasing by 812, varying each month. As many as 226 patients became waiting lists.

Based on the collection of primary data in the report on the Human Resources (HR) development plan, and the development of facilities or infrastructure services for Radiotherapy Installations at the Hospital Dr. H. Abdul Moeloek of Lampung Province for 2023, where the reporting on the procurement of radiographers amounted to 6 people, which was followed by the submission of facilities/infrastructure, namely the construction of the 2nd Bunker Linear Accelerator (LINAC) and the construction of nuclear medicine. Based on the results of preliminary studies, observations, and data collection at the Hospital Dr H. Abdul Moeloek of Lampung Province conducted at the Radiotherapy Installation, the problem felt as inaccurate in calculating radiographer workload and preparing reporting in the submission of human resources (HR) and facilities or infrastructure about the Number, namely, the submission of the Number of employees is not balanced with the Number of patient visits, patient waiting lists and the procurement of new facilities or infrastructure.

Based on the observations made, the workload analysis officer (ABK) in performance and quality reporting does not count one by one the amount of workload carried out by active, sick, or furloughed radiographers and in the report on the development plan of facilities/infrastructure services see the minimum standards of BAPETEN regulation Number 21 / Ka-BAPETEN / XII.02 concerning clinical radiology services. From the results of preliminary studies conducted on the Head of Human Resources (HR) at Other Health Worker Services and the Personnel Planning section at the Hospital. Dr. H. Abdul Moeloek, Lampung Province, the obstacle faced when tracing documents is the absence of guidelines in calculating workload and preparing the human resource needs (HR) of radiographers who can be distributed.

Based on the background contained above, the author wants to make a design for the development of workload calculation modifications from both methods, namely the Work Indicator of Staffing Need (WISN) Method and the Ilyas Formula, by combining the advantages of the two methods, and produce a workload calculation model of the NOVITA method. The advantages of the NOVITA method are that it is easy to use and produces realistic values by Standard Operating Procedures (SOP) in BAPETEN regulation Number 21 / Ka-BAPETEN / XII.02 concerning clinical radiology services.

This study aims to analyze the feasibility of the workload calculation model and the preparation of radiographers' human resource needs (HR) with the Novita method at the Hospital Dr. H. Abdul Moeloek, Lampung Province. Analyzing the needs of the Number of radiographers seen from the Clinical Radiology Service in Calculating the Planning of Radiogarfer Manpower Needs at the Hospital Radiotherapy Installation Dr. H. Abdul Moloek, Lampung Province. The benefits of this research are expected to make an academic contribution to developing theories on calculating workload and preparing the needs of Health Human Resources (HHR) (Afrimarta, 2021).

METHOD

This type of research was carried out in two stages, namely the first stage using the Research and Development (R&D) Method, which aims to create a model for calculating workload and preparing radiographer needs. The second stage is the mixed methods method with the Focus Group Discussion (FGD) technique, which aims to test the validity of the NOVITA Formula. This research method uses observation and interview methods. This research carried out observations by visiting or coming directly to the research location. Interviews were conducted to gather as complete information

as possible about the problems. The subjects to be studied are radiographers in radiotherapy installations. The population in this study were all radiographers in the radiotherapy unit at RSUD Dr. Hi. Abdul Moeloek Lampung Province numbered 12 (twelve) Radiographers.

RESULT AND DISCUSSION

The results of this study consist of 5 (five) main steps of the Research and Development (R&D) Method, namely, the analysis stage (Analysis), the product design stage (Product Design), the validation or evaluation stage (Evaluation), the Implementation stage (Implementation) and the product results stage (Product Results).

Results of Workload Calculation and Human Resources Preparation of Radiographers (HR)

NOVITA Formula is a design for the development of modified workload calculations and the preparation of radiographers' human resource needs (HR) from both methods, namely the Work Indicator Of Staffing Need (WISN) Method and the Ilyas Formula, the Work Indicator Of Staffing Need (WISN) method is a method for calculating labour needs based on the actual workload carried out by the workforce (WISN Formula, 2016), while the Ilyas Formula is a method of calculating Health Human Resource needs (HHR) by classifying individual workloads (Subhan et al., 2021). The NOVITA formula in preparing radiographer needs follows the Head of BAPETEN Regulation Number 21 / Ka-BAPETEN / XII.02 concerning clinical radiology services at the minimum personnel requirements (Beta, 2013).

Dr. H. Abdul Moeloek Hospital of Lampung Province is a hospital owned by the local government of Lampung Province which is a type A hospital and also a teaching hospital, contained in the Hospital Director Decree Number 180/7.H/VII.02/10.27/X/2022 (Trigunarso & Febrihartati, 2023). In the results of observation and document review, namely, President Director Decree Number 180/VII.02/10.27/X/2022 on October 5, 2022, Radiotherapy Unit at Dr H. Abdul Moeloek Hospital, Lampung Province, there are 4 (four) radiotherapy modalities tools, namely:

Linear Accelerator (LINAC)

Linear Accelerator (LINAC), a LINAC radiotherapy, is an external radiation therapy that uses a linear accelerator to produce high-energy X-rays or electrons in cancer cells (K. RI, 2020). Linear Accelerator (LINAC) at RSUD Dr. H. Abdul Moeloek Lampung Province has been operating. It is entering its second (second) year, based on the results of the 2022 performance and quality report on quality indicators for patients, which are completed at 70 to 80 patients per day.

CT Simulator

CT Simulator is a tool used in radiotherapy planning to produce detailed images of the area to be treated (Kasmudin, 2021). The following are the results of the 2022 performance and quality report on quality indicators for patients completed in radiotherapy planning, namely the CT Simulator for 18 to 20 patients per day with the following details:

a) CT Simulator Cranium area.
b) CT Simulator Cervical area.
c) CT simulator of the thorax area.
d) CT Simulator abdominal – pelvic area.
e) CT Simulator for the Extremity area

Brachytherapy

Brachytherapy is an internal radiation activity that places radiation material directly on the area to be treated (Kasmudin, 2021). There are 2 (two) radiographers in the brachytherapy room, and the patient limit is 3 – 5 per day. Results of the 2022 performance and quality report on quality indicators

in the radiotherapy unit starting brachytherapy for gynaecological malignancies, namely cervical and endometrial cancer.

C-ARM

C-ARM in radiotherapy functions to support medical services in quality indicators in 2022 for patients who complete 4 to 10 patients per day.

Radiotherapy modalities at RSUD Dr. H. Abdul Moeloek Lampung Province from the 2022 quality indicators report.

