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Research Article

Quality Assurance in Diagnostic Radiology: Current Status and Desirable Situation

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Abstract

Background and Purpose

In the radiology department of the hospital, certain safety considerations are in place to prevent damage caused by harmful rays. But there is less emphasis on other safety features. As part of the safety plan, these sections should be considered in terms of physical considerations, building design and fire fighting. In this study, the main objective is to determine the extent of safety, knowledge and practice considerations in the radiology departments of hospitals affiliated to Mazandaran University of Medical Sciences.

Materials and Methods

This is a descriptive and analytical study which has been done by cross-sectional method. The safety, knowledge and technical performance of the personnel of the radiology departments of Mazandaran University of Medical Sciences hospitals were investigated from a variety of aspects including physical space, observance of radiation protection professors, radiation protection patients, chemical safety and safety of employees. A questionnaire and observation questionnaire were used as a tool for collecting data. In each aspect, the score below 50% was considered safe, knowledge and performance undesirable, between 50% and 80% was considered as safe, knowledge and performance was relatively desirable, and between 80% and 100% was considered as safe, knowledge and optimal performance.

Results

The radiology departments of the hospitals are in a relatively favorable position in terms of radiation protection, compliance with physical standards, proper preservation of chemicals and the protection of personnel in the safety, knowledge and practice of radiology departments.

Conclusion

New radiation protection protocols should be considered in radiology departments. It is also necessary to provide different levels of education for staff in radiology departments. It is also suggested that the planning and design of patients' safety should be considered from the time they arrive in the radiology department until departure.

Introduction

Radiology, also called diagnostic imaging, is a series of different tests that take pictures or images of various parts of the body. Many of these tests are unique in that they allow doctors to see inside the body. A number of different imaging exams can be used to provide this view, including X-ray, MRI, ultrasound, CT scan, mammography, nuclear medicine, fluoroscopy, bone mineral densitometry and PET scan. Ionizing radiation may cause damage to the cells in your body. This is usually very minor and does not cause any serious damage; however, large doses may cause the cells to become cancerous. A very low dose x-ray, such as a chest x-ray, has a tiny risk. CT scans, which use higher doses of x-rays, have a higher risk, although it is still a very small risk. The prevention of X-ray damage is a prerequisite for radiological departments.

Various factors are taken into account in X-ray radiography by the radiologist and controlled, so that the absorption rate of patients is reduced to the minimum acceptable level, while the quality of the final image is not diminished. There must be a balance between the image quality and the patient's dose based on the ALARA law [1-5].

Exposure to ionizing radiation can also result from irradiation from an external source, such as medical radiation exposure from X-rays. External irradiation stops when the radiation source is shielded or when the person moves outside the radiation field [6-7]. People can be exposed to ionizing radiation under different circumstances, at home or in public places (public exposures), at their workplaces (occupational exposures), or in a medical setting (as are patients, caregivers, and volunteers) [6-7].

Exposure to ionizing radiation can be classified into 3 exposure situations. The first, planned exposure situations, result from the deliberate introduction and operation of radiation sources with specific purposes, as is the case with the medical use of radiation for diagnosis or treatment of patients, or the use of radiation in industry or research [8-11]. The second type of situation, existing exposures, is where exposure to radiation already exists, and a decision on control must be taken - for example, exposure to radon in homes or workplaces or exposure to natural background radiation from the environment. The last type, emergency exposure situations, results from unexpected events requiring prompt response such as nuclear accidents or malicious acts [12].

Medical use of radiation accounts for 98% of the population dose contribution from all artificial sources, and represents 20% of the total population exposure. Annually worldwide, more than 3600 million diagnostic radiology examinations are performed, 37 million nuclear medicine procedures are carried out, and 7.5 million radiotherapy treatments are given [13]. Today, hospitals are moving towards quality improvement to drive the goals of all standards for controlling and extending the quality of the hospital towards insuring employees and patients. Therefore, it is one of the most important standards of safe and healthy environment for patients and employees. But every hospital, depending on which society, country and region in the advanced world, is very different in comparison with the developing and developing regions of the world and with what system of hospital services [13].

