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## POTENTIAL HAZARD ANALYSIS PROFESSION RADIOGRAPHER AT DEMAK HOSPITAL

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### Abstract

Background: Potential hazards and risks in the workplace is the result of work systems or work processes, the use of machinery, equipment and ingredients are sourced from the limitations of his work. From the results of preliminary observations at the Hospital of Pelita Anugerah Mranggen Demak, researchers found several cases of work-related accidents in Radiology which are not recorded during this time. This study aimed to describe the potential hazards and risk values OSH and provide recommendations on the control of hazards in accordance with the standards. Methods: This study is a qualitative research with cross sectional approach. Subjects in this study consisted of 6 people technologist as key informants, 1 Chamber Head and 1 Chief of Radiology as an informer of existing support. The research variables are potential hazards, risks and value of the profession radiologist. Results: Control of danger that has been done in Radiology not meet the standards. Hazard control physics obtained is done using film badge and hide behind the veil of coated lead every task and biological hazards by wearing a mask and handscoon which then wash your hands after handling patient. **Conclusion:** The danger of physical and biological control are performed at the Hospital Radiology Pelita Anugerah Mranggen Demak not meet the standards, while for chemical hazards and ergonomic hazard control has not been done.

**Keywords:** Risk Value, potential hazards, profession radiologist

### 1. Introduction

In the Act Number 13 of 2003 on employment article 86-87 it is stated that Occupational Safety and Health (OSH) should be conducted at all workplaces, in particular workplaces that are at risk of health hazards, infectious diseases and or employing employees . If you consider the content of the article is that it is obvious if hospital included in high- potential workplace accidents are restricted. <sup>(1-4)</sup>

One of the risk areas in the hospital is the Radiology Installation. Radiology is a means of supporting the medical use of imaging or *imaging technology (imaging technologies)* to diagnose and or pengobatan diseases. Radiology is a branch of medicine that deals with the use of x-rays emitted by the plane x-rays or other radiation equipment in order to obtain visual information as part of the imaging or medical *imaging (medical imaging)*. <sup>(5,6)</sup>

The Radiology Installation has several laborers who are in charge of operating the X-ray equipment hereinafter called the radiographer. <sup>(6-8)</sup> technologist in general have a duty and responsibility, that perform radiographic examination of the patient, the radiation exposure techniques in radiotherapy the implementation of the health care field of radiology or radiography limited authority and responsibility, ensure the accuracy and security of radiation protection measures and Conduct radiographic equipment quality assurance measures. <sup>(8,9)</sup>

Results of a preliminary study at the Hospital of Pelita Anugerah Mranggen Demak known that there were some cases of accidents caused by work in Radiology were not recorded during this time, as in moving the patient requires knowledge of techniques to lift weights the right way and accidents as small as the fall of the cassette X-rays, eye Exposed to contrast media fluid and slip due to slippery floor. This study aims to describe the potential hazard as well as the value of OSH risk in the work stages of Radiographers at Pelita Anugerah Mranggen Demak Hospital.

### 2. Methods

Type of research used in this research is qualitative research with cross sectional approach. The main research subjects are all Radiographers of Pelita Anugerah Mranggen Demak Hospital, while the Supporting Research Subjects is 1 person Head of Radiology Room and 1 Head of Radiology Intallation as the informant of triangulation.

Data analysis on qualitative research is done by 3 stages before entering the field, during the field and after completion in the field. The study only addresses simultaneously with data collection in the field. In the



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analysis before the field, a nalis Carried out on data from the results of the preliminary study and secondary data used to determine the focus of the study. In the data analysis is the focus of research is still tentative and the results will be developed after the researchers were in the field. Then proceed with the analysis while in the field, namely the interview. Researchers already conducted an analysis of the answers were interviewed. If the answer were interviewed after the analysis was not satisfactory, the researchers will continue the questions again, to a certain extent, the data obtained are considered credible. And finally sealed ukan analysis during data processing in the field, starting with set a key informant is reliable informant "opened the door" to the investigators to enter the research object. After that the researcher interviewed the informant, and recorded the interview result. Then, the researchers' attention to the object of research and start asking questions deskriprif, followed by an analysis of the results of interviews

