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Study of the status of access to the information and quality improvement in radiology department of the five teaching hospitals

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ABSTRACT

Introduction: The aim of this study was to determine the status of quantitative and qualitative control of X-ray exposure in the radiology departments of the teaching hospitals of Urmia University of Medical Sciences.

Materials and Methods: This study was a mixed method study that was conducted in 5teaching hospitals on 2017.Data collection was done by structural interviewing with the department staff and study of their submitted documentations.

Results: From27 devices in the radiology units in teaching hospitals of the University, five was digital devices. The number of analog portable devices was 15, of which 3 were out of the date. The average rate of repeated (or rejected) images to all exposures in hospital No-2 was 0.093 and 0.11, respectively. The percentage of exposure elimination to the total exposure in hospital No-3 was 0.073.In hospital No-1 and No-4, the access to user information was not possible due to the lack of prediction in the software system of radiological devices.

Conclusion: By adopting appropriate quality control system, the rates of the safety of patients and staff can be increased.

Keywords: Radiography, Repeated images, Rejected images, Quality control

1. INTRODUCTION

Today, medical imaging is one of the most important diagnostic methods in medical sciences and plays a major role in detecting 70% of the diseases [1-3] and provides accurate information for diagnosis and treatment of patients to clinicians [4, 5]. This information is considered as a source of evidence in clinical decision making which have high accuracy [5, 6]. On the other hand, the emergence of digital imaging has revolutionized radiography. This innovation is the result of changing technology in the process of obtaining image and creating computerized software systems for image retrieval and the transfer [7-9]. The quality of digital images is better than analogue and provide the possibility to archive and transfer images from the radiology center to other clinical wards in any situation. Digital imaging is now more cost effective and efficient than its analog counterpart [8, 10, and 11]. While the percentage of repetitions of digital imaging by radiographs has dropped to 3-5% but in analog technology it was 15-10% [12].

Although the use of medical radiology devices has increased with the use of digital technology, however, the quality control of devices and the safety of patients and medical imaging staff is essential and cannot be ignored [13-15].Also, quality control is important in economic terms to control the health care costs [16-18]. Therefore, radiological images should have high quality and staff should be more careful to avoid the repetition of exposure of patients and have received adequate training. In other words, the quality control of radiological devices should be taken into account in the whole process of producing radiological images [19].

Furthermore, although the discovery of X-rays was very useful and has increasingly been used for diagnostic purposes but it also has adverse effects. Certainly, these effects will increase with higher rate of exposure and dose rates and will have serious risks for both the patient and the radiology staff [20, 21]. These undesirable effects seem to be the result of a defect in the medical imaging process and the greatest degree of defect affecting in processes is due to the defect or weakness of the infrastructure and inadequate training for employees [15, 22, 23]. It should also be noted that distance, time, and protection are factors that influence the risk of exposure. Training and awareness of the radiology department staff can have a direct impact on the increase and decrease of harmful effects of X-rays [24-26].

One of the concerns of the community and the World Health Organization is the issue of repeated radiographs. Also, one of the indicators for controlling the quality of radiographic process, especially in developing countries, is the repetition and rejection of radiographic images. Pierre et al. reported duplicate graphs of 27 percent [14]. In fact; the quality of the images depends on the technical factors associated with the staff and the equipment and factors associated with the patients. Inappropriate use, inadequate knowledge, inaccuracies in patient positioning, lack of attention to safety and quality control, and inappropriate design of computer software in radiography are important factors in the repetition and rejection of films or radiographic images [4, 18, 19, 27 -29].

In 1982, the World Health Organization reiterated the repetition and rejection of radiological images as an indicator for assessing quality control in diagnostic radiology [27]. Also, the repeat rate (RR) of images is considered as a measure of exposure protection and training of radiology technicians [30].

Despite the fact that the emergence of digital imaging evolved radiography and the quality of digital images is far better and more affordable and efficient than its analog counterpart, but during the analogue radiography device era, rejected films were easily collected and analyzed from garbage bins, while in digital radiography, calculating and estimating RR has become more difficult;

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because the exposure emitted by staff in the radiology department considered unacceptable can easily be removed and in many cases it may never be transmitted to the archive of images in order to store the information resulted by them. This issue is also present in a number of teaching hospitals in Urmia University of Medical Sciences and it seems that the causes of such errors should be addressed by the radiology department staff and rejected exposures in radiology devices are analyzed. Identifying these issues will be effective in reducing the repetition of radiographic images and improving the safety of staff and patients. Therefore, the purpose of this study was to determine the performance of users regarding the repeated or rejected rate of radiographic exposure to X-rays, and possibility to the software management intervention through the support companies of radiology devices with the aim of improving the radiography process.

