

FACTORS OF FAILURE TO REPEAT X-RAY PHOTOS ON COMPUTED RADIOGRAPHY IN RADIOLOGY UNIT dr. REKSODIWIRYO HOSPITAL PADANG

*Livia Ade Nansih¹, Aisyah Elliyanti¹, Dessy Arisanty¹

¹Program Studi Ilmu Biomedis Program Magister, Fakultas Kedokteran, Universitas Andalas, Padang, Indonesia

*adenansihlivia@gmail.com, aelliyanti@med.unand.ac.id, arisantydessy12@gmail.com

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ABSTRACT

In radiology services, there are other supporting factors for quality radiographic images, namely film processing techniques and officers who are capable and competent in carrying out these services because if there are frequent errors in taking radiographs, it will be detrimental to the hospital and the radiation dose received by the patient will increase due to repetition. For this reason, it is necessary to take corrective actions necessary to set up a system that provides a detailed analysis of the rejection of the film and the reasons for the rejection of the film and the ways in which it is implemented. Based on observations from January 2020 to June 2020 there were 123 repetitions with a repetition percentage of 4.04%. Based on the regulation (Kepmenkes No. 129 of 2008) regarding the minimum service standard of radiology, it states that the failure rate of X-ray services is 2%, so that the repetition at the radiology installation at the Dr. Reksodiwiry Hospital in Padang exceeds the standard set. The type of research used is descriptive quantitative, carried out at the Radiology installation of Rs.dr.Reksodiwiry Padang in June 2021. The population was 4,581 examinations with a sample of 143 photos repeated. The data is processed by identifying the repeated X-rays on computed radiography, recording the number of repetitions on the survey sheet, counting the number of repetitions and then grouping them based on the factors that cause repetition. Calculate the percentage of repetitions. The percentage results obtained are compared with the repetition tolerance limits that have been set. The results showed that the percentage of repeat X-rays in January was 1.20%, February 0.80%, March 0.67%, April 0.24%, May 0.13% and June 0.06%. The percentage of factors causing repetition due to patient movement is 3.22%, patient position factor is 49.03%, exposure factor is 9.03%, equipment factor is 3.87%, and artefact factor is 34.83%. Repetition of X-rays for 6 months was 143 times with a percentage of 3.12% while the number of factors causing repetition was 155 factors causing repetition, with the highest factor causing repetition the position factor of 49.03%.

Keywords: Repetition, Causative factors, Computed Radiography

BACKGROUND

In radiology services, there are other supporting factors for quality radiographic images, namely film processing techniques and officers who are capable and competent in carrying out these services because if there are frequent errors in taking radiographs, it will be detrimental to the hospital and the radiation dose received by the patient will increase due to repetition. photo done. One of the methods that will be described is repeat analysis or analysis of repetition of making images on radiographs. Repeatability analysis is a systematic process of rejected catalog images and determines the type of repetition so as to minimize errors or repetitions that occur in computed radiography (CR). Computed radiography (CR) is the process of converting conventional analog radiography systems into digital radiography. The use of CR in radiography still uses cassettes as in conventional radiography, only in the CR cassette there is an image plate (IP) as a medium for receiving images without any radiographic film and intensifying screen (IS) as in conventional radiography (Papp, 2011).

The main objective of the radiographic film repeat and rejection program is to take the necessary corrective actions to set up a system that will provide a detailed analysis of film rejection and the reasons for the rejection of the film and the ways in which it is implemented (Lloyd, 2001).

Computed radiography (CR) is the process of changing conventional analog radiography factors into digital radiography. The use of CR in radiography still uses cassettes as in conventional radiography, only in the CR cassette there is an image plate (IP) as a medium for receiving images without any radiographic film and intensifying screen (IS) as in conventional radiography.

The repetition of X-rays on computed radiography can be caused by human resources who are still not competent in handling computed radiography. Repetition of X-rays received by patients associated with exposure to low doses of

radiation is known as the stochastic effect, this effect appears in humans in the form of cancer (somatic damage) or defects in offspring (genetic damage) (Akhadi, 2000).

One of the most detrimental properties of X-rays is that X-rays cannot be seen with the eye, X-rays are ionizing radiation and X-rays can change body tissues, besides providing enormous benefits, they also have the potential to have detrimental effects (Barunawaty Yunus K. B., 2019).

According to Banahene dkk., (2014) The rejection rate at the Department of Radiology Teaching Hospital in Ghana was 14.1% of the 85.9% films received, the main factor contributing to the rejection of films was the patient position factor. Meadowbrook Queensland Australia's premier metropolitan emergency imaging department, an average rejection rate of 9% over a 15 month period of 90,298 images were obtained with a position factor error rejection rate of 49% and an anatomical limit of 21% (Atkinson et al., 2019). The results of the analysis of rejection and repetition on computed radiography Agfa CR 35-X at the Radiology Installation of RSUD DR. R. Goeteng Taroenadibrata Purbalingga in February 2016 showed rejection and repetition of digital images as much as 3.91% (Fajarrissetyo dkk., 2016).