Therefore, hospitals that play an important role in promoting and improving health and preventing diseases and modernizing services, must set standards to approach this quality management.

In fact, hospital standards are one of the most valuable conceptual elements of the organization due to their valuable role in demonstrating the expected performance and contribution to the evaluation of hospital activities [14]. Therefore, the radiology department must have documented and written safety policies and reviewed at least every 3 years and revised if necessary and then implemented. These policies include safety measures, emergency cases, patient response to contrast agents, and infection control. Also, due to the physical properties of the rays and their effect on the health of the body, certain safety measures must be taken to prevent harmful radiation, in order to minimize the radiation of these rays by methods such as filter installation, resonator screens Do not worry, wear protective clothing, protective plates for guards and protective barriers [15]. Since in a radiology department the ultimate goal is to obtain favorable results in diagnostic activities on patients. Therefore, control in this section is of fundamental importance, which itself has several stages, include in the importance of standards, the evaluation of methods with accepted standards and the correction of deviations from these standards [16,17]. These are necessary, but not enough, and the safety of this sector should be examined against fire, physical and physical damage. On the other hand, it should not be forgotten that many of the problems in the management of this sector are due to the

lack of managerial skills, and when the management in this sector does not have the standards and quality, the department office will be associated with many problems [18]. The purpose of this study was to assess the safety, performance and knowledge of the radiology departments of different hospitals of Mazandaran University of Medical Sciences and seek to solve possible problems in the areas mentioned.

Materials and Methods

This study is a descriptive study which has been done by cross sectional method. The population under study was all radiology departments of the University of Science Hospitals Medicine is Mazandaran (20 hospitals). In order to observe the conditions and to determine the current situation and adapt it to the standard standards of the observation sheet, the questionnaires were completed and filled out by the observers after the training. The checklist was also prepared using similar articles and use of valid site data and some Persian and English books and dissertations.

In order to determine the rate of safety, knowledge and practice of personnel in the radiology departments of hospitals of Mazandaran University of Medical Sciences in the checklist for each question, three answers were considered.

These responses included optimal, relatively desirable and unsatisfactory safety. For the safety criterion. Desirable score 3 was awarded for a relatively favorable safety score of Score 2 and for an unsatisfactory safety score of Score 1.Similarly, for these responses, knowledge was desirable, relatively desirable and not desirable. For the criterion of the desired knowledge of Score 3, his scores were rather favorable for Score 2 and for Score 1 for Unsuitable Knowledge.

And for responses that included optimal performance, were relatively desirable and unsatisfactory. For the criterion of the desirable performance of Score 3, for the benchmark for the performance of a relatively favorable score of 2 and for the unsatisfactory performance criterion, score 1 was considered.

Given the scores earned in each of the three aspects mentioned above, if the scores were less than 50%, safety, knowledge and performance were undesirable, the score between 50-80% of the total score was rather favorable and above 80% of the safety conditions, Knowledge and optimal performance were considered. Then the radiologist's questionnaire was calculated and the deviation was evaluated. To analyze the data, central indicators, distribution, and t-test were used. It was significant.

Findings

Different aspects of safety, knowledge and practice in radiology departments of hospitals of Mazandaran University of Medical Sciences were investigated. Private hospitals of Mazandaran province were excluded from the research community. The percentage of safety, knowledge and performance of hospitals in different aspects are presented in tables 1, 2 and 3.