2. MATERIAL AND METHODS

This study is a mixed method research which was conducted in 5 educational hospitals from February to July 2017.In the qualitative phase of this research, the status of the radiology departments of the selected hospitals was examined for the accessibility and analyzes of exposures taken by users of radiography devices. Also, using the action research method, we tried to improve the quality management process of medical imaging by digital and analog devices. After an initial situation analysis, according to the current situation, information about the percentage of repeat or rejection of radiographic images was collected. In the third step, the management suite of radiology departments was given feedback to make changes to improve current processes and in the fourth part, in order to train the staff of the radiology department, considering the identified status and the improvement of software system with the help of the support companies and medical equipment office of the university and the hospital, planning was conducted. In the fifth step, interventions were carried out according to the specific circumstances of each hospital and staff (Fig 1).

Figure 1 Steps to improve quality of imaging

1) Coordination the digital systems with HIS(as much as possible)
2) DR support companies were contacted through the director of the radiology department of the hospital and also by the head of the office. Possible changes to install or activate the related software were done.
3) In the case of collecting defective or rejected graphs, analogue devices, a few collection boxes for this purpose were installed in the radiology unit of specialized clinics and inside the department.
4) It was suggested that software facilities, including access to user performance, should be duly taken into account in the purchase of equipment for digital radiographs.
5) Using user-specific password to turning on the systems

The research environment consisted of 5 teaching hospitals that, the names of the hospitals kept confidential and are shown in code form. Sampling method was census-based and the sample size includes the staff of the radiology departments and the medical equipment experts of the mentioned centers. Data collection was done using the data collection form and, an interview with staff in the radiology departments was completed by examining the available documents. Data analysis was done using SPSS-22 software.

This study is a result of a research project approved by Urmia University of Medical Sciences and the agreement and consent of the hospitals to participate in the research was that the participation was optional and in keeping with the confidentiality of information from the results of the study, the names of the hospitals were reported in the form of codes.

3. RESULTS

The characteristics of the teaching hospitals were identified in the table 1. The results of the study showed that there was 27 radiology units in the teaching hospitals that, there were 5 digital devices and 7 fixed analog devices, 2 of which are outdated. The total number of portable analogue devices was 15, of which 3 were outdated, that's how the number of active radiology units was 22.The average life of analog and digital radiology devices was 13.6 years and 3 years respectively (Table 2).

Table 3 showed the lifetime of radiology devices in the hospitals. The greatest lifetime of the radiology device was for hospitals hospital No-2, 3 and5 (25 years).The shortest lifetime of the radiology device was a portable device related to the hospital No-3.Specifications relating to device names and the lifetime of radiology devices have been presented in Table 3.

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Table 1 Specifications of Teaching hospitals of Urmia University of Medical Sciences

Name of The Center	Number of Beds	Names of Devices	Hospital Wards
Hospital No-1	488	Analog Phillips Analog Shimadzu Fixed Digital DRMehranTeb Fixed Digital DRPayaTeb Shimadzu Portable Siemens Portable	Neurosurgical internal-Neurosurgical Surgery - General Surgery-Thoracic Surgery – Ear, nose and throat -Orthopedic-Digestive-Blood-Endocrine-Rheumatology-Kidney-Anatomy-Clutter-Eye-Emergency-ICU
Hospital No-2	330	Digital Radiological DDR Sed Cal ODEL Fixed Analogue Device VARIAN Fixed Analogue Device Shimadzu Portable Device General Portable Device Phillips Portable Device	Specialized pediatric wards- gynecology specialist-Genetics-CCU-ICU-NICU- Pediatric emergency surgery
Hospital No-3	220	DaVinci Digital DDR Device Toshiba FixedAnalogue Shimadzu Portable Phillips Portable	Skin-Internal-Infectious-Heart-Poisoning-CCU-ICU- Emergency
Hospital No-4	153	Fixed Digital Shimadzu CR Shimadzu Portable	ICU-CCU- Cardiac surgery-Heart-Emergency Surgery
Hospital No-5	100	Shimadzu Portable Device	Different parts of psychiatry
Total	1291		-

Table 2 Radiological devices in educational and medical centers (hospitals) of Urmia

Total available radiology devices	Digital number		Fixed Analog		Portable Analog		Average life of analogues	Average life of portables
27	CR	DR،DDR	active	outdated	active	outdated	13.6 years	3 years
	1	4	5	2	12	3		

The results also showed that the number of users of radiology devices was 103 that, this number was 40, 29, 19, 14, and 1 respectively for the hospital No-1, hospital No-2, hospital No-3, hospital No-4 and hospital No-5 hospitals. In all hospitals, besides the hospital No-5, students were active as well.