**3. Results**

Table 1. Job Safety Analysis on Radiographers

| No. | Activity   | Potential Hazard  | Recommendation<br>(Controls already done)   | Rekomendasi<br>(OHSAS 18001)  |
|-----|--|---|---|---|
| 1   | Opening the door of the examination room   | Biological Factors : Door handles that are often held can accumulate germs  | Administration : Wash hands   | Isolation : cleaning with disinfectant regularly on the door handle   |
| 2   | <ul style="list-style-type: none"> <li>a. Organize the cassette and set the tap (point of view) on the middle of the cassette</li> <li>b. Reforming the <i>bucky stand</i> (cassette holder) / examination table according to body and object to be in x-ray</li> <li>c. Position the patient</li> </ul> | <ul style="list-style-type: none"> <li>a. Biological factors : <i>Bucky stand</i> and when positioning the patient having to touch it, so it can happen germ transfer from the object to the radiographer</li> <li>b. Factors Ergonomics: The handles on the tube x-ray tpesawa less ergonomic</li> </ul>     | Administration : Wash hands after handling patient  | <ul style="list-style-type: none"> <li>a. Isolation : cleaning with disinfectant regularly <i>bucky stand</i> and the examination table</li> <li>b. Administration : Wash hands before and after handling patient.</li> <li>c. PPE : Using handscoon and masks.</li> <li>d. Substitution : Using the <i>x-ray</i>tube that is more ergonomic</li> </ul>   |
| 3   | <ul style="list-style-type: none"> <li>a. Set exposure and expose</li> <li>b. Insert contrast media</li> </ul>   | <ul style="list-style-type: none"> <li>a. Physical factors : Exposure to radiation released by the x-ray tube</li> <li>b. Chemical factors : Contrast media that cause eye irritation when exposed to the eye</li> <li>c. Ergonomics factors : <i>Repetitive work</i> when entering contrast media</li> </ul> | <ul style="list-style-type: none"> <li>a. Administration: Always wear a <i>film badge</i> (radiation measuring instrument)</li> </ul> | <ul style="list-style-type: none"> <li>a. Engineering Control/isolation: Wait a few seconds for the radiation emanating from the x-ray tube is missing</li> <li>a. Engineering Control/isolation: The distance the eye and syringes should not be too close</li> <li>b. Administration : Entering contrast to the way drip infusion</li> <li>c. PPE : Using google goggles when will enter contrast into <i>Sput</i></li> </ul> |



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| No. | Activity  | Potential Hazard   | Recommendation<br>(Controls already done)   | Rekomendasi<br>(OHSAS 18001)  |
|-----|---|--|---|---|
| 4   | <ul style="list-style-type: none"> <li>a. Insert x-ray into the envelope</li> <li>b. Lower the patient from the examination table</li> </ul>  | <ul style="list-style-type: none"> <li>a. Biological factors :<br/>Can get the disease from the patient, the risk of contracting the disease gets bigger when hand scraped envelope / x-ray film that resulted in injury to the skin surface</li> <li>b. Ergonomic factors :<br/>- Fall with the patient<br/>- Back Pain.</li> </ul>   | <ul style="list-style-type: none"> <li>a. Engineering Control/isolation:<br/>Giving plaster on the injured finger</li> </ul>  | <ul style="list-style-type: none"> <li>a. Engineering Control/isolation:<br/>Provide antiseptic to the wound then covered with plaster</li> <li>b. Administration: Use good weight lifting techniques when lifting the patient</li> </ul>   |
| 5   | <ul style="list-style-type: none"> <li>a. Replace the x-ray film in the printer</li> <li>b. Carrying out equipment for service operations (x-ray envelope, CT-Scan envelope, ultrasound envelope and so on) from the logistics department</li> <li>c. Accompanying the physician radiologist in performing ultrasound examinations</li> </ul> | <ul style="list-style-type: none"> <li>a. Ergonomics factors :<br/>Changing the x-ray film on a printer in a squatting position can cause cramps, Back Pain and hand squeezed printer can even be fracture</li> <li>b. Physical factors :<br/>Technologist slip or fall from exhaustion due to up and down stairs with a load of materials used for operational service in Radiology</li> <li>c. Biological factors :<br/>Wiping the patient's body with a tissue after examination</li> </ul> | <ul style="list-style-type: none"> <li>a. Elimination : -</li> <li>b. Substitution : -</li> <li>c. Engineering Control/isolation : -</li> <li>d. Administration: -</li> <li>e. PPE : -</li> </ul> | <ul style="list-style-type: none"> <li>a. Substitution : Replace CR printers with a more ergonomic</li> <li>a. Substitution : Adding new workers to deliver goods from logistics to service areas including radiology.</li> <li>a. PPE : Using handsocon and a mask while wiping the patient</li> </ul> |