Table 1: *Percentage of many operations personnel in X-ray units in hospitals of Medical Sciences in the technical department*

No	Protective Operation Subjects	Morning%	Evening%	Night%	Total%
1	Consideration of 180 cm distance in lung radiography	78	67.5	80	75.2
2	Educating of deep breath in lung radiography	70	59.6	50.5	60
3	Educating of deep exhalation in abdomen radiography	4	0	0	1.3
4	Radiography from ankle and knee with distinct radiation	22	24	16	20
5	Radiography from Palm and wrist with distinct radiation	60	56.7	44	53.5
6	Radiography from forearm and wrist with distinct radiation	54	43.2	40	45.7
7	Radiography from para nasal sinuses in position sitting to stand-up	82	51.3	52	61.8
8	Open mouth in sin use radiography	96	94.5	80	90.2
9	Neck cross table radiography in trauma patients	86	67.5	68	70.5
10	Considering fitting dimensions of cassette and body	90	81.08	84	85
11	Nose radiography from right and left side	66	35.1	28	43
12	90o primary open elbow in forearm profile	78	56.7	52	62.2
13	30o angle in knee profile	38	21.6	20	26.5
14	Putting marker in a suitable place	74	56	52	60.7
15	Quick services to emergency patients	98	94.6	100	97.5
16	Total	66.4	53.9	51	57.1

Table 2: *Percentage of many operations personnel working in radiology centers in hospitals of Mazandaran University of Medical Sciences in the field of conservation*

No	Protective Operation Subjects	Morning%	Evening%	Night%	Total%
1	Considering the minimum distance of tube to patient	78	67.5	80	75.2
2	Non - accompanying patients at room during radiography	70	59.6	50.5	60
3	Closing door during radiography	4	0	0	1.3
4	Leaden protector for patient companion in radiography room	22	24	16	20
5	Legal considering of distance square reverse	60	56.7	44	53.5
6	Radiography from forearm and wrist with distinct radiation	54	43.2	40	45.7
7	Radiography from Para nasal sinuses in position sitting to stand-up	82	51.3	52	61.8
8	Suitable second kilo volt and MiliAmpera	96	94.5	80	90.2
9	Elimination of metallic things from radiography place	86	67.5	68	70.5
10	Putting marker	90	81.08	84	85
11	Putting gonad and thyroid protector for patients	66	35.1	28	43
12	Total	78	56.7	52	62.2

Table 3: *Percentage of many operations personnel working in hospitals of Mazandaran University of Medical Sciences in technical fields*

No	Protective Operation Subjects	Morning%	Evening%	Night%	Total%
1	Machinery warm-up when tube is cold	78	67.5	80	75.2
2	Screwing selectors gently	70	59.6	50.5	60
3	Screwing tube in correct side	4	0	0	1.3
4	Extrication of tube lock after ending radiography	22	24	16	20
5	Tests of radiance field conformity	60	56.7	44	53.5
6	Tests of determining film fogginess	54	43.2	40	45.7
7	Correct making of appearance and stability substance	82	51.3	52	61.8

8	Test of cassette light diffusion	96	94.5	80	90.2
9	Darkroom machine servicing	86	67.5	68	70.5
10	Screen install and service	90	81.08	84	85
11	Adding any shift separately	66	35.1	28	43
12	Total	78	56.7	52	62.2

Table 1 shows that, in terms of radiation safety and proper storage of chemicals, the research community is in a state of complete safety. Regarding the observance of physical standards, only 5 of the 20 hospitals are in a relatively safe condition. In terms of staff protection, fifteen hospitals are in a relatively safe position. In terms of safety, 15 hospitals are in safe condition and the three hospitals are in an unsafe position and the rest are relatively safe. In 14 hospitals, the safety conditions of the staff are observed and in other hospitals, this is a relative condition. Overall, overall safety in all hospitals is relatively safe and in other hospitals is safe.

Safety standards include radiation safety, physical standards, and good preservation of chemicals in optimal conditions. Other standards include fire safety, staffing and patients are relatively desirable.

West hospitals in Mazandaran Province had better conditions for radiation protection, staff safety, physical standards, and proper storage of chemicals in eastern provinces. They are also relatively safe in terms of fire safety and protection of patients.

