Evaluation of related factors to repeated radiographs in radiology centers of Hamadan hospitals

Hamed Manoochehri Khoshinani, Samira Heidari*

Department of Radiology, Faculty of Paramedicine, Hamadan University of Medical Science, Hamadan, Iran

*Corresponding Author: e-mail address:s.haidary27@gmail.com (S. Heidari)

ABSTRACT

Repeating X-ray radiographs, as a common problem in radiology units, represent additional, non-billable costs due to increased film, chemistry, and equipment use as well as increased personnel time. Furthermore, patients receive additional radiation exposure from repetitions and must remain on the premises until the second exam is completed. Compounding the overt negative financial impact on the department is an increased burden on the waiting room and support staff, and a decrease in service quality. This study was designed to measure the radiograph repeat rate for Beesat and Farshchian hospitals in Hamadan, Iran. In this cross-sectional study the repeat rate was documented over the course of 3 months in Beesat and Farshchian hospitals. Regarding to personnel code, repeat rate were measured weekly for each staff and a questionnaires including sex, age, work experience, education level as well as shift numbers during 3 months were completed for each one. Collected data was analyzed by SPSS#20 using Chi-Squar and two sample T-test. Based on our results. The x-ray repeat rate was 3.8% for both studied hospitals. Repeat rate was also calculated for each hospital which showed 3.6% for Beesat and 5.4% for Farshchian. The highest repeat rate was documented for students and male personnel. The repeat rate for Beesat and Farshchian hospitals were acceptable according to published ones. The highest repeat rate in students and the negative relationship between work experience and the repeat rate suggests the need for close monitoring and more training for new staff especially students.

Keywords: Radiology; Radiographic Image Enhancement; X-Ray Film

INTRODUCTION

Long time has been passed from the first X-ray photograph taken by Roengten, but radiation is still widely used for diagnosis. The use of ionizing radiation like X-ray in the medical field is to an extent which is also called physician's third eye. Accurate diagnosis is the first step to effective treatment. Appropriate positioning of the patient, selection of proper exposure factors and control of film processing conditions are the essential requirements for production of high quality radiographs. These result in a good image quality and precise diagnosis of the resultant image [1]. Radiograph repeat is one of the most common problems in each radiology unit. In addition to receiving more radiation it also cause equipment and chemical use which is followed by imposing additional costs on both department and the patient. Time wasting and patient compliant are also resulted from repeating a radiograph. The importance of the repeat rate is to extent that radiologists are encouraged to assess their own department repeat rates and looking for appropriate ways to decrease it[1,2,3]. The repeat rate has been widely studied and its range has been between 3-15%[4]. A survey by Lewentat et al (1997) showed that repeat rate has been documented 9-13.2% in Germany[5]. In Nigeria, repeat rate was studied during 2002 to 2004 by Eze et al and it was about 8.86 percent [6]. Moreover, al-Maleki(2003) studied repeat rate in several Saudi Arabia new hospitals and reported result was 7.93 percent[7]. Ghorbani et al (1989), is one of the first articles that studied repeat rate in some Tehran hospitals. According to his results repeat rate was 6.12% which impose a billion dollar to the cost of health care [8]. In addition to Tehran, repeat rate was also studied in other cities and the review of their results showed that the lowest and highest repeat rate is 1.1% and 14.7% for Semnan and Ahvaz respectively[2,3]. Repeat rate was also studied in Bandar Abbas, Sari and Kermanshah which was 5.7%, 5.9 % and 6.6% respectively [1,9,10]. Considering all mentioned above, this article was aimed to determine repeat rate in Beesat and Farshchian Hospitals in Hamadan, and study its relationship to some personnel factors like sex, education and shift timing.