Table 1 Description of Radiotherapy Modality Equipment RSUD Dr. H. Abdul Moeloek Lampung Province

Type of Tool Modality	Number of human resources in Radiotherapy	Number of Patients in Radiotherapy	BAPETEN minimum requirements
Linear Accelerator (LINAC)	4	80 Patients/day	25 Patients/day
CT Simulator	2	20 Patients/day	500 Patients/year
Brachytherapy	2	5 Patients/day	According to needs and type of treatment
C-ARM	2	Patients/day	300– 400 Patients/year

Steps for Calculating Workload and Preparing Human Resources (HR) Requirements for Radiographers Using the NOVITA Formula

The NOVITA formula is a method for calculating the workload and preparing human resources (HR) for radiographers in the radiotherapy unit in the Linear Accelerator (LINAC) unit. The NOVITA formula has the advantage of being technical, comprehensive, and realistic and providing convenience in calculations adapted to Bapeten Head Regulation Number 21/Ka-BAPETEN/XII-02 concerning the Quality Assurance Program for Radiotherapy Installations. Below is Figure 1 Steps for Using the NOVITA Formula.

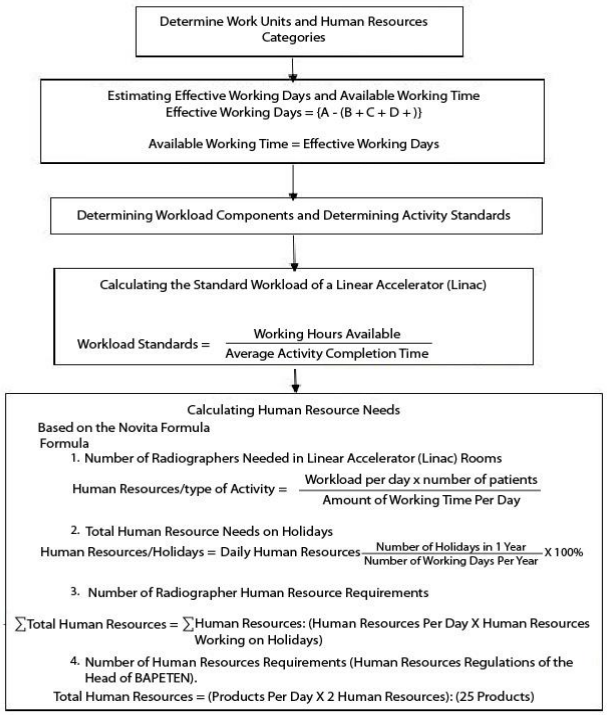


Figure 1 Step to Use the NOVITA Method

of the 8 (eight) steps to use the NOVITA formula, namely the NOVITA Formula, which is adjusted in the Head of Bapeten Regulation Number 21/ Ka-BAPETEN / XII-02:

$$\sum \boldsymbol{Total\ HR} = \{\sum \boldsymbol{SHR\ available} : (\boldsymbol{HR\ Per\ unit\ X\ HR\ on\ holidays})\}$$

$$\sum \boldsymbol{Total\ HR} = (\boldsymbol{Products\ per\ day\ x\ 2\ HR}) : (\ \mathbf{25}\ \boldsymbol{Products})$$

Method for Calculating Workload and Preparing Human Resources (HR) Requirements for Radiographers using the NOVITA Formula

Determine the Human Resources (HR) Work Unit for Radiographers

a) Determine Available Work Units
   The work unit is carried out in the Radiology Installation in the integrated Oncology section, namely the radiotherapy unit at RSUD Dr. H. Abdul Moloek, Lampung Province.
b) Determining the Type of Health Worker
   From the document review results and interviews with human resources (radiographers) in Radiotherapy, there were 12 radiographers, including a head of the room and a workload analysis officer (ABK). In preparing the types of personnel, researchers make a list of staff or a list of employees whose workload will be calculated.
c) Determining Health Facilities
   Dr. Hospital H. Abdul Moloek Lampung Province has 4 (four) modalities. From the results of the 2022 quality performance report, the Linear Accelerator (LINAC) modality tool is the main highlight because ≥80% never reached the target; from the results of the document review, patient data for the Linear Accelerator (LINAC) modality tool exceeds the workload of the minimum requirements.

Table 2 Work Unit Form in Health Facilities

Work Unit in Health Facilities Radiology Installation in Radiotherapy Unit			
Number of Staff or Human Resources in the Work Unit	**Unit Facilities**	**Number of Staff/HR in Unit Facilities**	**BAPETEN minimum requirements**
12 Radiographers	CT Simulator	4	25 Patients/day
	Brachytherapy	2	500 Patients/year
	Linac	2	According to needs and type of treatment
	C Arm	2	300– 400 Patients/year

Determining Available Working Time (Available et al.)

Available Working Time (AWT) at RSUD Dr. H. Abdul Moeloek Lampung Province based on interview sheets with critical informants regarding working day policies, annual leave, external assignments or external service, education and training activities, work absence, and working time. RSUD Dr. H. Abdul Moloek follows existing government policies and regulations in 2022 to learn about national holidays. The following are the results of collecting information from key informants:

"In an interview conducted by researchers with one of the respondents, namely the key informant, the informant described Dr. H. Abdul Moeloek Lampung Province in the radiotherapy unit in the LINAC examination room, CT Simulator, the working day policy is five working days in 1 week and for working hours in Radiotherapy from 07.00 to 14.00. Dr. Hospital H, Abdul Moeloek Lampung Province, has an annual leave of 12 working days every year, following applicable regulations. "For external service activities such as training activities, seminars, workshops, a six working day permit is given, and for national holidays following government policy."

From the results of collecting information from key informants, more details can be seen in Table 3 below:

Table 3 Description of Working Hours Available at RSUD Dr. H. Abdul Moeloek Lampung Province Radiotherapy Unit in 2022.

Code	Type of Activity	Number of Days/ Time	Information
A	Working days	312	Day/Year
B	Annual leave	12	Day/Year
C	Education and training	5	Day/Year
D	National holiday	16	Day/Year
E	Absence from work	28	Day/Year
F	Working time	8	Day/Hour

Description of calculations in determining working days working time available to radiographers in 2022 in the radiotherapy unit, as follows:

A. Available Working Days = (A – (B + C+ D + E))
= (312 – (12 + 5+ 16 + 28))
= (312 – 61)
= **251 working days/year**

B. Available Working Time = Available Working Days x F
= 251 working days/year x 8 hours/day
= 2,008 hours/year

Calculate the Number of Radiographers Needed Based on Type of Activity Per Day. The need for radiographers in the radiotherapy unit has been described in Table 4, namely the types of activities

Table 4 Types of Activities at Dr. H. Abdul Moeloek Hospital, Lampung Province, in the Radiotherapy Unit

Type of Tool Modality	Number of human resources in Radiotherapy	Number of Patients in Radiotherapy	Completion Time
Linear Accelerator (LINAC)	4	80 Patients/day	35 minutes

Calculating the Standard Workload of Radiographers in the Radiotherapy Unit

Standards for calculating radiographer workload in Linear Accelerator (LINAC)

$$\text{Standard workload} = \frac{\text{Available working time}}{-\text{average activity completion time}}$$

$$\text{Standard Workload} = \frac{480 \text{ minutes/day}}{35 \text{ minutes/day}}$$

$$\text{Standard Workload} = 13 \text{ minutes/product}$$

Suppose you look at the calculation above for examinations in the Linear Accelerator (LINAC) room for endometrial and cervical Ca examinations. In that case, the standard workload for radiographers is 13 minutes for the implementation and results of this type of examination.