The western hospitals of the province other than the safety of the employees who are in a relatively safe condition are safe in other cases and the hospital in the eastern province of Mazandaran is not in desirable condition regarding patient safety and in other cases it is desirable. Imam Khomeini Hospital, Sari city, has a good safety and safety standards and, in other cases, safety considerations have been observed.

Table 2 shows that in terms of personnel knowledge, radiology departments are in a relatively favorable position. Knowledge of technical aspects and compliance with the physical standards of 12 hospitals were in a relatively desirable situation. In terms of personnel knowledge, 12 hospitals are in a desirable situation, and in the three hospitals, knowledge of personnel is in a disadvantaged position and the rest of the staff in other hospitals is relatively favorable. In 9 hospitals, the conditions of employee knowledge are observed and in other hospitals, these conditions are relative. In general, overall knowledge is fairly consistent across hospitals. In the hospitals in the eastern province of Mazandaran, the personnel knowledge conditions of the staff are weaker than those in the hospitals in the west of the province.

In terms of personnel performance, 12 hospitals are in a desirable situation, and in the four hospitals, the performance of staff is in an unfavorable situation, and the rest of the staff of other hospitals is relatively favorable. In the hospitals in the eastern province of Mazandaran, the performance conditions of the staff are weaker than those in the hospitals in the west of the province. In general, overall performance in all hospitals is desirable.

Discussions

In recent years, the harmful effects of ionizing radiation have led the medical community to reduce the exposure of people and the harmful effects of radiation by implementing standards and limiting radiation to the patient and staff, and choosing appropriate methods and familiarity with the devices. First, radiologists and then the staff are responsible for ensuring the safety of the patient, by using less radiation and radiography. Better quality with less irradiation and avoidance of mistakes and repeat radiography and reduce radiation to the patient or staff [19-21].

Although it is the only patient to be exposed to radiation, many tests have shown that radiation may also be due to secondary scattering or leakage of the bulb. Applying the methods used to reduce the patient's radiation will also reduce the radiation exposure of the staff. In this regard, spacing and protection are the factors that are most capable of providing protection against exposure to radiation. In 1995, by defining radiological standards, the guidelines for the training of radiologists to perform the best method for performing diagnostic and therapeutic radiology services provided [22-23].

The NCRP organization has recently published a number of standards. These standards cover cases such as diagnostic, interventional, nuclear medicine and ultrasound radiology and are reviewed every 3 years. The main goal of these standards is to produce radiology services of the best quality. As the visit of doctors to the American Insurance Officers from the Institute, these standards were able to appear well. In addition to these standards, there are many international standardization programs for the radiology department in Australia, New Zealand and Korea, available at the agency offices of International Standardization Organizations [22-23].

In Iran, the results of a research in hospitals affiliated to Yazd University of Medical Sciences showed that the ten most areas of safety concern the safety of physical space and equipment and the lowest percentage belongs to the use of personal protective equipment and the percentage of total safety in this sector 61% Is. Also, the results in the radiology departments of the hospitals of Guilan University of Medical Sciences indicate that the average of the current status of hospitals complies with the international standards is 53%, and in 43% of these sections there was no archive about the protection of workers from radiation. These results are compared with Sohrabi and Šegota study of consistency abundance [23-25].

However, in this study, different areas of radiation protection standards including radiation protection, patients, staff, physical standards, and proper storage of chemicals were investigated. The results showed that the research population was in terms of protection against radiation The emphasis is on optimal safety. But this is not true in all safety cases. The radiology departments of Mazandaran University of Medical Sciences have a high safety level in terms of protection against radiation and also have a favorable condition for overall safety by gaining 50% of the scores, safety, knowledge and performance of the personnel. This indicates that in most hospitals of Mazandaran University of Medical Sciences standards of radiology safety standards are up to acceptable levels and the rules and regulations are monitored regularly and continuously. These results are compared with Alsharif and Cochon study of consistency abundance [26-27].

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