At the beginning there was no documentation regarding the system of the rate of the imaging waste in the departments. After our initial interventions, the number of exposures and the number of rejections in the last 6 months were extracted as follows (Table 4).The average percentage of repeated images to the total exposure produced by the digital and analogue radiology devices is 0.093 and 0.106, respectively.

Regarding the definition and use of dedicated passwords for each user, this readiness was not possible in all hospitals but two, due to the presence of just one radiology device, a high number of users, and the timing of entering and leaving the monitor screen, and, on the other hand, the likelihood of users resisting and the department manager controls the performance of users using special markers and the history of performing graphs. In hospital No-3 hospital, 6 active radiology devices (fixed and portable) have 5 active devices and one inactive device (Table 4). The prevailing graphs required by the center are made only using Davinci digital device.

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Table 3 Information from digital and analogue radiology devices at the hospital No-2 Training Center

device type	Month	February 2017	March 2017	April 2017	May 2017	June 2017	July 2017	total
DDR digital radiology device	Total Exposures	988	242	1134	1050	1032	1067	5513
	Number of repetitions	125	21	94	96	85	88	509
	Percentage of repeats to total exposures	0.13	0.09	0.08	0.09	0.08	0.08	0.093
Fixed analog radiology devices	Total Exposures	820	853	933	851	812	921	5190
	Number of waste	74	92	110	98	91	86	551
	Waste percentage to total exposures	0.09	0.11	0.12	0.11	0.11	0.09	0.106

Table 4 Information resulted from digital radiology devices at the hospital No-3 educational center

Time period	Exposure	Patient	Deleted	Printed	Percentage of deleted to total exposures
July 13-July22	1188	562	44	1185	0.037
July23-Aug22	3749	1825	127	3744	0.034
Aug23-Sep5	1582	775	65	1577	0.041
Total	6519	3162	236	6506	0.037

It's worth noting that, following an emphasis on the need to access user information, the department's management suite has put more emphasis on training users, especially students, on the agenda.

4. DISCUSSION

Considering the increasing use of X-rays in diagnosis of diseases, in order to improve the efficiency of available resources and to reduce costs, it is inevitable to examine the extent and the factors for the repetition of radiographic images. Improper use of X-rays leads to over-exposure of patients and radiology personnel, which is in contradiction to the ALARA (As low As Reasonably Achievable) principle. The principle of ALARA means that the design and use of sources and their effects should be such that, the ir-exposure guarantees the lowest reasonable effect [26-28, 31]. It is also worth noting that the repetition of radiography imposes depletion of devices and reduces their useful life, increases patient service time, congestion of radiology departments, and dissatisfaction of clients. In numerous articles, various cases have been introduced as factors leading to repeated radiographic images. These factors include inaccurate exposure factors, inappropriate X-ray technique, X-ray defect, defect in the process of emergence and confirmation, and lack of patient collaboration [13, 28, 30-32].

The rate of repetition in the current study in hospital No-2 hospital was 9.3% in digital radiography and 10.6% in analog radiography, and in the hospital No-3 the repeat rate was 3.7% in digital radiography. It seems in addition to a good imaging system in hospital NO: 3 our interventions had better outcome. Meanwhile with our initial interventions the rate of the repeat or rejection was comparable with more developed centers, but the re-evaluation is necessary to reduce current barrier like busy departments with multiple user. I n addition documentation of analog systems should be continue.

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In various studies, the repeat rate of radiography imaging has been reported to be 2-27.6% [32-35].According to studies conducted in Iran, this rate has been expressed in 4.03% -14.7% [18, 28, 29, 31, 36]. According to the estimates made in England in 1999, the percentage of repetitions of graphs was 10% and the most common reason for repeated graphs is poor patient status [21]. Also, according to estimates in Saudi Arabia, the financial loss resulting from repetitive radiography types of government hospitals in the country is reported to be about 1.82 million dollars annually [34]. Also, the results of the study by Feintelman et al. showed that, their educational and technical intervention at the Massachusetts Hospital in the United States has reduced the repeat rate of radiography images [10].

