

ANALYSIS OF REPEAT PANORAMIC RADIOGRAPHY AT THE RADIOLOGY DEPARTMENT OF PADANG PARIAMAN HOSPITAL REGIONAL**ANALISIS PENGULANGAN (REPEAT) RADIOGRAFI PANORAMIK DI INSTALASI RADIOLOGI RSUD PADANG PARIAMAN****Cicillia Artitin¹, Neli Putri Yanti², Sagita Yudha³, Chairun Nisa⁴**Radiology Study Program, Faculty of Vocational Studies, Baiturrahmah University, Padang, West Sumatra, Indonesia^{1,2,3,4}

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Corresponding Author*ABSTRACT**

The radiology installation is one of the important components in a hospital that functions as a medical support unit in establishing diagnoses through high-quality radiographic results. Panoramic dental examination is used to display the structure of the jaws and teeth comprehensively without anatomical obstruction. However, repeated imaging often occurs, which can reduce service efficiency and increase patient radiation dose. This study aims to determine the percentage of panoramic radiograph repetitions (repeats), whether it remains within the standard limits set by the Ministry of Health, and to identify the factors causing these repetitions. This type of research is a quantitative descriptive study conducted in the Radiology Department of Padang Pariaman General Hospital from July to September 2025. The study population consisted of all panoramic patient examinations, totaling 264 individuals, using a total sampling technique. Data were collected through observation and documentation of repeated radiographic results, then analyzed to determine the frequency and percentage of repetitions based on causal factors of that repeat. The results showed that the percentage of repeated exposures that occurred was 2.65% from July to September 2025. The most significant cause of radiograph repetition was artifact factors (42%), followed by equipment and patient movement factors (14%), and patient positioning factors (28%). This percentage exceeds the tolerance limit set by the Indonesian Ministry of Health Regulation No. 129/Menkes/SK/II/2008, which states that the acceptable repeat rate for radiographs should ideally be less than 2% within a three month period.

Keywords: Radiology, Repeat Analysis, Dental Panoramic.**ABSTRAK**

Instalasi radiologi merupakan salah satu komponen penting di rumah sakit yang berfungsi sebagai penunjang medis dalam menegakkan diagnosis melalui hasil radiografi yang berkualitas. Pemeriksaan panoramik gigi digunakan untuk menampilkan struktur rahang dan gigi secara menyeluruh tanpa adanya halangan anatomi, namun sering terjadi pengulangan foto yang dapat menurunkan efisiensi pelayanan dan meningkatkan dosis radiasi pasien. Penelitian ini bertujuan untuk mengetahui persentase pengulangan (repeat) radiografi panoramik, apakah masih dalam batas standar yang ditetapkan oleh Kementerian Kesehatan, serta untuk mengidentifikasi faktor penyebab terjadinya pengulangan tersebut. Jenis penelitian ini adalah deskriptif kuantitatif, dilakukan di Instalasi Radiologi RSUD Padang Pariaman selama bulan Juli–September 2025. Populasi penelitian adalah seluruh pasien pemeriksaan panoramik sebanyak 264 orang dengan teknik total sampling. Data dikumpulkan melalui observasi dan dokumentasi terhadap hasil radiograf yang diulang, kemudian dianalisis untuk menentukan frekuensi dan persentase pengulangan berdasarkan faktor penyebab terjadinya pengulangan repeat tersebut. Hasil penelitian menunjukkan Persentase angka pengulangan penyinaran yang telah terjadi yaitu Faktor penyebab pengulangan radiografi paling besar yaitu faktor artefak sebesar 42%, faktor alat dan pergerakan pasien sebesar 14% dan untuk pemosisian pasien sebesar 28%. Bulan juli sampai september 2025 yaitu 2,65%, dan jumlah ini melebihi batas toleransi standar yang telah ditetapkan oleh kemenkes RI nomor 129/Menkes/SK/II/2008 batasan radiograf yang diterima idealnya angka pengulangan radiografi

Kata Kunci: Radiologi, Repeat Analisis, Dental Panoramik

1. INTRODUCTION

The radiology facility is a vital component of a hospital. It serves as a medical support system, particularly for confirming a disease diagnosis by producing high-quality radiographs. The radiology facility offers several service areas, including diagnostic radiology, radiotherapy, and nuclear medicine (Minister of Health Regulation No. 780 of 2008).

Diagnostic radiology services encompass several areas, including radiodiagnostic services, diagnostic imaging services, and interventional radiology services. Diagnostic radiodiagnostic services involve diagnostic procedures using ionizing radiation, such as conventional x-rays and computed tomography (CT) scans. A conventional x-ray is a panoramic dental radiography examination (Ministry of Health Regulation No. 1014 of 2008).

Dental Panoramic/Panoramic tomography is a term used to describe a technique for producing unobstructed images. This radiographic technique produces an image of the entire mandible, including the temporomandibular joint and the entire dental arch. Panoramic films depict the mandible and maxilla, from condyle to condyle, in a single radiograph (Frommer and Savage, 2011).

