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STUDY OF THE REASONS OF THE RADIOGRAPHIC IMAGES REPETITION IN SISTAN AND BALUCHESTAN'S TREATMENT CENTERS

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ABSTRACT

Background and Objective: the repetition of radiographic images causes increased dose of the patients and personnel, reduced life of the equipment and wasting the national capitals away. By identifying the percentage of the repetition of radiographic images and the factors associated with it, we can significantly make help to reducing the dose of patients, increase the useful life of the equipment, increase the efficiency of personnel, reduce the dose of personnel and make economy in national costs.

Materials and Methods: in this descriptive study, the radiographic images had been collected for 3 months from nine governmental hospitals in the province of Sistan and Baluchestan and also the reasons why the radiographic images were not accepted by the experts resident in that center was studied. In this study, the reasons of the repetition of radiographic images were studied as follows: error in exposure conditions, error in positioning the patient, lack of adoption between radiation center and cast center, inappropriate choosing of the film size, movement of the patient, the error resulted from radiography equipment, error in the process of fixation and emergence, lack of appropriate choosing of the radiation point on the limb and other cases. **Findings:** Of the 34287 films used in nine treatment center, 4434 films were repeated and the overall percentages of the repetition of radiographic images were 12.9% which the maximum percentage of the repetition of radiographic images was in Amiralmomenin Hospital in Zabol (26.9%) and the minimum percentage was related to Nabiakram Hospital in Zahedan (6.7%). Of the factors related to the repetition of radiographic images, the maximum percentage of repetition was related to the high radiation condition (3.22%) and the minimum amount was related to inappropriate choosing of the film size (0.21%). The percentage of other factors comprised of choosing the radiation condition (2.38%), error in radiation center (1.88%), error in equipment performance (0.61%), error in the patient's positioning (0.61%), movement of the patient (0.33%), darkroom (1.57%) and other factors (2.08%).

Conclusion : The percentage of the repetition of radiographic images in governmental hospitals in Sistan and Baluchestan province are in acceptable level in comparison with the statistics issued in other centers, the percentage of the repetition of radiographic images can be significantly reduced and the national capitals can be prevented to be wasted away through taking the measures such as regular quality control of X-ray equipments , training the less experienced personnel and designing the methods of appropriate choosing of radiation condition.

Keywords: radiography, film, darkroom, radiation condition, radiographic images, Sistan and Baluchestan

INTRODUCTION

Due to the fact that X-ray is frequently applied to diagnose diseases and to reduce the patient's dose and prevent from wasting the national capitals away, studying the amount and factors resulted in the repetition of radiographic images are an unavoidable necessity so that inappropriate using of X-ray generators causes the over-exposure of patients and personnel in radiology department which is contrary to the ALARA (As Low As Reasonably Achievable) principle (1).

On the other hand, the repetition of radiographic images causes increased amount of time in giving services to patients, the patient's dissatisfaction, reduced useful life of the equipment and wasting the national capitals away.

Therefore, the factors which are led to the repetition of radiographic images in treatment centers should be taken into consideration and the re-exposure of the patient should be prevented as much as possible.

The significant factors of the repetition radiographic images are as follows: the inappropriate radiation factors, the error in the apparatus's performance, movement of the patient, error in the film size, lack of adoption of the radiation center and cast center, lack of appropriate adoption of radiation point on the limb, etc. (2,3). It has been attempted in this study that the amount of the repetition of radiographic images are taken into consideration as well as the most significant factors affecting on the repetition of images be identified in order to the appropriate guidelines be presented to reduce the repetition of radiographic images, and

consequently reduce the costs imposed on the treatment center.

MATERIALS AND METHODS

In this descriptive design, the radiographic images were collected for three months and have been studied by observation as such as according to the overall number of the accepted patients and the number of applied films, repetition fraction was calculated according to the equation below:

$$R_i = A_i / (A_i + B_i)$$

Which in this equation:

R_i : fraction of repetition in radiographic center

A_i : total number of repeated films

B_i : total number of accepted films

In the next stage, to determine the factors related to the repetition of radiographic images, the form of data collection was designed and some of the most common factors in the repetition of radiographic images have been written down as below:

- 1- Error in radiation condition which is led to creating a complete dark or white image and this error can be investigated having seen the image.
- 2- Error in patient's positioning which can be investigated by observing the image with asymmetrical zooming or lack of complete seeing of the concerned limb.
- 3- Lack of appropriate choosing of the radiation point on the limb and lack of adoption of radiation center with cast center which this error can be investigated with seeing the image.
- 4- Inappropriate choosing of the film size.
- 5- Patient movement, which this error causes the fading and lack of clarity of the image
- 6- Error resulted from the equipment which can be investigated by studying an image with two projections in a film and seeing the image of the patient in the experiments which several radiography are performed to follow up the performance of the limb.