AsgharZadeh and Mohseni (2003) in Kashan hospitals examined 6438 radiographies that, the number of repetitive radiographs was 317, accounting for 4.9% of the total [31]. The results of Jabari et al. (2011) showed that, the most common cause of repeat was the risk of exposure (54%) and poor patient status (18%) [37]. Elahi Far et al. (2014) examined a total of 24392 radiography by studying radiological centers of Zahedan University of Medical Sciences that, the frequency of radiography images was 1241. The repeat rate in three hospitals was 5.9% [18]. Hagh Parast et al. [2012] in their study estimated the percentage of repetitive graphs 7.5 [3].

Inaddition Al-Maliki et al.'s (2002) study in Jeddah hospitals (Fahad royal hospital, Abdul Aziz hospital and Obstetrics and Gynecology Hospital) in Saudi Arabia showed that, the repeat rate of radiography images was a total of 7.93% [34]. In the study of Neul et al. (2006), the repeat rate of analogue radiology device is 10.5% and for digital radiology 4.7% is estimated [11]. In 2008, a study was conducted in Nigeria to investigate the repetition of radiography images. Of the 15059 films used in the study period, 1338 films (8.86%) were rejected and wasted [38]. Zang et al. (2012) in Taiwan studying repeat rate of images in digital radiography in 249215 cases of radiography annually that, in this study, they identified 13 errors as the cause of repeated radiography images and the highest repeat percentage was due to screen problems (35.59%), computer problems (26.39%), and X-rays problems (17.95%) [39]. In 2012, a study was conducted by Fintelmanet al. at the Massachusetts General Hospital of the United States in the Emergency Department. The repeat rate of digital radiography images was 3.6% for a portable device and 13.13% for a fixed device. Using educational and technical interventions, the repeat rate of images decreased from 3.6% for portable devices to 1.8% and for fixed devices from 13.3% to 8.2% [10]. Vanboth et al. (2017) conducted a study at Jos University Teaching Hospital and out of a total of 16184 survey films from January to December 2015, 1185 cases were rejected and were not accepted [40].

5. RECOMMENDATIONS AND CONCLUSION

1) According to the policies of the Ministry of Health and Medical Education and the WHO, which has prohibited the production of radiography films due to pollutants since 2010, it is suggested that hospital centers are accelerating the transition of analogue devices to digital devices. Increasing problems with radiology films - Cutting films - Lack of comprehensive access to user functionality - Failure to coordinate with hospital HIS systems and connection to PACS system - Long time to remove the stereotype– Burnout and the impossibility of standard calibration and the problems of supplying parts, especially the analogue tubes, are of the reasons for the replacement of digital devices.
2) To train modern radiology techniques for personnel and radiology users periodically by faculty members, transfer internal experiences and provide feedback from training sessions to the teaching authorities and supervisors of the centers in order to monitor user performance.
3) Consulting with experts who are experienced in radiology and targeting with the participation of internal stakeholders to purchase radiology equipment.
4) The necessity of continuing education of general practitioners in order to become more familiar with the angles of exposure and types of radiography applications.
5) Up-to-date training for users and authorities of the radiology units in order to gain access to the facilities of software and hardware and to reduce the restrictions imposed by the companies.
6) The intra-department relationship of radiography users and physicians as an advisor to select the appropriate graphic representation and reduce unnecessary graphs.
7) A review with the monitoring of the policy of affiliated financial payments relative to the number of radiographic requests
8) The necessity of designing the replacement process of analog radiography with a variety of digital (preferably DDR) types and defining priority criteria for educational and therapeutic centers
9) Performing periodic and regular quality control in relation to radiology devices, especially analogue types with a high life expectancy
10) Disposal of worn-out devices in technical ways to protect patients

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11) To justify users to put enough time with the patients to properly place them with the aim of reducing the patient's repeat exposure and safety
12) Purchase and installation of the second device with the purpose of replacing in the event of failure of the first machine
13) Modifying the HIS Hospital system to allow access to the total number of exposures of each device separately.
14) Failure to cut the film in order to make it possible to compare the number of repetitive graphs with the total exposure
15) Establishment of the PACS system and the software and the interface between the hospital HIS system and the PACS system with the connection system to other centers simultaneously with the replacement of analog radiology devices with digital types

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

ETHICAL CODE

This study was ethically approved and financially supported by the Urmia University of Medical Sciences, Iran and the Ethical Committee of Research Department, with the reference number: IR.UMSU.REC.1396.457.