MATERIALS AND METHODS

In this cross-sectional study the repeat rate was documented over the course of 3 months in Beesat and Farshchian hospitals. Undesirable radiographs regarding to personnel code and repeat rate were measured weekly for each staff and a questionnaires including sex, age, work experience, education level as well as shift numbers during 3 months were completed for each one. Collected data was analyzed by SPSS 20 using Ch-Squar and two sample T-test. All participants signed an informed consent.

RESULTS

Based on our results, the x-ray repeat rate was 3.8% for both studied hospitals. Repeat rate was also calculated for each hospital which showed 3.6% for Beesat and 5.4% for Farshchian (table 1)**.** Considering the work experience, the highest repeat rate was documented for staffs with less than 5 years (mainly students) and 10-15 years experiences (Figure.1). As shown in figure 2, based on the education level, training students and working students documented the highest repeat rate which was 22.7%, 8% respectively.

The documented repeat rate is shown for male and female staffs in figure 3. As it is illustrated in figure4 the less repeat rate is documented for staffs with the history of highest shift numbers. Table 2 showed repeat rate in 3 working shift; repeat rate is higher in morning (6%) and evening (4%) shifts for Farshchian and Beesat hospitals, respectively.

Table 1. Repetition rate in Beesat and Farshchian hospitals

Hospital	Total of graphy	Number of repeated graphy	Percentage of repeated graphy
Beesat	31032	1133	3.6%
Farshchian	3363	184	5.4%
Total	34395	1317	3.8%