According to the Decree of the Minister of Health Number 129/Menkes/SK/11/2008 concerning minimum radiology service standards, one of the minimum radiology service standards is the occurrence of x-ray service failures. This is damage to the image that cannot be read. The frequency of data collection on x-ray service failures is carried out with a three-month analysis period. The occurrence of x-ray service failures has a standard of 2%. Repetition of images that occurs in radiology installations often exceeds the permitted limit, so it is necessary to identify the factors causing radiograph repetitions to minimize losses.

Repeat analysis is a systematic process for listing repeated images and determining the cause of the repeats so that the repeats can be minimized or even eliminated, resulting in a lower dose to the patient. It can be said that repeat analysis is performed before the radiograph printing process (Papp, 2011).

Research by Artitin (2020), entitled "Analysis of Radiograph Repeats in the Radiology Unit of Mohamad Nasir Solok Regional General Hospital" shows that the biggest factors causing repeats are patient positioning errors and patient movement. The results with a percentage of 2.96% exceed the standard set by the Decree of the Minister of Health of the Republic of Indonesia Number 129/Menkes/SK/II/2008, which is less than 2%.

The causes of repeat radiographs can vary greatly. According to Papp, (2015) the causal factors in repeating panoramic radiographs are patient movement, artifacts, errors in patient positioning, overexposure, underexposure and equipment errors. Based on observations during field work practice (PKL) at Padang Pariaman Regional General Hospital, repeat panoramic radiographs often occur. Because if errors often occur in taking radiographs, it will be detrimental to the hospital and the radiation dose received by patients will increase due to the repeated photos taken. By conducting an in-depth analysis of the factors causing repeat radiographs at Padang Pariaman Regional General Hospital, we attempt to identify solutions that can improve service efficiency and the quality of radiological examination results.

Based on fieldwork experience at Padang Pariaman Regional General Hospital, researchers frequently encountered repetitions of panoramic examinations, which could disrupt quality assurance services at the radiology facility. This repetition was often caused by patient movement, particularly due to the frequent presence of children undergoing panoramic examinations at the facility.

This study aims to determine the percentage of repeat panoramic radiographs, whether it is still within the standard limits set by the Ministry of Health, and to identify the factors causing this repeat.

2. METHODS

The type of research for this Scientific Paper is to use a descriptive quantitative method by conducting field observations and literature studies. The location of this Scientific Paper research will be conducted at the Radiology Installation of Padang Pariaman Regional General Hospital. The data collection time will be carried out in September 2025. The population in this study is all panoramic examinations during the last 3 months, namely in July-September 2025, the number of patients was 264 people. The sample used in this study is all patient data who experienced repeat panoramic examinations during the last 3 months. The collected data is then calculated systematically to calculate the percentage of repeat panoramic photo examinations using the formula:

$$\text{Jumlah Pengulangan pemeriksaan} / \text{Jumlah total pemeriksaan} \times 100$$

Meanwhile, to find out the percentage of the largest factors that cause repetition of panoramic photos in the Radiology Installation of Padang Pariaman Regional Hospital, the method is to calculate the repetition rate for each category using the following formula:

$$\text{Jumlah pengulangan berdasarkan kategori} / \text{Jumlah total pemeriksaan} \times 100$$

Data analysis in this study was conducted by grouping the causes of repeated panoramic photos, to determine the biggest factors that cause repeated panoramic photos, based on the data that has been processed and the known percentage of repetition. If the repetition is 2% then it is still within the permissible limits according to KMK No. 129/Menkes/SK/11/2008, whereas, if the repetition is > 2% then further study is needed.

3. RESULTS

Table 1. Percentage of Irradiation Each Month

Month	Number of Exposures	Number of Repetitions	Percentage
July	74	2	2.70%
August	90	2	2.22%
September	100	3	3%

B. The percentage result of repeated irradiation is divided by each month.

- 1) July: $2/74 \times 100\% = 2.70\%$
- 2) August: $2/90 \times 100\% = 2.22\%$
- 3) September: $3/100 \times 100\% = 3\%$

Table 1 presents the percentage of repeated irradiation during the observation period from July to September. The total number of irradiation exposures increased each month, from 74 exposures in July to 90 exposures in August and 100 exposures in September. During the same period, the number of repeated irradiations was two cases in July, two cases in August, and three cases in September.

The percentage of repeated irradiation was calculated by dividing the number of repeated irradiations by the total number of exposures in each month and multiplying the result by 100. Based on these calculations, July recorded a repeated irradiation rate of 2.70%, August showed the lowest rate at 2.22%, and September recorded the highest rate at 3.00%.

Although the number of repeated irradiations remained relatively low throughout the observation period, a slight increase was observed in September compared with the previous months. Overall, the repeated irradiation rate remained below 3% in July and August and reached 3% in September, indicating that repeated irradiation occurred infrequently during the study period.