REFERENCE

1. Dunn M, Rogers A. X-ray film reject analysis as a quality indicator. *Radiography*. 1998;4(1):29-31.
2. Özsunar Y, Çetin M, Taskin F, Yücel A, Can S, Argin M, et al. The level of quality of radiology services in Turkey: a sampling analysis. *Diagnostic and Interventional Radiology*. 2006;12(4):166.
3. Haghparast M, Tashnizi MH, Sadeghi S, Karimi T. Radiographic images repeats in Bandar Abbas teaching hospitals, Iran. *Bimonthly Journal of Hormozgan University of Medical Sciences*. 2013;17(2):167-74.
4. Cândido S, Ribeiro LPV, Ribeiro AM, Abrantes AFL, Pinheiro JP, Almeida RPP, et al. Image Quality Control in Digital Radiology. *American Journal of Biomedical Engineering*. 2013;3(6A):8-14.
5. Donnelly LF, Strife JL. Performance-based assessment of radiology faculty: a practical plan to promote improvement and meet JCAHO standards. *American Journal of Roentgenology*. 2005;184(5):1398-401.
6. Marshall N. An examination of automatic exposure control regimes for two digital radiography systems. *Physics in medicine and biology*. 2009;54(15):4645.
7. Irrera P, Bloch I, Delplanque M. A Landmark Detection Approach Applied to Robust Estimation of the Exposure Index in Digital Radiography. *IRBM*. 2017;38(1):42-55.
8. Tucker DM, McEachern M. Quality assurance and quality control of an intensive care unit picture archiving and communication system. *Journal of digital imaging*. 1995;8(4):162-7.
9. Lau S-l, Mak AS-h, Lam W-t, Chau C-k, Lau K-y. Reject analysis: a comparison of conventional film–screen radiography and computed radiography with PACS. *Radiography*. 2004;10(3):183-7.
10. Fintelmann F, Pulli B, Abedi-Tari F, Trombley M, Shore M-T, Shepard J-A, et al. Repeat rates in digital chest radiography and strategies for improvement. *Journal of thoracic imaging*. 2012;27(3):148-5.1
11. Nol J, Isouard G, Mirecki J. Digital repeat analysis; setup and operation. *Journal of digital imaging*. 2006;19(2):159.
12. Waaler D, Hofmann B. Image rejects/retakes—radiographic challenges. *Radiation protection dosimetry*. 2010;139(1-3):375-9.
13. Roohi Shalemaei R. Films reject analysis for conventional radiography in Iranian main hospitals. *Radiation protection dosimetry*. 2011;147(1-2):220-2.
14. Peer S, Peer R, Giacomuzzi S, Jaschke W. Comparative reject analysis in conventional film-screen anddigital storage phosphor radiography. *Radiation protection dosimetry*. 2001;94(1-2):69-71.
15. Colin C, Vergnon P, Guibaud L, Borson O, Pinaudeau D, Du Cray MP, et al. Comparative assessment of digital and analog radiography: diagnostic accuracy, cost analysis and quality of care. *European journal of radiology*. 1998;26(3):226-34.
16. Desai N, Valentino DJ, editors. A software tool for Quality Assurance of Computed/Digital Radiography (CR/DR) systems. Medical Imaging 2011: Physics of Medical Imaging; 2011.
17. Ahmed NA, Suliman II. Quality Assurance and Optimization of Radiation Protection of Patients in X-Ray Radiographic