Calculating Radiographer Needs using the NOVITA Formula

I. Radiographer needs in Linear Accelerator (LINAC)

Linear Accelerator (LINAC)

$$\sum \text{HR/type of activity} = \frac{\text{Workload Per day x Number of Patients}}{\text{Number of Working Time Per day}}$$

$$\sum \text{HR/type of activity} = \frac{35 \text{ minutes x } 40 \text{ patients/day}}{480 \text{ minutes}}$$

$$\sum \text{HR/type of activity} = 3 \text{ HR}$$

II. Radiographer needs on Formula Novita holidays

$$\frac{\sum \text{HR}}{\text{holidays}} = \text{HR per day x } \frac{\text{Number of holidays in 1 year}}{\text{number of working days per year}}\ 100\%$$

III.NOVITA Formula Radiographer Needs

$$\sum \text{Total HR} = \{\sum \text{HR}(: \text{HR per day x HR working on holidays})\}$$

$$\sum \text{Total HR} = 12 : (8 \text{ x } 1)$$

$$\sum = \frac{12 \text{ radiographer}}{8 \text{ radiographer}} = 1 \text{ radiographer}$$

Preparation of NOVITA Formula Requirements based on BAPETEN Head Regulations

$$\sum \text{Total HR} = (\text{ Products Per day x 2 HR }) : (25 \text{ Product})$$

$$\sum \text{Total HR} = (40 \text{ X } 2\ ) : (25)$$

$$\sum \text{Total HR} = 3 \text{ radiographer}$$

BAPETEN Head Regulation Note Number: 21/Ka-BAPETEN/XII-02 Minimum Personnel Requirements: human resources for 1 unit handling 25 patients/day.

Table 5 Description of calculation results at Dr H. Abdul Moeloek Lampung Province

Linear Accelerator (LINAC)			
Number of Radiographers in the Field	**Counting NOVITA formula**	**Minimum requirements BAPETEN**	**Products produced**
2	3	2	40 Patients/day

The conclusion from the Novita Formula calculation results is that there is an additional 1 (one) Radiographer to produce 40 patients/day. Suppose 40 patients are assigned to 3 (three) people. In that case, the results of calculating BAPETEN Head Regulation Number: 21/Ka-BAPETEN/XII-02 Minimum Personnel Requirements are appropriate.

Method for Calculating Work Load and Preparing Human Resources (HR) Requirements for Radiographers using the Work Indicator of Staffing Need (WISN) Method and the Ilyas Formula

Calculation of the Work Indicator of Staffing Need (WISN) Method

1) First Step: Calculate the non-productive workload time used by radiographers in the Linear Accelerator (LINAC) unit

$$\text{Non} - \text{productive Workload} = \frac{\text{Available Working Time}}{\text{Average Non} - \text{Productive Time}}$$

$$\text{Non} - \text{productive Workload} = \frac{480 \text{ minute}}{60 \text{ minute}} = 8 \text{ minute}$$

2) Second step: Calculate HR Needs.

$$\text{HR Needs} = \frac{\text{Product Quantity}}{\text{Product turnaround time}} \text{ x Non} - \text{Productive Workload}$$

$$\text{HR Needs} = \frac{40 \text{ product}}{35 \text{ minute}} \text{ x } 8 \text{ minute} = 9 \text{ radiographer}$$

Ilyas Formula Calculation

a) The first step is to calculate the daily needs of radiographers

$\sum$HR/day = {(BK_{ij} = JT x WT) : JKE}

$\sum$HR/day = {(Workload per day) : 480 minutes}

= {(40 patients/day x 35 minutes) : 480 minutes}

= {(1400) : 480}

= 3.8 (4 people completed)

From the calculation results of the Work Indicator of Staffing Need (WISN) Method and the Ilyas Formula, these two methods are for the human resource (HR) needs of Radiographers produced in the Linear Accelerator (LINAC) unit with a workload of 35 minutes producing 40 patients/product per day handled by 4 (four) radiographers based on the Ilyas Formula calculation results, and 9 (nine) radiographers based on the Work Indicator Of Staffing Need (WISN) Method calculation results. The results of the two methods are more than the NOVITA Formula calculations.

Application of the NOVITA Formula in Calculating Workload and Preparing Radiographer Needs in the Radiotherapy Unit

Application in calculating workload and preparing radiographer needs using the NOVITA Formula is carried out by developing a new product and improving existing products. The application of the NOVITA Formula is carried out in 3 (three) steps, namely:

NOVITA formula

The NOVITA formula is a method for calculating workload and preparing Radiographer needs from a modified calculation of the Workload Indicators ff Staffing method Need (WISN) and Ilyas formula. The NOVITA Formula calculates the minimum personnel requirements based on the Standard Operating Procedures (SOP) for modalities, products produced, or workload, referring to BAPETEN Head Regulation Number 21/Ka-BAPETEN/XII.02.

The results of interviews conducted by researchers with one of the respondents or **critical informants** show that there are no specific guidelines for preparing Radiographer needs by the Republic of Indonesia Minister of Health Regulation Number 33 of 2015, as quoted as follows:

"In the radiotherapy unit at Dr H. Abdul Moeloek, Lampung Province, there are no specific guidelines for preparing Human Resources (HR) needs for Radiographers; the calculation is based on the Republic of Indonesia Minister of Health Regulation Number 33 of 2015 concerning Guidelines for Preparing Health Human Resources Needs Planning." **Informant 1 (Key)**

The results of interviews conducted by researchers with one of the respondents or **informant 2** show no standard reference for calculating workloads and preparing Radiographer needs in radiology installations. Crew officers work on load calculation reports using the Workload Indicators of Staffing Need (WISN) method, namely following existing 2021 archives and preparing the needs for radiographers for crew members referred to Ministry of Health sources, as quoted below:

"In calculating workload, workload analysis officers use the Workload Indicators of Staffing Need (WISN) method; following the 2021 archives, there are also calculations using the Daily log and the Ilyas formula. In preparing radiographer requirements, officers used sources from the Ministry of Health. Previously, no standard reference had to be used for calculating workload and reporting in preparing radiographer requirements." **Informant 2**