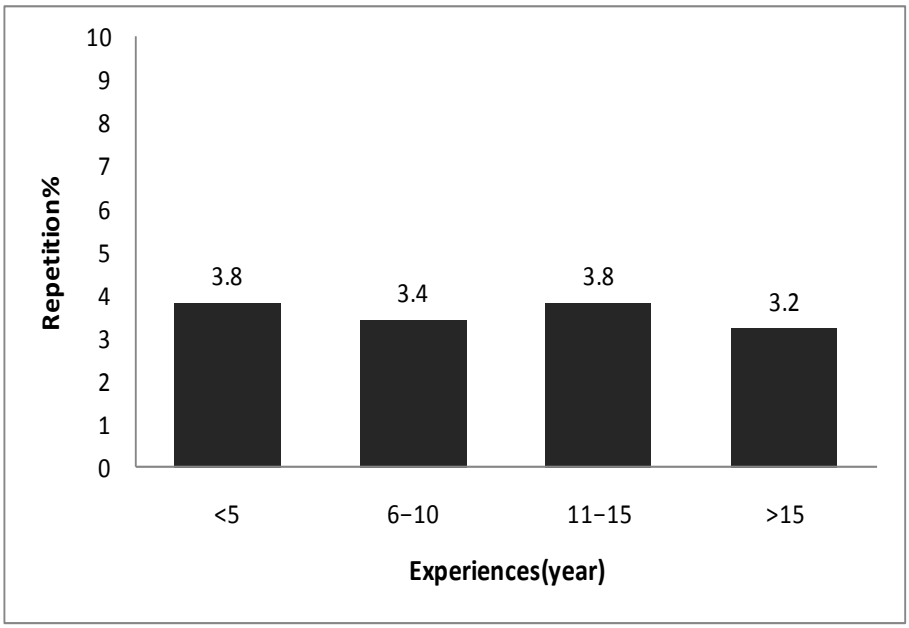

Figure 1. Relationship between repetition and personnel experiences

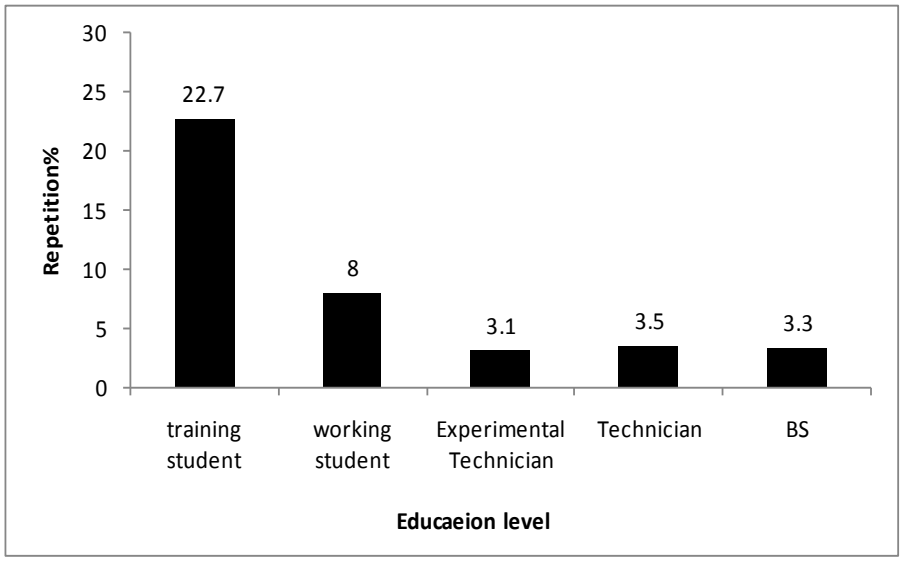

Figure 2. Relationship between repetition and personnel education level

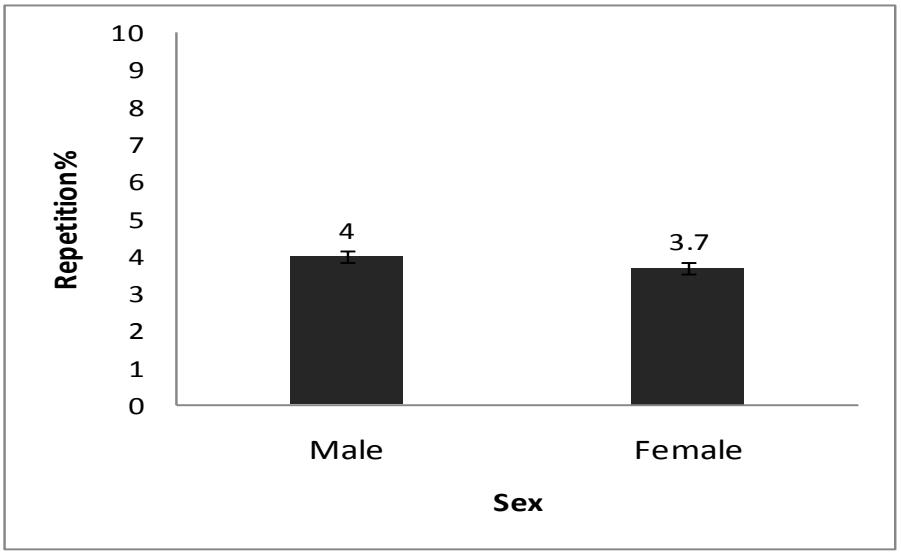

Figure 3. Relationship between repetition and personnel sexuality

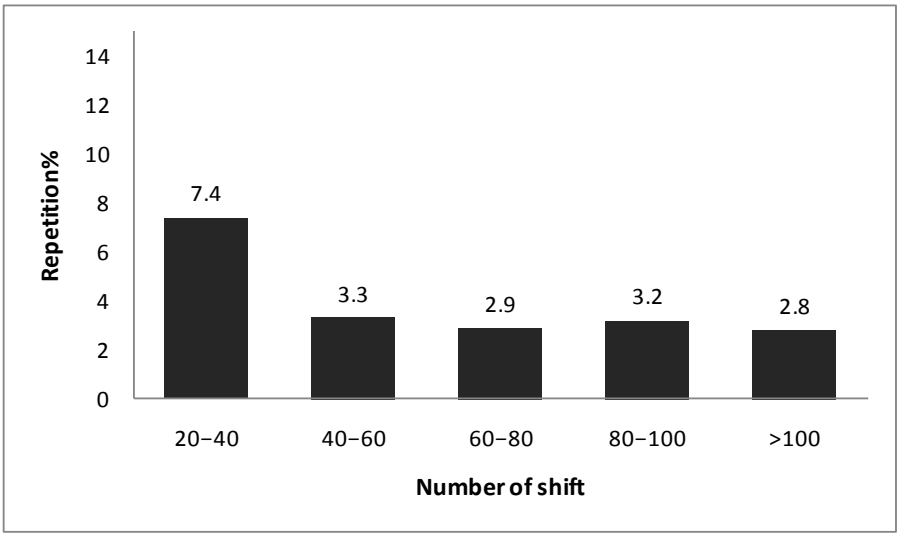

Figure 4. Relationship between repetition and number of shift

Table2. Repetition in tripple shifts in Beesat and Farshchian hospitals

	Beesat			Farshchian		
	Tatal graphy	**Number of repeated graphy**	**Percentage of repeated graphy**	**Tatal graphy**	**Number of repeated graphy**	**Percentage of repeated graphy**
Morning	10862	381	3.5%	1345	85	6%
Evening	12415	499	4%	1177	54	4%
Night	7755	253	3.2%	841	45	5%
Total	31032	1133	3.6%	3363	184	5.4%

DISCUSSION

The documented repeat rate for both hospitals collectively was 3.8% which is acceptable according to the previous reported range[3]. The reported repeat rate in other studies are: Haghparast 5.7%, Saberi 14.7%, Almaleki 7.4% to 9.57%, Goraybi 6.12%, Tohidnia 6.6% and Fallahmohammadi 5.9%[1,3,7,8,9,10]. In order to minimize personal manipulation of result, in this study we studied the repeat rate weekly based on the repeated radiographs for each personnel code. The documented repeat rate was higher in Farshchian hospital than Beesat hospital. The number of students and graduated ones who were doing their training course as well as patients were higher in Beesat hospital compared to Farshchian so it seems that in Farshchian hospital, radiographs are assessed more sensitively and it leads to more repeat rate. In the other word, it can be said that the quality of radiographs in Beesat hospital is lower than Farshchian. Based on the experience, two groups showed the higher repeat rate. First, staffs with less than 5 years; considering the importance of appropriate positioning of the patient, selection of proper exposure factors and control of film processing conditions as the essential requirements for production of high quality radiographs, taking more training courses may be a useful suggestion for reducing repeat rate in this group. The second group was staffs with 10-15 years experiences.