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Examinations Using the Rejects Film Analysis. *Journal of Radiology and Diagnostic Imaging*. 2013;1(2):60-4.
18. Elahifar MA, Dehghan Monfared GH, Ranjbar Sistani M. Assessment of radiographic film repeats rate and its causes in radiology centers of Zahedan University of medical sciences. *ISMJ*. 2014;17(3):443-50.
19. Mazzaferro RJ, Baiter S, Janower ML. The incidence and causes of repeatedradiographic examinations in a community hospital. *Radiology*. 1974;112(1):71-2.
20. Zewdeneh D, Teferi S, Admassie D. X-ray reject analysis in Tikur Anbessa and Bethzatha Hospitals. *Ethiopian Journal of Health Development*. 2008;22(1):63-7.
21. WeatherburnG, Bryan S, West M. A comparison of image reject rates when using film, hard copy computed radiography and soft copy images on picture archiving and communication systems (PACS) workstations. *The British journal of radiology*. 1999;72(859):653-60.
22. Nkubli B, Nzotta C, Nwobi I, Moi S, Luntsi G, Salisu U, et al. Quality control in radiology units of tertiary healthcare centers in north eastern Nigeria. *Nigerian Journal of Medical Imaging and Radiation Therapy*. 2013;2:26-31.
23. Foos DH, Sehnert WJ, Reiner B, Siegel EL, Segal A, Waldman DL. Digital radiography reject analysis: data collection methodology, results, and recommendations from an in-depth investigation at two hospitals. *Journal of digital imaging*. 2009;22(1):89-98.
24. White SC, Pharoah MJ. Oral Radiology-E-Book: Principles and Interpretation: Elsevier Health Sciences; 2014.
25. Benz C, Mouyen F. Evaluation of the new RadioVisioGraphy system image quality. *Oral surgery, oral medicine, oral pathology*. 1991;72(5):627-31.
26. Radiation UNSCotEoA .Sources and effects of ionizing radiation: sources: United Nations Publications; 2000.
27. Clark P, Hogg P. Reject/repeat analysis and the effect prior film viewing has on a department's reject/repeat rate. *Radiography*. 2003;9(2):127-37.
28. Fallah Mohamadi G. Assessment of radiographic film repeats rate and its related causes within hospitals in Sari during 2008. *Journal of Mazandaran University of Medical Sciences*. 2009;19(71):75-9.
29. Touhidnia M, Dezfoulimanesh Z. Frequency and rate of radiographicsrepeat and it's causes in selected hospitals in Kermanshah. *Journal of Kermanshah university of medical sciences*. 2009;39:424-34.
30. Rasuli B, Pashazadeh AM, Tahmasebi Birgani MJ, Ghorbani M, Naserpour M, Fatahi-Asl J. quality control of conventional radiology devices in selected hospitals of Khuzestan province, Iran. *Iranian Journal of Medical Physics*. 2015;12(2):101-8.
31. Asgharzadeh AA, Mohsei M. Evaluation of repeated radiographic films and its causes in kashan hospitals in 2003. *Feyz Journals of Kashan University of Medical Sciences*. 2005;9(1.(
32. Nixon P, Thorogood J, Holloway J, Smith N. An audit of film reject and repeat rates in a department of dental radiology. *The British journal of radiology*. 1995;68(816):1304-7.
33. Lewentat G, Bohndorf K .Analysis of reject x-ray films as a quality assurance element in diagnostic radiology. *RoFo: Fortschritte auf dem Gebiete der Rontgenstrahlen und der Nuklearmedizin*. 1997;166(5):376-81.
34. Al-Malki M, H. Abulfaraj W, I. Bhuiyan S, A. Kinsara A. A study on radiographic repeat rate data of several hospitals in Jeddah. *Radiation protection dosimetry*. 2003;103(4):323-30.
35. Morgan TL, Banks DA, Kagan AR. Radiation therapy port films: a quality assurance study. *International Journal of Radiation Oncology* Biology* Physics*. 1998;42(1):223-7.
36. Sabzevari S. GHazikhanlou sani K. Evaluation of radiographic repeat rate data and film reject analysis of radiology departments in several hospitals of hamadan university of medical sciences. *Iranian journal of radiology*. 2011;8:79.
37. Jabbari N, Zeinali A, Rahmatnezhad L. Patient dose from radiographic rejects/repeats in radiology centers of Urmia University of Medical Sciences, Iran. *Health*. 2012;4(02):94.
38. Eze K, Omodia N, Okegbunam B, Adewonyi T, Nzotta C .An audit of rejected repeated x-ray films as a quality assurance element in a radiology department. *Nigerian journal of clinical practice*. 2008;11(4)
39. Tzeng W-S, Kuo K-M, Liu C-F, Yao H-C, Chen C-Y, Lin H-W. Managing repeat digital radiography images-a systematic approach and improvement. *Journal of medical systems*. 2012;36(4):2697-704.
40. Jwanbot D, Sirisena U, Akpolile F, Tungtur T, Nkop P. Analysis of Reject Radiographic Films as a Quality Assurance Element in Diagnostic Radiology. 2017.

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