The results of interviews conducted by researchers with one of the respondents or **informant 3** provide an illustration that RSUD Dr. H. Abdul Moeloek Lampung Province has no provisions for calculating workload or preparing human resources (HR), whether in the form of standard guidelines or Standard Operating Procedures (SOP). Respondent or informant 3 provided direction in calculating and compiling and could access the digital information system from sibangjangkri.kemkes.go.id, as quoted below:

"There are no standard guidelines or Standard Operating Procedures (SOP) for calculating workload and preparation distributed to each unit. However, each unit can calculate workload and preparation from sibangjangkri.kemkes.go.id, as can be seen in the results "Illustration 1 is information on the preparation of human resources (HR)" **Informant 3**

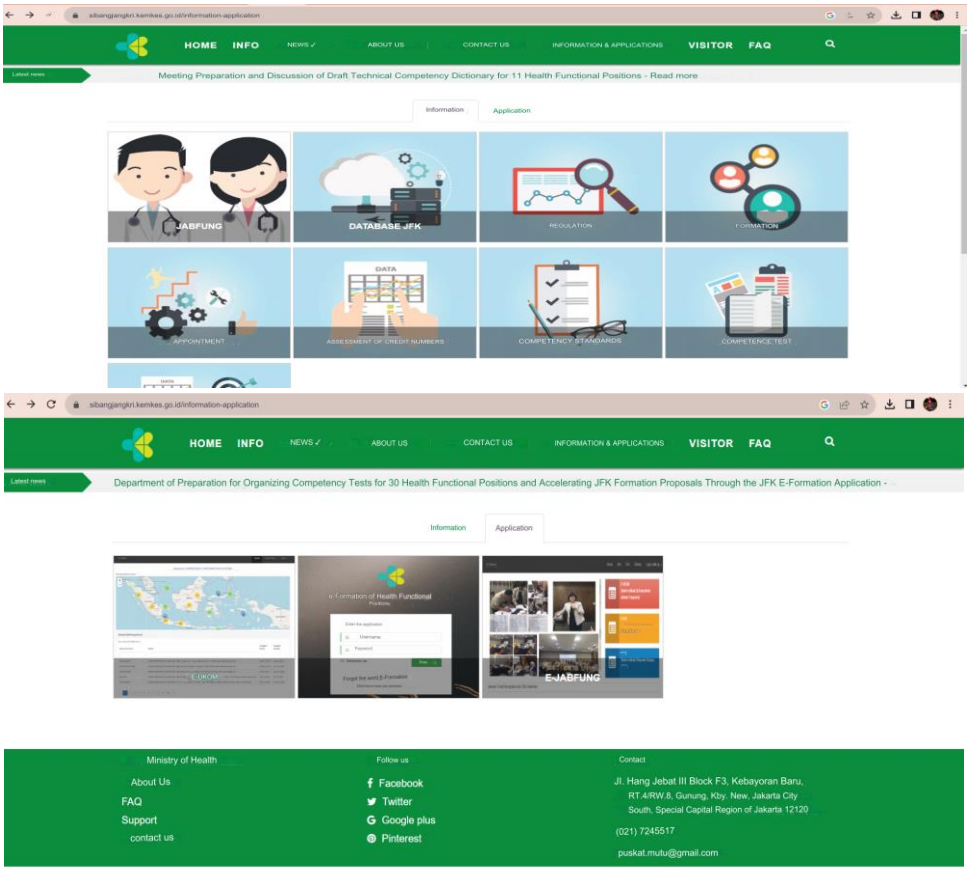


Figure 2 Information on the Preparation of Human Resources (HR)

Expert Validation

Expert validation of the NOVITA Formula was carried out using the Focus Group Discussion (FGD) technique, namely from triangulated informant sources; expert validation was carried out by 6 (six) validators, according to researchers, the (FGD) technique was carried out to provide a diversity of perceptions, from the Number of validators The minimum Number of participants included is 6 (six) people. ("Koentjoro, 2005: 7," 2015) In validation using the Focus Group Discussion (FGD) technique, 2 (two) stages are carried out, namely:

Practitioner Validation

The NOVITA Formula was validated with practitioners in Master of Business Administration (MBA) and Master of Education (M.Pd) to determine the feasibility level of the NOVITA Formula developed before it was used generally. Practitioner validation is carried out in the Focus Group Discussion (FGD) technique in the same room at Raden Intan Lampung State Islamic University. The following is a summary of the practitioner validation and revisions carried out.

Table 6 Summary of Practitioner Section Validation

Expert	Indicator	Revision
Master of Business Administration (MBA)	Display Aspect Instructions or Guide Purpose of Preparation and Calculation Models Material Contents Media Display Method Efficiency The usefulness of the Method	The input has been corrected with examples of implementing steps using the NOVITA Formula in a complex manner.
Master of Education	Display Aspect Instructions or Guide Purpose of Preparation and Calculation Models	The media display in Bahasa has been adjusted to spelling (EYD) in

Expert	Indicator	Revision
	Material Contents Media Display Method Efficiency The usefulness of the Method	the guidelines, use of foreign languages, and punctuation.

The validation results with practitioners show that the formulation of the NOVITA Formula in the guidelines for calculating workload and preparing the needs of radiographers in the Radiotherapy Oncology Installation can be used in general.

Expert Validation

The NOVITA formula was validated for expert radiographers, workload analysis officers (ABK), personnel, and Master of Business Administration (MBA) practitioners; the Focus Group Discussion (FGD) technique was carried out in the same room located at RSUD Dr. H. Abdul Moloek, Lampung Province. The following is a summary of the validation and revisions carried out.

Table 7 Summary of Section Validation for Expert radiographers, workload analysis officers (ABK), staffing

Expert	Indicator	Revision
radiographer, crew member	Display Aspect Instructions or Guide Purpose of Preparation and Calculation Models Material Contents Media Display Method Efficiency The usefulness of the Method	Completed outreach to the population working in the LINAC section

The results of expert validation in the expert radiographer section and workload analysis officers (ABK), as well as the staffing section, show that the formulation of the NOVITA Formula in calculating workload and preparing radiographer needs is generally by conditions in the field to be used in calculating workload. Radiographer needs to develop Standard Operating Procedures (SOP) modality tools and human resources (HR) workload.