Although it is expected for these staffs to be well trained, but lack of a well-established prize system based on their daily reports have disappointed them. So considering daily report for repeat rate in their job promotion can be a useful motivator for repeat rate reduction among well experienced staffs. The experience role is well showed in staffs with more than 15 years who documented the less repeat rate. Tohidnia also reported the highest repeat rate for students (7.2%) in his study [9]. Based on our results repeat rate percent was significantly related to education level (P=0.00); the least repeat rate was documented for the staffs with BS degree in radiology. Although technicians are well trained and showed less repeat rate percentage compared to students, but this result showed that having academic knowledge along with enough experience could effectively help in decreasing repeat rate. The highest repeat rate was documented for students which can be related to their low experience, low skill as well as lack of sufficient supervision on their performance. Tohidnia reported the highest repeat rate for students (9%)as well as staffs with BS degree in radiology (6.7%) while in Saberi article the highest repeat rate has been documented for technicians (19.7%) and students (14%)[9,3]. The common results about student group could be considered as an emphasis for doing closer surveillance on students when they are passing their training courses. The relation between repeat rate and sex was also studied and showed higher repeat rate in male staffs which were not statistically significant (p=0.0155) but may be due to more accuracy in female staffs. In the case of sex importance in repeat rate Tohidnia reported that doing radiography by a radiograph who has the same sex with patient has resulted in less repeat rate (6.3% vs 6.9%)[9]. Our results also showed that there is a significant relation between shift numbers and repeat rate; increase in shift numbers has been followed by repeat rate decrease for staffs.