C. The results obtained are based on the repetition factor

Table 2. Percentage of Causes of Repeated Irradiation

Causative factor	Number of Repeats	Percentage
Patient Movement Factors	1	14%
Artifact Factor	3	42%
Patient Positioning Factors	2	28%
Overexposure factor	0	0%
Under exposure factor	0	0%
Tool Error Factor	1	14%

[Figure 1: Histogram of the percentage of repeat factors per category from July-September 2025 — Patient Movement 14%, Artifact 42%, Patient Positioning 28%, Overexposure 0%, Underexposure 0%, Tool Error 14%]/ The results of repeat radiographs for the period July to September 2025, namely: $7/264 \times 100\% = 2.65\%$

4. DISCUSSION

4.1. Analysis of Radiograph Repeat Rates from July to September 2025

The findings of this study indicate that the overall radiograph repeat rate at the Radiology Installation of Padang Pariaman Regional General Hospital during the July–September 2025 observation period was 2.65%. This percentage was calculated from 7 repeated examinations out of a total of 264 radiographic examinations performed during the three-month period. Monthly analysis showed that the repeat rate fluctuated slightly, with 2.70% in July (2 repeats out of 74 examinations), 2.22% in August (2 repeats out of 90 examinations), and 3.00% in September (3 repeats out of 100 examinations).

Although the monthly variations were relatively small, the repeat rate consistently remained above the quality standard established by the Indonesian Ministry of Health Regulation No. 129/Menkes/SK/II/2008, which recommends that radiographic repeat rates should remain below 2% within a three-month evaluation period. The findings therefore suggest that the radiology installation has not yet achieved the expected quality indicator for minimizing repeat examinations.

Repeated radiographic examinations are an important quality assurance indicator because they increase patient exposure to ionizing radiation, reduce workflow efficiency, and consume additional hospital resources. Consequently, maintaining repeat rates within the recommended standard is essential for ensuring patient safety while improving the effectiveness of radiology services.

4.2. Factors Contributing to Radiograph Repeats

The analysis of the causes of repeated radiographs identified several contributing factors, with artifacts representing the most dominant cause, accounting for 42% of all repeat examinations. Artifact-related repetitions generally occurred because foreign objects remained within the imaging field during examination, indicating that patient preparation and communication before image acquisition were not always performed effectively. In several cases, limited patient cooperation also contributed to the presence of artifacts that compromised image quality.

The second most frequent cause was patient positioning, which accounted for 28% of repeated examinations. These cases occurred when the anatomical structures required for diagnostic evaluation were not optimally captured due to inaccurate patient positioning. Proper positioning is essential in dental radiography because even minor deviations can result

in incomplete visualization of anatomical structures, making the images unsuitable for diagnostic interpretation.

Patient movement contributed 14% of repeat examinations. This factor occurred when patients were unable to remain still throughout the exposure, producing blurred images that failed to meet diagnostic quality requirements. Effective communication before image acquisition and clear instructions regarding the need to remain motionless may help reduce movement-related repeats, particularly among patients who experience discomfort or anxiety during the examination.

Another contributing factor was equipment error, which also accounted for 14% of repeat examinations. In this study, equipment-related repetition occurred when technical problems affected the digital imaging process, resulting in blank or completely white images after scanning. Although equipment failures occurred less frequently than procedural factors, regular equipment maintenance and quality control remain necessary to minimize technical interruptions.

Interestingly, no repeated examinations were attributed to overexposure or underexposure during the study period. This finding suggests that exposure parameters were generally selected appropriately by radiology personnel, indicating satisfactory performance in determining radiation settings for dental radiographic examinations.

Overall, the distribution of repeat factors demonstrates that technical and procedural issues, particularly artifacts and patient positioning, were the primary contributors to repeated radiographs at Padang Pariaman Regional General Hospital. These findings highlight the importance of strengthening patient preparation procedures, improving communication between radiographers and patients, reinforcing positioning techniques through continuous professional training, and implementing routine quality assurance measures to reduce unnecessary repeat examinations and enhance the quality of radiology services.

5. CONCLUSION

This study found that the overall radiograph repeat rate at the Radiology Installation of Padang Pariaman Regional General Hospital during the July–September 2025 observation period was 2.65%, based on 7 repeated examinations out of 264 total radiographic examinations. This repeat rate exceeded the quality indicator established by the Indonesian Ministry of Health Regulation No. 129/Menkes/SK/II/2008, which recommends that radiograph repeat rates should remain below 2% over a three-month evaluation period.

The analysis of the contributing factors revealed that artifacts were the leading cause of repeated examinations, accounting for 42% of all repeat cases. Patient positioning errors represented the second most common cause (28%), while patient movement and equipment-related errors each contributed 14%. No repeat examinations were associated with overexposure or underexposure during the study period.

Overall, the findings indicate that technical and procedural factors, particularly artifacts and positioning errors, remain the primary contributors to repeated radiographs, highlighting the need for continuous quality improvement within the radiology service.

6. RECOMMENDATIONS

To reduce unnecessary radiograph repeats, radiology personnel should strengthen adherence to standard operating procedures throughout the examination process. Greater attention should be given to patient preparation, appropriate cassette selection, accurate patient positioning, and the selection of suitable exposure parameters. Clear and effective communication should also be provided to ensure that patients understand and follow examination instructions, particularly the importance of remaining still during image acquisition. Finally, radiographers should perform a final verification of object positioning and

imaging boundaries before exposure to ensure that the resulting radiograph meets diagnostic quality standards while minimizing unnecessary radiation exposure.

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