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Analysis of the Implementation of the Radiation Occupational Safety and Health Management System (SMK3) in the Radiology Installation of Bhayangkara Hospital Semarang

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ABSTRACT
Indonesian Government Regulation Number 63 of 2000 concerning safety and health in the use of ionizing radiation explains that the Radiation Safety Management System (SMKR) which must be applied in the use of radioactive substances or other radiation sources has 7 components, namely: (1) radiation protection organization, (2) radiation dose monitoring and radioactivity monitoring, (3) radiation protection equipment, (4) health checks, (5) document storage, (6) quality assurance and (7) education and training. This study aims to describe, understand, and analyze the implementation of the Radiation Occupational Safety and Health Management System (SMK3) in the Radiology Installation of Bhayangkara Hospital. The specific objective is to provide suggestions for improving the implementation of the radiation occupational safety and health management system (SMK3) in the Radiology Installation of Bhayangkara Hospital Semarang. The research method is descriptive qualitative. The subjects in this study were 5 radiographers and 1 head of the room. Data collection was carried out through observation, documentation, and interviews with radiographers and radiation protection officers. Data validity was carried out using triangulation techniques, namely triangulation of sources and data. Source triangulation is carried out by checking data obtained from several sources. Data processing is carried out through data reduction, data presentation, then data analysis with references and literature to draw conclusions and suggestions. The results of the research on radiation protection organizations, radiation dose monitoring, health checks, document storage, and quality assurance are good and well structured. Document storage is still manual. Education and training for radiation workers are planned at the beginning of each budget year and have limited budgets. Documentation suggestions are changed to digital form.

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INTRODUCTION

Sistem Manajemen Keselamatan dan Kesehatan Kerja (SMK3) adalah bagian dari sistem manajemen perusahaan secara keseluruhan dalam rangka pengendalian risiko yang berkaitan

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dengan kegiatan kerja guna terciptanya tempat kerja yang aman, efisien dan produktif. Dalam Permenaker Nomor 5 Tahun 1996 tentang Sistem Manajemen Kesehatan dan Keselamatan Kerja, yang menyatakan bahwa setiap perusahaan yang mempekerjakan tenaga kerja sebanyak seratus orang atau lebih dan atau mengandung potensi bahaya yang ditimbulkan oleh karakteristik proses bahan produksi yang dapat mengakibatkan kecelakaan kerja seperti peledakan, kebakaran, pencemaran dan penyakit akibat kerja wajib menerapkan Sistem Manajemen K3.

Occupational Safety and Health Management System (SMK3) is part of the overall company management system in order to control risks related to work activities in order to create a safe, efficient and productive workplace. In the Minister of Manpower Regulation Number 5 of 1996 concerning the Occupational Health and Safety Management System, which states that every company that employs a workforce of one hundred people or more and or contains potential hazards caused by the characteristics of the production material process that can result in work accidents such as explosions, fires, pollution and occupational diseases is required to implement the K3 Management System.

The definition of a hospital according to the Minister of Health Regulation Number 3 of 2020 concerning Hospital Classification and Licensing states that "A hospital isa health service institution that provides comprehensive individual health services, providing inpatient, outpatient and emergency services. One part of the hospital is the radiology installation.Radiology installations are included in the criteria of workplaces with various potential hazards that can cause health impacts such as potential radiation hazards, so safety factors are important so that they can minimize the risk of accidents due to work in radiology installations and the impact of radiation on radiation workers, to prevent this can be done by implementing a radiation safety management system where radiation safety is an action taken to protect patients, workers, and members of the public from the dangers of radiation (Dianasari & Koesyanto, 2017).

MenuThe Indonesian Government Regulation Number 63 of 2000 concerning safety and health in the use of ionizing radiation explains that the Radiation Safety Management System (SMKR) which must be applied in the use of radioactive substances or other radiation sources has 7 components, namely: (1) radiation protection organization, (2) radiation dose monitoring and radioactivity monitoring, (3) radiation protection equipment, (4) health checks, (5) document storage, (6) quality assurance and (7) education and training. The responsibility for implementing this SMK3 Radiation rests with the installation entrepreneur as the permit holder.

MenuBased on the author's observations of the seven components of the Radiation Safety Management System, several components have not been optimally implemented in the Radiology Installation of Bhayangkara Hospital Semarang, such as document storage, education, and training. Furthermore, not all officers have received occupational health and safety training. According to Article 7 of Government Regulation No. 63/2000, the seven components of the Radiation Safety Management System must be met in every installation that utilizes radioactive substances or sources. Therefore, the author is interested in

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conducting research and selecting it as a research topic. Yang entitled. "Analysis of the Implementation of the Occupational Safety and Health Management System (SMK3) Radiation in the Radiology Installation of Bhayangkara Hospital Semarang".

METHODS

This research method is descriptive qualitative.The subjects in this study were 5 radiographers and 1 head of the room. Data collection was conducted through observation, documentation, and interviews with radiographers and radiation protection officers. Data validity was conducted using triangulation techniques, namely source and data triangulation. Source triangulation was carried out by checking data obtained from several sources. Data processing was carried out through data reduction, data presentation, and then data analysis with references and literature to draw conclusions and suggestions.