Based on observations made by the author at the radiology installation of Dr. Reksodiwiry Hospital, Padang, there were repeated X-ray examinations in January 2020 as many as 55 times out of 1052 total exposures from 820 patients. The repetition error in February 2020 was 37 times out of 1,088 exposures from 803 patients. The repetition error in March 2020 was 31 times out of 907 total exposures from 666 patients. Based on the data above, it can be concluded that from January to March 2020 the number of X-ray patients was 2,289 patients, with a total of 3,042 exposures with a total number of repetitions of the use of computed radiography modalities in the radiology installation of Dr. Reksodiwiry Hospital Padang as many as 123 repetitions with a percentage repetition is 4.04%.

Based on the regulation (Kepmenkes No. 129 of 2008) regarding the minimum service standard of radiology, it states that the failure rate of X-ray services is 2%, so that the repetition in the radiology installation at the Dr. Reksodiwiry Hospital in Padang exceeds the standard set for that it is necessary to take corrective action to determine the number of repetitions. X-rays and analyze the factors causing the repetition of X-rays in the radiology installation of Dr. Reksodiwiry Hospital, Padang.

METHODS

The type of research used is descriptive quantitative research, conducted in June 2021 at the Radiology Installation of RS.dr.Reksodiwiry Padang. The study population was all X-ray examinations in January 2020-June 2020 as many as 4,581 examinations. The sample used purposive sampling technique, so the sample in this study was 143 photos that experienced repetition. The inclusion criteria for all X-rays repeated on computed radiography in January 2020-June 2020, with the factors causing the repetitions are: patient movement factor, position factor, exposure factor, equipment factor and artifact factor. Exclusion criteria for X-rays that do not experience repetition. The source of the data obtained in this study was a repeating X-ray found on computed radiography at the Radiology installation of RS.dr.Reksodiwiry Padang accompanied by a radiographer who had worked for more than five years as the person in charge of the room in the radiology installation of the hospital. Reksodiwiry Padang. Data processing by identifying repeated X-rays, noting the number of repetitions, counting the number of repetitions and grouping the number of repetitions based on the factors that cause repetition. Analyze the data by calculating the percentage of repetition numbers and the percentage of factors that cause repetition by using a formula. The percentage result obtained is compared with the repetition tolerance limit that has been set by Kepmenkes No.129 of 2008 is <2%.

RESULTS AND DISCUSSION

After doing research by collecting all the data on repeating X-rays and then doing calculations, the results of the picture of repeating X-rays are as follows:



Figure 1. Error due to movement factor



Figure 2. Error due to position factor



Figure 3. Error due to exposure factor

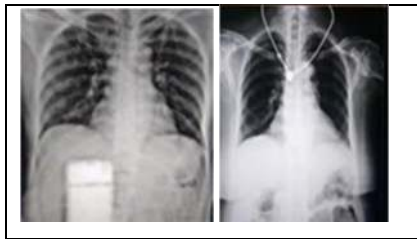


Figure 4. Errors due to artifacts



Figure 5. Error due to equipment factor

Table 1. X-ray Recapitulation

Month	Amount Exposure	Amount Repetition X-Ray Photo	Percentage Number Repetition (/6 months)
January	1.052	55	1,20%
February	1.088	37	0,80%
March	907	31	0,67%
April	508	11	0,24%
May	421	6	0,13%
June	605	3	0,06%
Jumlah	4.581	143	3,12%

Table 2. Recapitulation of Factors Causing Repetition of X-Rays

Factor Cause Repetition	January	February	March	April	May	June	Total	Percentage
								Factor Repetition
Movement	2	0	2	1	0	0	5	3,22%
Position	30	14	20	5	5	2	76	49,03%
Ekposure	7	4	1	1	1	0	14	9,03%
Equipment	3	2	1	0	0	0	6	3,87%
Artifact	18	19	10	5	1	1	54	34,83%
Total	60	39	34	12	7	3	155	99.98%

In January the number of factors causing the repetition of X-rays, there were 60 factors that caused 55 of the number of X-rays that were repeated, so there were 5 X-rays with the repetition factor of more than one factor causing repetition. In February there were a number of factors that caused the repetition of X-rays, there were 39 factors that caused the number of photos to be repeated, so there were 2 X-rays with the repetition factor of more than one factor causing the repetition. In March there were a number of factors that caused the repetition of X-rays as many as 34 factors that caused out of 31 the number of photos that were repeated so there were 3 X-rays with the repetition factor of more than one factor causing the repetition. In April there were a number of factors causing the repetition of X-rays, there were 12 factors that caused the number of photos to be repeated, so there was 1 X-ray with the repetition factor of more than one factor causing the repetition. In May there were a number of factors causing the repetition of X-rays as much as 7 times out of 6 times the number of photos being repeated, so there was 1 X-ray with the repetition factor of more than one factor causing the repetition. In June there were a number of factors causing the repetition of X-rays as much as 3 times out of 3 times the number of photos being repeated, so there were no X-rays with factors causing the repetition of more than one factor.