7- The changes in the appearance of the image in darkroom which this error can be studied by observing the image, because it can be clearly seen by inappropriate washing of the film or dislodging the film's emulsion due to the roller's failure.

8- Other factors which can be involved such as artifact, error in performing the demanded radiography, etc.

In the next stage radiographic images are investigated by the experts in radiology in each hospital and will be involved in the special form according to the above definition. Finally, after complete the related forms, the repetition of

radiography images, absolute frequency, relative frequency and frequency percentage for the factors related with according to the mentioned cases are determined and the objectives of the plan have been realized.

FINDINGS AND DISCUSSION

During performing this design, 34287 films were used in the concerned hospital. Table 1 shows the percentage of repetition of radiographic images in the concerned hospitals.

Table (1): the percentage of repetition radiographic images in the governmental hospitals of Sistan and Baluchestan province

Hospital name	percentage of repetition films in radiographic centers
Aliebnabitateb of zahedan	11.8
Boali of zahedan	14.3
Nabiakram of zahedan	6.7
Taminejtemai of zahedan	14.3
Amiralmomenin of zabol	26.9
Imamkhomeyni of zabol	12.6
Khatam of iranshahr	11.8
Iran of iranshahr	15.2
Imamali of chabahar	7.2

The results achieved in this study indicate that the overall percentage of the repetition films is 12.9%. The contribution of the percentage of each factors resulted in the repetition for the regarded nine hospitals has been shown in table 2.

Table (2): the number (percentage) of the repeated images based on the factors resulted in repetition in governmental hospitals of Sistan and Baluchestan Province

Factors resulted the repetition radiographic images	High radiation condition	low radiation condition	Film size	Patient positioning	Processor and darkroom	Radiation center	Patient movement	Error of equipment performance	Other cases
repetition Number (percentage)	1105 (3.22)	827 (2.38)	71 (0.21)	208 (0.61)	540 (1.57)	645 (1.88)	114 (0.33)	209 (0.61)	715 (2.08)

Due to the fact that the range of the percentage of radiography images repetition in several studies has been indicated between 0.9% to 27.6% (4-9), it can be said that the percentage of the repetition in governmental hospitals of Sistan and Baluchestan province are in an acceptable range. This study indicated that high radiation condition and inappropriate choosing of film size are the most and least possible causes for repetition, respectively. Amiralmomentin hospital of zabol and Nabi -Akram Hospital of Zahedan have the most and least percentage of repetition, respectively.

In the studies performed by Nixon (7) and Morgan (9), error in positioning has been indicated as the most significant cause in the repetition of radiographic images, while in the current study, patient positioning and performance error of the equipment are both in sixth grade.

The admission statistics in Imamhomeyni of Zabol and Khatam of iranshahr Hospitals are higher than other treatment centers and due to the high lifetime of the equipment of Zabol's Imamhomeyni Hospital, providing a new equipment for this hospital is necessary. On the other hand, inappropriate filtration of the equipment in Taminejtemai Hospital of Zahedan causes the percentage of the repetition of radiography images is high in this center. Therefore, the filtration function of this equipment should be corrected. Finally, due to the results obtained in this study, the following measures can be effective in reducing the repetition of radiographic images in governmental hospitals of Sistan and Baluchestan Hospitals:

Providing the auxiliary equipment to make limit the regarded limb of the patient, proving the special charts of choosing the radiation condition for the employees who are less experienced, replacing some of the radiography equipments, regular quality control of the equipments and the processors and continuous training of the personnel.

The Amiralmomentin Hospital of Zabol also have a high percentage of exposure repetition which talking with the patients before being exposed and the precision of radiologists are necessary to improve the condition.

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