RESULTS AND DISCUSSION

Results

The radiation protection organization at the Radiology Installation of Bhayangkara Hospital Semarang is well structured by carrying out functions according to its main duties and functions.

a. Installation Entrepreneur: Director of Bhayangkara Hospital Semarang
b. Radiation Protection Officer (PPR): Setiyono, SSi, MM
c. Radiation workers: 3 radiology specialists, 9 radiographers, 1 medical physicist, 1 radiology nurse

Radiation safety issues are the responsibility of radiation protection officers who also act as medical physicists. Personal and environmental radiation dose monitoring has been implemented in a structured and periodic manner. For radiation officers, personal dose monitoring uses a TLD (Touch Screen Digital Display). There are 14 TLDs, corresponding to the number of radiation workers. Meanwhile, environmental radiation dose monitoring uses a survey meter. Radiation monitoring results have been documented in an orderly manner and are still carried out manually. Radiation dose monitoring for radiation workers is carried out in the form of a dose card, while environmental radiation dose monitoring is also structured, and archiving is the responsibility of the radiation protection officer (PPR).

In the Radiology Installation of Bhayangkara Hospital, the radiation protection equipment for personnel is 14 TLd, 6 aprons, 2 Gonad shields, 2 thyroid shields, 4 Pb glasses for the operator's room, 4 radiation symbols, 4 red lights for radiation signs, the examination room has met the standard, namely the walls of the examination room are coated with 2 mm Pb so that it is safe from radiation hazards. The existing radiation protection equipment has met the standard.

Health checks for radiation workers at the Radiology Unit of Bhayangkara Hospital Semarang are conducted regularly and systematically, once a year, at the beginning of each year. These tests include routine urine tests, routine blood tests, and chest X-rays.Radiation protection officers have properly recorded and documented the results of health checks for

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radiation workers (health cards). According to regulations, health checks for radiation workers must be conducted before work, periodically during work, and after work (BAPETEN, 2005).

Document storage has been carried out and is well organized. For example, dose monitoring documents, dose cards, health examination results, quality assurance, and copies of training/education results are archived by radiation protection officers. Meanwhile, education and training documents are still kept by each radiation worker in their personal files. PPR only receives copies. Document storage is still manual (hard copy), namely, they are archived and sorted if necessary into new files and scanned.

The Bhayangara Semarang Hospital radiology facility has conducted regular quality assurance. Simple tests are usually conducted in conjunction with research activities of partners who use the facility for research and community service. Calibration is performed periodically by a third party, as it does not yet have quality control equipment.

Education and training for radiation workers is planned at the beginning of each fiscal year and has a limited budget. Planning requires precise numbers and personnel to participate. Therefore, if there is a scientific seminar, a large number of participants cannot be sent; usually, one person is sent per event. Proposed educational advancement is budgeted or funded by the institution only for civil servant (PNS) employees.

Discussions

Dnature supports the results of the research by conducting observations at the research location, namely at the Radiology Installation of Bhayangkara Hospital Semarang regardingo radiation protection organization, radiation dose monitoring and radioactivity monitoring, radiation protection equipment, health checks, document storage, quality assurance and education and training.

Oradiation protection organization

BBased on the Regulation of the Head of BAPETEN (Nuclear Energy Regulatory Agency) No. 8 of 2011, the Radiology Installation of Bhayangkara Hospital has met the requirements for licensing the presence of radioactive sources. Based on the results of in-depth interviews regarding the radiation protection organization, it already has components in the radiation protection organization. These components are the Installation Entrepreneur, Radiation Protection Officer and Radiation Worker.

Researchers analyzed that the radiation protection organization is well-structured, and the primary duties of Radiation Protection Officers (RPOs) are well-executed, including planning and evaluating radiation protection programs and evaluating radiation accidents. However, there are still some overlapping duties, such as the Radiation Protection Officer also being a medical physicist. It is hoped that in the future, there will be no more double jobs, with one PPPR and one medical physicist, considering the very heavy workload of concurrently serving as both a PPR and a medical physicist.

Radiation dose monitoring

MonitorRadiation doses for workers can be measured using a Thermo Luminescence Dosimeter (TLD). Radiation dose monitoring is conducted every three months by sending it to the Health Facility Security Center. The results of the dose report will then be used for

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evaluation and documented for approximately 30 years from the time the worker terminates their employment. To monitor radiation exposure doses using a survey meter, this tool is not required for use with radiology X-ray machines.(BAPETEN, 2007).

Personal dose monitoring in the Radiology Installation of Bhayangkara Hospital Semarang uses TLDs, with all 14 radiation workers already using them. Meanwhile, environmental radiation dose monitoring uses survey meters. Radiation monitoring results have been properly documented and are still carried out manually. Radiation dose monitoring for radiation workers is carried out in the form of dose cards, while environmental radiation dose monitoring is also structured, with archiving being the responsibility of the radiation protection officer (PPR).