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**4. Discussion**

1. Process or Stages of Radiographers Work  
 Process or work stages technologist at Pelita Augerah Hospital Mranggen Demak starting from x-rays received a letter from the doctor requests the sender, then do *billing* (data collection) to enter patient data, from the name, address, age up to those requested. X-ray examination can be done by contrast or non-contrast. After the patient *billing*, patient called to then ushered into the examination room and then make an X-ray examination in accordance with the clinical picture and photo requests by doctors sender.

The patient is set in the projection to be examined, then the Radiographer adjusts the exposure factor followed by processing the X-ray film in the CR (Computed Radiography) chamber, when the film is out of the printer then inserted into the X-ray envelope.

2. Potential Hazards and OHS Risk in Radiology Installation  
 a. Radiology Officer  
 The results of observations when performing x-ray examination found some hazards that occur are the dangers of the work environment such as biological hazards, ergonomic hazard and physical hazards.

- 1) Inspection of X-Rays
  - a) Biological hazards and ergonomic hazards  
 Germs or viruses that are on the door handle, bucky stand and examination table will go into the body, other than that the disease from the patient can be transmitted to the radiographer. From the aspect of ergonomic hazards, the grip on the ergonomic x-ray tube plane causes the radiographer to feel an objection when turning the x-ray tube.
  - b) *Consequences* of performing x-ray examination which includes arranging cassettes and arranging the point of view and arranging bucky booths with potential biological and ergonomic hazards of 50 (Major) assuming if the radiographer positioned the patient according to the object will be examined then the direct contact that occurs can cause germs / bacteria / virus from the patient transmitted to the radiographer, while the aspect of ergonomic cause radiographer must exert extra energy to set the tube on x-ray.
  - c) Possibility (likelihood) the occurrence of work accidents on the action of x-ray examination that is 1 (rare) that is rare accident occurrence, never happened accidents for years of exposure but may happen to the radiographer. For example when going to take x-ray tapes from the bucky stand or bucky that is on the examination, the tape is held down and hit the foot or toes it can cause bruises or minor injuries that can make the temporary work temporary cessation

2) Adjust exposure and insert contrast media  
 a) Physical and chemical hazards  
 Exposure to radiation released by an x-ray tube that affects the body or a fluid contrast medium that can also affect the eyes and cause irritation. Because continuous exposure to radiation can cause stochastic effects and non stochastic effects, whereas in contrast media fluids can obviously have an effect especially on the eyes, when not using PPE. This can happen if workers are less careful at work, do not use gloves, masks and google glasses when available when interesting contrast media into the patient's body.

While for the control of the radiation exposure, the radiographer is required to always use a badge film (radiation monitoring tool) while performing his duties as a radiographer. The organization controls by providing radiography safety and health training to radiographers and provides personal protective equipment such as gloves, masks and film badges. The level of risk is expected to fall with assumptions that need to be monitored and addressed on an ongoing basis.