NOVITA Formula Product Test

The NOVITA Formula trial phase was carried out after revisions and improvements by the validator, so the next step was to trial the NOVITA Formula. This trial aims to see the effectiveness of the formulas in the NOVITA Formula in calculating the workload and preparation of radiographers in Radiotherapy Oncology at RSUD Dr. H. Abdul Moeloek Lampung Province. Trials were carried out on users, namely 12 (two) radiographers in the Radiotherapy Oncology unit. Why did 12 (two) radiographers do this? 12 (two) radiographers consisting of 1 (one) head of the room and 2 (two) workload analysis officers (ABK) and why the trial did not involve the personnel department, namely the product test was carried out by researchers in 3 (three) stages, namely:

1) Product Feasibility Test (Product Feasibility Test)
   Product usability testing (product use testing) is the development of a product prototype to provide an experience to potential users or consumers by testing the usability of the new product. (Robert & Brown, 2019) Researchers conducted a Product Feasibility Test at RSUD Dr. H. Abdul Moeloek Lampung Province by presenting the Module for Calculating Workloads and Preparing Radiographer Needs, namely the steps for using the NOVITA Formula. 12 (twelve) radiographers followed them to calculate their workload using the formulas in the NOVITA Formula.
2) Product Evaluation
   Product Evaluation is an evaluation directed at the program's results to be achieved to determine the final decision, repair, modification, improvement, or termination. (Shell, 2019) In this case, the researcher recorded the excellent inputs and the advantages and disadvantages of the Workload

Calculation and Preparation of Radiographer Requirements Module. From the product evaluation results, the NOVITA Formula can be used; however, in the calculations, the NOVITA Formula and the BAPETEN Head Regulations cannot yet be used for Brachytherapy units.

3) Product Assessment

Product or work product assessment is an assessment of the skills in making a particular product and the quality of the product (Robert & Brown, 2019). In this case, product assessment is divided into 2 (two): Validity Test and Reliability Test. Researchers in product assessment, namely, by distributing questionnaires or assessment questionnaires to respondents, namely 12 (twelve) radiographers, to assess whether the Module for Calculating Workload and Preparing Radiographer Needs Using the NOVITA Formula is compatible or relevant to the conditions in the field. The assessment in the questionnaire or questionnaire contains 6 (six) question points and 4 (four) assessment weights, which include (relevant, quite relevant, less relevant, not relevant).

Validity test

The researcher used the Likert Scale calculation (Likert Interval 1-4) to test the validity of the researcher. According to researchers, the Likert scale is a research scale used to measure attitudes and opinions, which are carried out to collect and measure data (Budiaji, 2013) The results of the respondent's assessment, namely the 12 (twelve) radiographers, the percentage of the feasibility of the Workload Calculation Module, and the Preparation of Radiographer Requirements using the NOVITA Formula are presented in the following figure:

Figure 3 Assessment Results of 12 (twelve) Respondents with 4 (four) assessment weights

X6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Quite Relevant	2	16.7	16.7	16.7
	Relevant	10	83.3	83.3	100.0
	Total	12	100.0	100.0	

X

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21	1	8.3	8.3	8.3
	23	2	16.7	16.7	25.0
	24	9	75.0	75.0	100.0
	Total	12	100.0	100.0	

Frequency Table

RESPONDENT

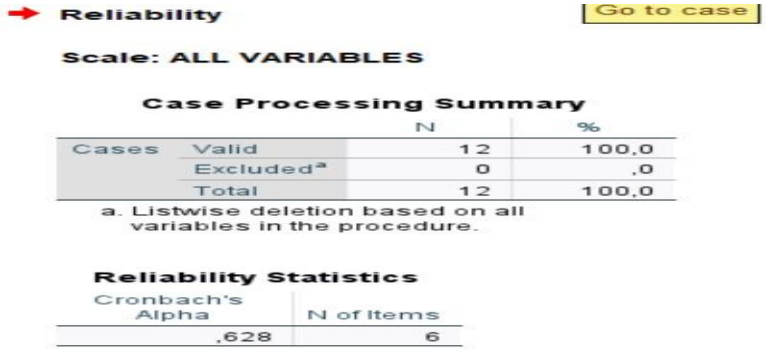
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Irrelevant	1	8.3	8.3	8.3
	Less Relevant	1	8.3	8.3	16.7
	Quite Relevant	1	8.3	8.3	25.0
	Relevant	1	8.3	8.3	33,3
	5	1	8.3	8.3	41.7
	6	1	8.3	8.3	50.0
	7	1	8.3	8.3	58.3
	8	1	8.3	8.3	66.7
	9	1	8.3	8.3	75.0
	10	1	8.3	8.3	83.3
	11	1	8.3	8.3	91.7
	12	1	8.3	8.3	100.0
	Total	12	100.0	100.0	

Based on the figure above, it can be seen that the percentage of the feasibility of the Module for Calculating Workloads and Preparing Radiographer Needs with the NOVITA Formula, out of 12 (twelve) respondents, namely 10 (ten) respondents or radiographers answered 83.3%, which means the NOVITA Formula is Relevant and 2 (two) respondents the results obtained and 16.7% of the modules are pretty relevant.

Reliability Test

According to researchers, reliability is an index that shows the extent to which a measuring instrument can be trusted or relied upon (Prof Dr. Sugiyono, Notoatmodjo, 2016). In this case, the researcher retested 12 (12) respondents, namely radiographers, and researchers, using the Cronbach's Alpha Method reliability test calculation. The results of the respondent's assessment were the 12 (twelve) radiographers, namely presented in the following figure:

Figure 4 Calculation Results of the Cronbach's Alpha Method Reliability Test



Reliability [Go to case]

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	12	100,0
	Excluded[a]	0	,0
	Total	12	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,628	6

The results obtained in calculations using Cronbach's Alpha formula are >0.628 or 6%; in this case, the assessment is acceptable or reliable. Researchers states that Cronbach's Alpha is acceptable if >0.6. The closer the Cronbach's Alpha, the higher the reliability or internal consistency. (Ghozali (2018), 2019) Reliability and validity tests were processed using IBM SPSS for Windows software.

Developing a Workload Calculation Model and Human Resources (HR) for Study Radiographers in Radiotherapy at RSUD Dr. H. Abdul Moeloek Lampung Province

Preparing a model for calculating workload and preparing human resources (HR) for radiographers is research and development to create new products or models. In this case, the researcher used the research model. This model is very supportive in the preparation of the workload calculation model and the preparation of radiographers using the NOVITA formula. Borg and Gall's research is an industry-based development model where research findings are used to design new products and procedures, which are then systematically field-tested, evaluated, and refined until the findings are suitable (Putra et al., 2020).