Radiation Protection Equipment

According to the Government Regulation of the Republic of Indonesia Number 33 of 2007 concerning ionizing radiation safety and security of radioactive sources, Article 31 states that permit holders are required to provide radiation protection equipment and every worker, patient, patient companion and/or other person who is in contact with radiation is required to wear radiation protection equipment. The examination room is in accordance with the standard, namely the walls of the examination room must be 20 cm thick concrete or 25 cm red brick with a density of 2.2 gr/cm3 or equivalent to 2 mm Pb so that it is safe from radiation hazards (BAPETEN, 2005).

In the Radiology Installation of Bhayangkara Hospital, the radiation protection equipment for personnel is 14 TLd, 6 aprons, 2 Gonad shields, 2 thyroid shields, 4 Pb glasses for the operator's room, 4 radiation symbols, 4 red lights for radiation signs, the examination room has met the standard, namely the walls of the examination room are coated with 2 mm Pb so that it is safe from radiation hazards. The existing radiation protection equipment has met the standard.

Medical examination

Health checks that should be carried out include laboratory blood tests, clinical chemistry, complete urine and physical. Pre-employment health checks to investigate the health history including all exposure to ionizing radiation from previous work or from examinations with medical treatment (Akhadi, 2000). Periodic health checks for every radiation worker at least once a year (PP No. 63 of 2000). Post-employment checks are carried out on organs that are sensitive to radiation and then it is necessary to determine whether further health monitoring is necessary or not (Akhadi, 2000). The results of the health checks must be conveyed to the radiation worker and must be recorded on each radiation worker's health card (PP No. 63 of 2000).

According to the author, the implementation of health checks for radiation workers at the Radiology Installation of Bhayangkara Hospital is good, but the archiving needs to be further improved by following technological developments, namely with digital archiving, so that it can be accessed wherever needed.

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Document storage

Document storage has been carried out and is well organized. For example, dose monitoring documents, dose cards, health examination results, quality assurance, and copies of training/education results are archived by radiation protection officers. Meanwhile, education and training documents are still kept by each radiation worker in their personal files. PPR only receives copies. Document storage is still manual (hard copy), namely, they are archived and sorted if necessary into new files and scanned. To make it easier to access when needed, documents such as dose monitoring documents, dose cards, health check results, quality assurance and copies of training/education results can be stored in soft file form.

Quality Assurance

The Bhayangara Hospital Semarang radiology facility has conducted regular quality assurance. Simple tests are usually conducted in conjunction with research activities of partners who use the facility for research and community service. Calibration is also performed periodically by a third party, as it does not yet have quality control equipment. It needs to be planned in the budget submission for equipment procurement.*quality control*gradually considering the large budget for purchasing the equipment.

Education and training

Radiation workers are scheduled at the beginning of each fiscal year and have a limited budget. The planning process requires precise numbers and personnel to participate. Therefore, if there's a scientific seminar, a large number of participants cannot be sent; typically, one person is sent per event. Proposed educational advancement is budgeted or funded by the institution only for civil servant (PNS) employees. Planning for scientific activities and further education requires having a Satu Sehat account so that radiation officers can follow scientific updates available on the Sehat platform by attending webinars, which can be a solution for limited budgets.

CONCLUSIONS

The implementation of the radiation occupational safety and health management system (SMK3) in the Radiology Installation of Bhayangkara Hospital Semarang is as follows: 1) The radiation protection organization in the Radiology Installation of Bhayangkara Hospital Semarang is well structured, consisting of Installation authorities, radiation protection officers (PPR) and radiation officers who carry out functions according to their respective duties and functions. 2) Personal and environmental radiation dose monitoring has been carried out in a structured and periodic manner. Personal dose monitoring is carried out using 14 TLDs. Meanwhile, environmental radiation dose monitoring uses a survey meter. Radiation monitoring results have been documented in an orderly manner and are still carried out manually. 3) Radiation protection equipment is quite complete, consisting of 14 TLDs, 6 aprons, 2 Gonad shields, 2 thyroid shields, 4 Pb glass for the operator's room, 4 radiation symbols, 4 red radiation sign lights, the examination room has met the standard, namely the walls of the examination room are coated with 2 mm Pb. 4) Health checks for radiation workers at the Bhayangkara Hospital Radiology Installation have been carried out regularly

in accordance with applicable laws, namely once a year, which includes routine urine, routine blood and chest x-rays. 5) Document storage has been carried out and is well organized in hardcopy form. 6) The Bhayangara Semarang Hospital radiology installation has carried out quality assurance periodically. Simple testing usually coincides with partner research activities that use it as a place for research and community service. 7) Education and training for radiation workers are planned at the beginning of each budget year and are limited in budget. Research suggestions are: 1) There is no double job so that there is 1 radiation protection officer and 1 medical physicist. 2) To facilitate access when needed, documents such as dose monitoring, dose cards, health examination results, quality assurance and copies of training/education results can be stored in soft files. And digital storage. 3) It is necessary to plan in the budget submission for the procurement of quality control equipment in stages. 4) Planning for scientific activities and further education.

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