Based on Perka Badan Tenaga Nuklir Nasional Number 020/KA/I on Guidelines for Occupational Health and Safety Risk Assessment states that the film badge as a radiation monitoring tool shall be used by each Radiographer while performing tasks in the radiation area untill the end of business hours, given the important and dangerous effects of radiation that can be generated if ionozing the body.<sup>(7)</sup> The results of this study are in line with radiation impact research on the health of radiation workers at RSUD Arifin Achmad, Santa Maria Hospital and Awal Bros Pekanbaru Hospital indicating that Radiographers should have protection for occupational safety and health both before starting work, while working or after



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finished working because x-rays have characteristics can cause deterministic effects (tissue damage) or genetic.

- 3) Lower the patient from the examination table and insert the x-ray into the envelope  
 The dangers present in lowering the patient from the examination table and inserting the x-ray into the envelope are serious and permanent severe diseases such as back pain, injury or fracture from falling with the patient due to a lack of strength to support the patient's body, then when inserting an X-ray into Envelopes, hands can be scratched envelopes. For that, need to be more careful when working and increase alertness.

This can make the risk value in the category acceptable or low. According to Minister of Health Decree No. 1087 / Menkes / SK / VIII / 2010 concerning Occupational Safety Standards in Hospitals on the importance of knowledge of the correct technique of lifting patients to avoid causing PAK (Work Disease) to health workers.<sup>(8)</sup> The results are consistent with studies of Ergonomics Risk Control Case (*Low Back Pain*) *LBP* on a nurse at the Hospital stating that health workers are often exposed to *LBP* (*Low Back Pain*) because of the intensity move patients more than 1 time in 1 shift working hours.<sup>(23)</sup>

- 4) Replacing the X-ray film, carrying supplies from logistics and accompanying radiologist performing ultrasound

Changing the x-ray film on a printer in a squatting position can cause ergonomic hazards in the form of cramps, Back Pain and hand squeezed printer can even be *fracture*. While the physical hazards that a radiographer may receive when picking up the equipment in the logistics section are slip or fall due to exhaustion due to up and down stairs by carrying the burden of materials used for service operations in Radiology. While for the process of wiping the patient's body with the use of tissue after an ultrasound examination can cause transmission of disease from the patient's body to the radiographer.

For recommendations according to OHSAS 18001: 2007 then to lift the burden of logistics to the radiology can be done by substitution, which is adding a person assigned specifically to deliver the goods. While when accompanying radiologist for ultrasound examination then can menggunakan APD in the form of mask and handscoon then continued by washing hands.

3. OHS Risk Control that has been done

K3 risk control has been done in Radiology RS Pelita Anugerah Mranggen Demak ie wash their hands after treating patients and providing for the technologist *film badge* while performing tasks in Radiology. In the use of *film badge*, be evaluated once a month by BAPETEN. Hospital Radiology party Pelita Anugerah Mranggen Demak will send a *film badge* to BAPETEN to evaluate the results of radiation exposure to the technologist, then the results of the evaluation will be given back to the RS Pelita Anugerah Mranggen Demak.

**5. Conclusions**

- 1. The process or stage of work of the Radiographer at Pelita Anugerah Mranggen Demak Hospital begins with the Radiographer receiving a letter of request for x-rays from the patient, inserting the patient into the examination room, adjusting the patient's position according to the object to be photographed, entering the contrast medium (when examining using contrast media) , Adjusting exposure factors, processing X-ray films in CR (Computed Radiography), inserting X-rays into envelopes.
- 2. Potential hazards and risks OSH are the most present in the danger of physics that comes from exposure to x-ray radiation and the danger ergonomics generated from the start technologist rotating tube x-ray examination to arrive at moving the patient and replacing the x-ray film printer, and then also There are biological hazards arising from the patient's body and equipment or objects around the radiology examination chamber as well as the chemical hazards obtained from contrast media fluids when the contrast fluid is on the eye.
- 3. The value of the highest consequence and likelihood obtained in danger of physics with extreme values or a significant risk that required special attention and continuous in control, then the danger of ergonomic and chemical hazards earned high risk value or high risk, as well as biological hazard with medium risk value or moderate.



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4. OSH risk controls already carried out in the profession Radiology technologist at Pelita Anugerah Hospital Mranggen Demak hand washing after handling the patient as well as the use of film badge for officers Every task in Radiology.

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