The model for calculating the workload and preparation of radiographers using the NOVITA Formula involves carrying out 5 (five) main steps, namely following research, including collecting information, designing a product or model, expert validation and revision, product testing and product results. The following are the results of research in the field:

Information Collection

In this case, the researcher used an observation method by collecting data, checking the completeness of documents, and conducting interviews by visiting or coming directly to Radiotherapy Oncology to meet **key informants** or heads of radiotherapy rooms and workload analysis officers (ABK). From the results obtained, in Radiotherapy Oncology, there are no specific guidelines for calculating the workload or preparing the needs of radiographers. In this case, the head of the room and the workload analysis officer (ABK) calculate the workload referring to the Performance and Quality Report in 2022, namely using the method Workload Indicators of Staffing Need (WISN) and RI Minister of Health Regulation Number 33 of 2015 in preparing human resource (HR) needs. The Workload Indicators of Working Need (WISN) method is a method for calculating labour requirements based on the actual workload carried out by the workforce (WISN Formula, 2016). Meanwhile, the Republic of Indonesia Minister of Health Regulation Number 33 of 2015 is a

guideline for preparing health human resource needs (HHR) planning within the scope of general guidelines for the provincial district and city levels (Government Regulation, 2015).

Arranging the needs of radiographers in Radiotherapy should refer to the Decree of the Head of BAPETEN Number 21/Ka-BAPETEN/XII-2002 concerning the quality assurance program for radiotherapy installations on minimum requirements for personnel, units, and workload. There are 3 (three) modalities in Radiotherapy as stated in the Decree of the Head of BAPETEN Number 21/Ka-BAPETEN/XII- 2002, namely Linear Accelerator (LINAC), CT Simulator and Brachytherapy which have minimum requirements for personnel and workload, from the results obtained In the field, researchers are focused on the results of the performance and quality report in 2022 and the results of the description of the condition of personnel and workload in radiotherapy oncology in the Linear Accelerator (LINAC) unit. Completion times lengthen the period used, and the products produced exceed the minimum requirements.

The workload or products produced and from the 2022 quality performance report on the Linear Accelerator (LINAC) unit are operational for 5 (five) working days and 16 hours/day. See Appendix 10 on the 2022 performance report sheet and 2023 service development report in the radiotherapy installation in the Linear Accelerator (LINAC) unit in 2022 RSUD Dr. H. Abdul Moeloek, Lampung Province, many obstacles occur, namely damage to the modality equipment, exposure time or working on patients tends to be long, and patient load waiting time increases. There needs to be more maximum workload calculations and preparation of radiographer needs based on conditions in the field and developments.

Based on existing problems and constraints and not being by the Decree of the Head of BAPETEN Number 21/Ka-BAPETEN/XII-2002 concerning the quality assurance program for radiotherapy installations, researchers created a model for calculating workload using a combination of formulas called the Formula NOVITA and in preparing radiographer requirements refers to the Decree of the Head of BAPETEN Number 21/Ka-BAPETEN/XII- 2002.

NOVITA Formula Product Design

The NOVITA formula is a collection of formulas from modifications to calculating workloads and preparing human resource (HR) requirements, namely from the Work Indicator of Staffing (WISN) Method and the Ilyas formula. In this case, the advantage of the Formula used in the Work Indicator Of Staffing Method (WISN) method is that it calculates labour requirements based on the actual workload carried out by the workforce (WISN Formula, 2016), namely in the Work Indicator Of Staffing Method (WISN) formula, in the NOVITA Formula, this Formula calculates or determines working time and effective working days. The Formula in Ilyas is a method for calculating the need for health human resources (HRK) based on the workload available in the field. (Ilyas, 2013) The NOVITA Formula uses the Ilyas formula to calculate the standard workload on a unit and the products produced per day. The Workload Calculation and Preparation of Radiographer Requirements Module outlines these two modified formulas.

The advantage of the NOVITA Formula in calculating workload is that it can calculate the number of radiographers on holidays, the need for radiographers on effective working days, and the adequate time to produce the products being worked on. The advantage of the NOVITA Formula in calculating the preparation of radiographer needs is that it can be adjusted to the minimum personnel requirements and workload seen from BAPETEN Head Regulation Number 21 / Ka-BAPETEN / XII.02. The weakness of the Module for Calculating Workloads and Preparing Radiographer Needs using the NOVITA Formula has a weakness, namely that in preparing Radiographer needs it limits Radiotherapy to calculating Linear Accelerator (LINAC) units.

Expert Validation and Revision

The Module for Calculating Workload and Preparing Radiographer Needs using the NOVITA Formula was validated; validation was carried out using the Focus Group Discussion (FGD) technique. The researcher determined validation with 2 (two) categories, practitioner validation and expert validation, where the researcher invited practitioner validation, namely Master practitioner validation. Of Business Administration (MBA) to provide a review of the NOVITA Formula and whether the Formula can be used in calculations. The Focus Group Discussion (FGD) technique is a focused discussion group with 6 – 12 participants and led by a moderator. (Paramita & Kristiana, 2020) In this case, the category of Focus Group Discussion (FGD) technique can be carried out because there are 6 (six) respondents or validators. From the validation results, practitioners get improvements where examples or conditions in the field in calculations can be given in the module. For the perfection of the NOVITA Formula module, practitioner validation is carried out at the Master of Education (M.Pd) specifically for language lecturers, who will validate the language, spelling, and punctuation that are easy to understand and by EYD.

Expert validation is carried out at RSUD Dr. H. Abdul Moeloek Lampung Province by inviting practitioner validation, namely Master of Business Administration (MBA) practitioners and expert validation in the expert radiographer section, workload analysis officers (ABK), and the personnel section. The researcher provides a model for calculating workload and preparing Radiographer needs using the NOVITA Formula by presenting the steps of the NOVITA Formula in front of validation experts and practitioners; the researcher notes input from the validator after the researcher provides a questionnaire or assessment questionnaire of 6 (six) questions and 4 (four) assessment weights and validator input, from the results of filling out the questionnaire or questionnaire, the researcher summarizes the results of the expert and practitioner validator assessments. From the summary results, namely the assessment and input from validator practitioners and experts, the NOVITA Formula Model for Calculating Workloads and Preparing Radiographer Needs can be used generally for product trials with users, namely the 12 (twelve) respondents or radiographers at RSUD Dr. H. Abdul Moeloek Lampung Province.

NOVITA Formula Product Test

The NOVITA Formula product test is carried out in 3 (three) stages, namely: product feasibility or product suitability test, product evaluation, and product assessment; this aim is carried out to ensure that the NOVITA Formula meets quality standards, guarantees the functionality and compatibility of the NOVITA Formula, in terms of This is according to reasearchers (Notoatmodjo, 2012). The technical work in the field, namely the NOVITA product or Formula, was carried out with a presentation with 12 (twelve) radiographers and accompanied by a moderator; in this case, the moderator is part of the staff.