In the radiology installation of RS. Reksodiwiry Padang, the position factor that causes the biggest repetition, this repetition occurs in patients from the ER who are uncooperative then during the exposure the officer does not observe the patient again through the shielding glass whether the patient is moving or not, therefore the officer applies proper communication. easy to understand by patients and sticking standard operating procedures on the walls of the room so as to prevent repeat radiographs. According to Lestari and Fatimah., (2018) the factor causing the repetition of the position factor is because the patient who comes in is in a bad condition or is uncooperative so it is difficult to communicate and the patient is difficult to calm down, therefore the officers positioned in a hurry and did not re-examine the patient's position. According to Sayuti., A (2020), the position factor is caused by the patient being unconscious, causing the radiographer to have difficulty in positioning the patient because they cannot communicate.

The solution to overcome the repetition factor due to position errors is to give sanctions to the radiographer who repeats the examination (*Rahmawati., 2017*). Improve the radiographer's skills in performing examinations, positioning uncooperative patients, using fixation aids in examining children or infants and giving clear instructions (Maesaroh and Kurniawati., 2019). Efforts must be made to minimize this positional error by communicating with the patient and being more careful in handling or positioning the patient so that there is no repetition (Chafidi.,dkk, 2018).

The factor causing the second highest repetition is the artifact factor. Artifacts are film processing errors that form white shadows on the film after processing. This factor occurs because the officers are not careful enough to examine foreign objects such as jewelry and other objects that can interfere with the radiographic image, while the artifacts caused by the imaging plate (IP) and laser printer are due to the lack of attention of officers to carry out regular maintenance. Artifacts caused by the imaging plate are characterized by the appearance of a white line on the edge of the radiograph when viewed with a normal gray scale percentage on the radiograph (Sari, 2017). The higher the grid line level, the better it will be and will not cause artifacts. On the contrary, the less the grid line level, it will cause artifacts in the radiographic results (Sari and Fadly., 2017).

The repetition of the exposure factor is the third order repetition factor found in the Radiology Installation of the Hospital. Reksodiwiry Padang. Exposure factors are those that affect the quality and quantity of X-rays to obtain optimal image results. The quality of X-rays describes how X-ray beams have high penetrating power. While the quantity of X-rays indicates the number of photons in X-rays (Bushberg, 2012). Under exposure occurs because the exposure factor given is not enough, so the image becomes white due to lack of contrast and density. Over exposure occurs because the exposure factor given is too high, so the resulting image becomes dark due to excess contrast and density (Rahman, 2009). The solution to overcome the repetition of X-rays due to exposure factors should be to

examine objects with high thickness such as lumbosacral, thoracolumbar, abdominal three positions and others, officers must be more careful in determining the exposure factor by looking at the object to be exposed properly.

Damage to the scanner on the CR can result in missing parts of the plate that should be passed through the scan line, this can also be caused by dust, memory problems and digitization problems. Lasers also have a limited life and must be replaced regularly (Papp, 2006). An error in the scanner occurs due to an error in the scanner tool when the cassette is inserted, causing the image to be lost or the image to be black (Maesaroh and Kurniawati., 2019). The solution to overcome the repetition of X-rays due to equipment, officers should be able to place the CR cassette properly so that the cassette is not damaged by falling which can cause the imaging plate to be damaged. Perform periodic maintenance on CR components.

The movement factor is the fifth order repetition factor in the radiology installation of the hospital. Reksodiwiry Padang. The repetition factor due to movement occurs due to the lack of supervision by officers on patients when exposing, especially non-cooperative patients, so that the radiographic image obtained becomes blurry so that the anatomy cannot be assessed properly. Repetition occurs because movement usually occurs on chest x-ray examination in children (Maesaroh and kurniawati., 2019).

The solution to overcome the repetition of X-rays due to patient movement, the officer should give clear instructions and be understood by the patient during the examination, especially in uncooperative patients by observing the patient through the shielding during the exposure. To reduce the movement of the patient can be reduced by providing a short exposure time, to reduce movement in children can be done by providing a fixation device.

CONCLUSIONS AND SUGGESTIONS

Repetition of X-rays for 6 months is 143 times with a percentage of 3.12% while the number of factors causing repetition is 155 factors causing repetition, with the highest factor causing repetition is positional factor of 49.03% so it is necessary to provide training to improve radiographer skills in examining non-cooperative patients. to prevent the stochastic effect even though the image printing is done using the computed radiography method.

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