Considering the facts about work experience, we can explain that doing more shift make the staff more familiar to the equipment and give him/her more experience about the job which in turn cause repeat rate decrease. The analysis of shift timing and repeat rate showed a significant relation between these two factors in Beesat hospital (p=0.013). According to our results more repeat rate was documented in morning

and evening shifts compared to night shift. Possible reasons could be the presence of student in morning and evening shifts, less patient number in night shift which led to more accurate radiography and the presence of some experienced staffs responsible for radiography in night shifts.

Although non-significant relation for shift timing and repeat rate was recorded for Farshchian hospital (p=0.16), the repeat rate was higher in the morning shift which there was more students. Unlike to Beesat hospital, there was more repeat rate in night shifts compared to evening which could be explained by personnel tiredness and sleepiness due to high working load and lack of experienced staffs that are especially in charge for night shifts.

At the end, the development of the survey to all hospitals of Hamadan, assessment of the relationship between repeat rate and patient and staff sexes, and marital status of the personnel are recommended for further studies.

CONCLUSION

Briefly, the repeat rate was acceptable percentages according to previous studies. The highest repeat rate was documented among students with low experience and can be decreased by better monitoring on their performance and periodic training courses. Other approaches to decrease repeat rate include improving personnel motivation, decreasing their tiredness by employing appropriate numbers of staffs, and digitizing the units.

ACKNOWLEDGEMENT

The authors acknowledge the technical support and cooperation received from the staff of the participating hospitals and is grateful to research Assistance of the University of Hamedan. We are also thankful to Mr.Haeri and Ms.Bahrami who are the supervisors of radiology units of Farshchian, ,Beesat hospitals respectively, and our special thanks is for Mr.Sajad Heshmati who help us in data collecting.

REFERENCES

1.Haghparast M, Hosaini Tashnizi S, Golvardi yazdi M S, Sadeghi S, Karimi T. Survey Causes of repeated radiographys in Bandar Abas teaching hospitals Radiology centers. The Hormozgan Journal of Medical Sciences: 2013;17(2):167-74. [Persian]

2.Jadidi M. Quality assessment of the radiography films. The Razi Journal of Medical Sciences. 2002;9:317-26.[Persian]

3.Saberi SAH, Haghighi zadeh M, Nik paik H, Afrooz A. Analysis of causes for reject of x-ray films radiology departments of Ahvaz Imam Khomeini and Golestan Hospitals. Scientific Medical Journal of Ahvaz University of Medical Sciences. 2005;(43):23-30. [Persian]

4.World Health Organization.Quality Assurance in diagnostic radiology. Geneva, World Health Organization (1982).

5.Lewentat G, Bohndorf K. Analysis of reject x-ray films as a quality assurance element in diagnostic radiology.Rofo. 1997;166:376-81.

6.Eze KC, Omodia N, Okegbunam B, Adewonyi T, Nzotta CC. An audit of rejected repeated x-ray films as a quality assurance element in a radiology department**.** Niger J Clin Pract. 2008;11(4):355-8.

7.Al-Malki M, Abulfaraj W, Bhuiyan S, Kinsara A. A study on radiographic repeat rate data of several hospitals in Jeddah. Radiation protection dosimetry. 2003;103(4):323-30.

8.Gourabi H, Sharafi A. Evaluation of repeated or abandonment of radiography in diagnostic radiology. Partou Journal. 2003;1:12-14. [Persian].

9.Tohidnia M, Dezfoolimanesh J. Frequency and rate of radiographics repeat and it's causes in selected hospitals in Kermanshah (2006). Behbood, the Scientific Quarterly. 2009;12(4):434-41. [Persian].

10.Fallahmohamadi GR. 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[Persian].