After the presentation, each Radiographer can calculate their workload according to their work unit. After carrying out the calculation together, the researcher gave a questionnaire or assessment questionnaire to the 12 (twelve) radiographers by providing 6 (six) questions and 4 (four) assessment weights. The NOVITA Formula product trial did not involve other parties, such as the personnel department human resources (HR), because the NOVITA Formula was designed to make it easier to calculate the workload and prepare radiographer needs according to conditions in the field by adjusting Standard Operating Procedures (SOP) and requirements. Minimum personnel, workload, and units in BAPETEN Head Regulation Number 21 / Ka-BAPETEN / XII.02.

Feasibility of a Workload Calculation Model and Human Resources (HR) Arrangement for Radiographers

The feasibility of calculating workload and preparing radiographers using the NOVITA Formula was assessed at RSUD Dr. H. Abdul Moeloek Lampung Province in the Radiotherapy section of the Linear Accelerator (LINAC) unit. Product feasibility assessment is carried out in 2 (two) test stages, namely validity testing using Likert Scale calculations (Likert interval 1-4), which has 4 (four) weighted marks from 6 (six) questions. The Likert scale is a bipolar scale method that measures positive and negative responses or is a measurement used to measure a person or group's attitudes, opinions, or perceptions (Budiaji, 2013). Meanwhile, the validity test measures questionnaire instruments (Prof Dr Sugiyono, Notoatmodjo, 2016).

The results of the respondent's assessment, namely from 12 (twelve) radiographers, consisting of 1 (one) head of the room, 2 (two) workload analysis officers (ABK), and 8 (eight) radiographers, are presented in table 4 where the calculation results show a percentage of 10 (ten) respondents out of 12 (twelve) respondents gave an assessment to 6 (six) questions of 8.3% out of 100% in this case, according to Arikunto 2019 the feasibility of systematic assessment of the percentage of questionnaire responses was declared VALID, namely in the percentage of responses of 80-100%. For the assessment, the NOVITA Formula is declared VALID, namely showing a validity value that is by reality, namely that the NOVITA Formula can be used in the field, namely Dr. H. Abdul Moeloek Lampung Province in the radiotherapy unit at the Linear Accelerator (LINAC). The following is an illustration of Table 3 of the percentage of questionnaire responses according to Arikunto 2019 (Arikunto 2019, 2019)

Figure 5 Respondent Assessment Results

X6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Quite Relevant	2	16.7	16.7	16.7
	Relevant	10	83.3	83.3	100.0
	Total	12	100.0	100.0	

Table 8 Percentage of Likert Scale Responses (Likert interval) (Arikunto 2019, 2019)

Criteria	Percentage
VALID	80% < score ≤ 100%
ENOUGH VALID	60% < score ≤ 80
LESS VALID	30% < score ≤ 50
INVALID	0 % < score ≤ 30

According to researchers, a reliability test shows the degree of certainty or applicability of the research results to the population. (Prof Dr Sugiyono, Notoatmodjo, 2016) Reliability testing is carried out so that the NOVITA Formula is genuinely valid and reliable; of course, it can be used legally for scientific research. Researchers use the Cronbach's Alpha method reliability test, why researchers use this method is because the Cronbach's Alpha method is the benchmark used to describe the correlation or relationship used in the variable. It is reliable, with a Cronbach's Alpha of more than 0.60. (Prof Dr Sugiyono, Notoatmodjo, 2016)

The Cronbach's Alpha calculation results were processed using IBM SPSS for Windows software. The results obtained by the researchers were 0.628, so in this case, the results of the calculation and assessment are **reliable**, namely showing that the model instrument for calculating workload and preparing radiographer needs using the NOVITA Formula is suitable for implementation or use at Dr. H. Abdul Moeloek Lampung Province in Radiotherapy at the Linear Accelerator (LINAC) unit.

Radiographers need to use the NOVITA Formula.

The NOVITA formula is a method for calculating the workload and structuring the needs of radiographers in radiotherapy installations on Linear Accelerator units (LINAC). The NOVITA Formula has 8 (eight) calculation stages. The calculation results are obtained at RSUD Dr. H. Abdul Moeloek Lampung Province at the radiotherapy or radiotherapy oncology installation in the Linear Accelerator unit (LINAC). From calculating the workload and preparing the Radiographer's needs, the NOVITA Formula has different results from the Method WISN. The Ilyas Formula, namely the NOVITA Formula, requires adding 2 (two) radiographers where 1 (one) Radiographer assists, or additional radiographers are tasked with working on 40 patients/day. One Radiographer is on duty on holidays. In this case, it has been adjusted to BAPETEN Head Regulation Number 21 / Ka-BAPETEN / XII.02. In the Method WISN, the results were very high, namely 9 (nine) radiographers. Ilyas's Formula from the calculation results obtained 4 (four) radiographers to work on 40 patients/day in 1 (one) unit of modality equipment.

The use of completion time in working on patients can be accelerated by carrying out maintenance activities that are carried out every year. Linear Accelerator (LINAC) is the latest radiotherapy technology in cancer treatment that utilizes high-energy radiation to accelerate subatomic particles to release energy to cancer cells. So, in this case, the Linear Accelerator (LINAC) in carrying out its role has a breakdown time as reported in the 2022 quality development in radiotherapy oncology at RSUD Dr. H. Abdul Moeloek, Lampung Province, the processing time is 45 to 50 minutes, if seen from the NOVITA Formula calculation, the adequate time to complete the inspection is 13 minutes. The time range calculated using the NOVITA Formula if seen in the basics of Radiotherapy in Susworo 2006, adequate time using the Linear Accelerator tool (LINAC), which is 10 – 15 minutes. Suppose you look at the NOVITA Formula calculation results. In that case, the results show a time of 13 minutes, which is the adequate time according to the basics of radiotherapy equipment. An important factor is if the time measurement results exceed 15 minutes, this result shows the performance of the Linear Accelerator (LINAC) downtime.

Researcher Limitations

This research has been attempted and carried out by scientific procedures and scientific steps that have been established. However, some limitations need to be acknowledged. This limitation lies in the involvement of only research subjects who use calculating workloads and preparing Radiographer needs at RSUD Dr.H. Abdul Moeloek, Lampung Province.

CONCLUSION

Based on the research results, it can be concluded that as follows:

Feasibility of the NOVITA Formula in calculating workload and preparing Radiographer needs in Radiotherapy in the Linear Accelerator (LINAC) unit at RSUD Dr H. Abdul Moloek, Lampung Province, based on the results of the Validity Test and Reliability Test, conducted a trial of the NOVITA Formula in calculating the workload and preparing the needs of radiographers in Radiotherapy at the Linear Accelerator (LINAC) unit at RSUD Dr. H. Abdul Moloek, Lampung Province, the 12th (twelfth) Radiographer, with a score of 8.3% Valid and 0.628 reliable, namely showing that the model instrument for calculating workload and preparing radiographer needs using the NOVITA Formula is suitable for implementation or use at Hospital Dr. H. Abdul Moeloek Lampung Province in Radiotherapy at the Linear Accelerator (LINAC) unit.

Based on NOVITA Formula calculations using the ratio of BAPETEN Head Regulation Number 21 / Ka-BAPETEN / XII-02, the total need for radiographers in the Linear Accelerator (LINAC) unit is 3 (three) radiographers with a workload of 40 products produced per day and 1 (one)

the radiographer on duty is on holiday. From this ratio, the number of radiographers needed to carry out the existing workload must be increased by 2 (two) radiographers from the 2 (two) radiographers already available.

REFERENCES

82/Puu-Xiii/2015, U. R. N. (2015). Tentang Tenaga Kesehatan. In Ekp (Vol. 13, Issue 3, Pp. 1576–1580).

Afrimarta, P. (2021). Pengaruh Beban Kerja Terhadap Kepuasan Kerja Karyawan Pada Usaha Pemecahan Kemiri Nagari Padang Magek Kecamatan Rambatan.

Arikunto 2019. (2019). Metode Penelitian (Vol. 4, Issue 1).

Beta, W. P. D. (2013). Legal And Regulatory Framework For Safety And Security Of Radioactive Sources: Challenge On Inspection Of Safety And Security Of Radioactive Sources: Indonesia Experience. Books Of Synopsis On International Conference On The Safety And Security Of Radioactive Sources: Maintaining The Continuous Global Control Of Sources Throughout Their Life Cycle. Abu Dhabi, United Arab Emirates, 27–31.

Budiaji, W. (2013). Likert Scale. Journal Of Informatics And Telecommunication Engineering, 2(2), 127–133. Https://Doi.Org/10.31227/Osf.Io/K7bgy

Formula Wisn. (2016). Metode Penghitungan Beban Kerja Wisn.

Ghozali (2018). (2019). Cronbach's Alpha. 41–58.

Hartawan, I. G. A. G. U., & Ilyas, Y. (2020). Analisis Kebutuhan Perawat Berdasarkan Pengamatan Terhadap Penanganan Pasien Dewasa Dan Anak-Anak Di Unit Gawat Darurat Rumah Sakit Bali Royal. Medicina, 47(2), 116–125. Https://Doi.Org/10.15562/Medicina.V47i2.72

Ilyas, F. (2013). Ilyas Formula.

Kasmudin. (2021). Brakiterapi. 18, 18–28.

Koentjoro, 2005: 7. (2015). In Focus Group Discussion Fgd (Vol. 20, Issue 5).

Made Yoga Putra, N. & H. (2015). Premenkes No 33 Tahun 2015. In Ekp (Vol. 13, Issue 3).

Mahawati, E., Yuniwati, I., Ferinia, R., Rahayu, P. P., Fani, T., Sari, A. P., Setijaningsih, R. A., Fitriyatinur, Q., Sesilia, A. P., & Mayasari, I. (2021). Analisis Beban Kerja Dan Produktivitas Kerja. Yayasan Kita Menulis.

Notoatmodjo. (2012). Metodologi Penelitian Kesehatan.

Nurvan, H., Wardani, A. K., & Palupi, N. E. (2023). Karakteristik Pemeriksaan Pasien Di Instalasi Radiologi Rumah Sakit Ananda Babelan Bekasi Periode Agustus 2021–Juli 2022: Studi Retrospektif. Jurnal Pandu Husada, 4(4), 1–14.

Paramita, A., & Kristiana, L. (2020). Teknik Focus Group Discussion Dalam Penelitian Kualitatif (Focus Group Discussion Technique In Qualitative Research). Buletin Penelitian Sistem Kesehatan, 16(2), 117–127.

Peraturan Pemerintah. (2015). Permenkes No 33 Tahun 2015 Pedoman Penyusunan Perencanaan Kebutuhan Sumber Daya Manusia Kesehatan (Vol. 13, Issue 3, Pp. 1576–1580).

Prof Dr Sugiyono, Notoatmodjo, W. (2016). Buku Uji Validitas Dan Reliabilitas. In Buku Uji Validitas Dan Uji Reliabilitas.

Purwani, N. E., Kep, M., Meliyana, E., Leonardho, M., & Pajar, M. (2022). Pengaruh Pendidikan Kesehatan Terhadap Tingkat Pengetahuan Remaja Tentang Pencegahan Kanker Serviks Di Kelas Xi Sma Pgri 1 Bekasi 2022.

Putra, D. D., Okilanda, A., Arisman, A., Lanos, M. E. C., Putri, S. A. R., Fajar, M., Lestari, H., & Wanto, S. (2020). Kupas Tuntas Penelitian Pengembangan Model Borg & Gall. Wahana Dedikasi : Jurnal Pkm Ilmu Kependidikan, 3(1), 46. Https://Doi.Org/10.31851/Dedikasi.V3i1.5340

Rani, D. M. (2018). Pengawasan Terhadap Pelayanan Kebidanan Pada Bidan Praktik Mandiri Dalam Penggunaan Ultrasonografi Studi Kasus Di Kabupaten Musi Rawas. Unika Soegijapranata Semarang.

Ri, K. (2020). Keputusan Menteri Kesehatan Republik Indonesia Nomor Hk.01.07/Menkes/316/2020 (Vol. 8, Issue 75).

Ri, P. (2020). Premenkes Ri No 24 Tahun 2020 Tentang Pelayanan Radiologi Klnik (Vol. 21, Issue 1, Pp. 1–9).

Robert, B., & Brown, E. B. (2019). Studi Kelayakan Produk. Viii(1), 1–14.

Shell, A. (2019). Manajemen Sdmk (Pp. 1–23).

Subhan, M., Wardani, R., & Ramdani, D. (2021). Analysis And Evaluation Of Pharmacist Power Needs With The Wisn Method In The Pharmaceutical Installation Of Haji Hospital Surabaya. Jbmp (Jurnal Bisnis, Manajemen Dan Perbankan), 7(2), 275–292.

Trigunarso, S. I., & Febrihartati, I. (2023). Influence Of Organizational Behavior And Simrs On Er Employees Performance In Dr. H. Abdul Moeloek Hospital Lampung. Jurnal Aisyah: Jurnal Ilmu Kesehatan, 8(2).

Undang-Undang Ri No 36 Tahun 2014. (2014). Tentang Tenaga Kesehatan. In Presiden Republik Indonesia (Pp. 1–78).

Waluyo, C., Suprihanto, J., & Akhmad, J. (2018). Analisis Pelaksanaan Standar Pelayanan Minimal (Spm) Rumah Sakit Bidang Farmasi Di Instalasi Farmasi Rsu Purwogondo Tahun 2017. Stie Widya Wiwaha.