

## Assessing the Safety and Health Standards in Diagnostic Radiology Centers in Hamadan Province

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Received: November 10, 2014; Revised: November 30, 2014; Accepted: December 1, 2014

Providing safety and health criteria is a very important part of the management of all diagnostic radiography centers. The prime aim of this study was to assess the safety and health standards of diagnostic radiology centers in Hamadan Province. This descriptive study that was performed in 22 imaging institutes, 21 hospitals, 1 faculty and 8 healthcare centers (governmental and non-governmental) in Hamadan Province, Iran were selected. All of the X-ray radiography units (including the CT. Scan, panorex, mammography, simple radiography and portable X-Ray units) were evaluated in terms of physical status, radiation protection principals, health criteria and current condition according to the national performed standards of Ministry of Health and Atomic Energy Organization checklists. The findings showed that 106 x-ray units activated in 52 medical imaging centers in this city covering about 1.9 million people. Among 106 x-ray units, 49 were located in hospital wards and 57 were located in the other institutes in 9 townships. 36% of darkrooms, 68% of radiation rooms and 66% of control rooms were suitable in terms of physical status. 57% of health criteria factors had standard condition. Regarding to radiation protection term, the situation was unfavorable in comparison with physical status and health criteria, especially in the application of portable X-ray devices in the various wards of the hospitals. Radiology wards in Hamadan Province had obvious problems in the radiation protection principals; they need better management and maintenance to achieve the standards conditions in terms of safety and health.

**Keywords:** Radiology; Safety; Health; Standards

### 1. Introduction

Radiology departments are of very important and hazardous parts of every medical center and presence of their disturbances may cause irretrievable damage to the patients and healthcare providers (1, 2). After laboratory studies (3), X-ray radiography is the most common paraclinical assessment. Progressive development in demands to diagnostic imaging and costs during the past two decades have shown that multiplicity of imaging units has increased worldwide as well as Iran (1). By looking at the reports of Ministry of Health and Medical Education (MOHME) of Iran and Atomic Energy Organization (AEOI) of Iran, it can be understood that one major activity is evident: "compilation and execution of authorization procedure for all medical imaging centers". The major purpose of the procedure and other national standards is to prevent probable risks treating the staff and patients (4). It is believed that observance of technical bases in the X-ray radiography not only provides the safety of employees but also has its effect on efficiency and satisfaction (5). The results of a research showed that most of the Iranian radiology employees were not satisfied with their lack of job security, environment job and

employees retention, job-service training, occupational health, especially radiation safety regulations in the radiology departments (6). Therefore, investigation the quality and situation of Radiology wards and comparing them with the reliable international and national safety and health standards plays an important role in the safety assurance in imaging as well as providing cares (7, 8).

The aim of this study was to assess the safety and health standards in diagnostic radiology centers in Hamadan Province.

### 2. Materials and Methods

This cross-sectional, descriptive study was conducted by means of 21 radiology departments in hospitals, 1 faculty of Hamadan University of Medical Sciences, 22 imaging institutes and 8 healthcare centers in Hamadan Province from August to November 2013. We evaluated all diagnostic radiology wards, (including simple radiography x-ray, panorex, mammography, CT-scan and portable X-ray units) according to national standards recommended by MOHME and AEOI. All data included the physical status (radiation room, control room, dark room, change room, doors, ventilation, film storage, waiting room, health fa-

cilities) radiation protection principals (lead shielding, warning alarm system, lead glass, personnel monitoring devices, patients and staff protective device, radiation warning signs, quality control tests, pass cosset ) health criteria (environmental and occupational health factors). In order to assess the details of situation, one of X-ray radiography devices established in a radiation rooms to be considered as an x-ray unit.

### 3. Results

The results of this investigation showed that 106 x-ray units (include 63 simple radiography, 15 panorex, 8 mam-

mography, 8 CT-scan and 12 portable X-ray units) activated in 52 medical imaging centers in Hamadan province. Among 52 centers, 21 were located in hospital wards and 31 were located in the other institutes in 9 townships that covered about 1.9 million people. In addition to these centers, 23 were located in governmental and 29 in non-governmental institutes. The results extracted of check-lists about physical status are shown in Tables 1, 2. Table 3 shows radiation protection principal and health criteria, respectively. This table shows number of units that have suitable status about factors and also percentage of them in the proportion of total units that include factors.

**Table 1.** The Conditions of Radiology Units About Physical Status <sup>a</sup>

Factor	Simple Radiography	CT-Scan	Panorex	Portable X-ray	Mammography	Total
Radiation room	42 (67)	7 (88)	9 (60)	-	6 (75)	64 (68)
Control room	35 (56)	7 (88)	15 (100)	-	5 (63)	62 (66)
Change room	26 (41)	6 (75)	-	-	-	32 (45)
Dark room	21 (33)	-	-	5 (42)	3 (60)	29 (36)
Waiting room	35 (56)	6 (75)	10 (83)	-	5 (63)	56 (59)
Film storage	23 (36)	6 (75)	15 (100)	4 (33)	3 (37)	51 (48)
Health facilities	28 (45)	5 (62)	11 (73)	-	6 (75)	50 (47)
Ventilation	29 (44)	6 (75)	8 (53)	4 (33)	5 (63)	52 (49)
Doors	51 (81)	7 (88)	14 (93)	-	7 (87)	79 (84)

<sup>a</sup> Data are Presented as No. (%).

**Table 2.** The Conditions of Radiology Units About Radiation Protection Principals <sup>a</sup>

Factor	Simple Radiography	CT-Scan	Panorex	Portable X-ray	Mammography	Total
Lead shielding	54 (85)	7 (88)	13 (87)	4 (33)	7 (87)	85 (80)
Warning alarm system	41 (65)	7 (88)	9 (60)	-	5 (62)	62 (66)
Lead glass	60 (95)	8 (100)	7 (47)	4 (33)	6 (75)	85 (80)
Patients and staff Protective device	36 (57)	7 (88)	5 (33)	3 (25)	3 (37)	54 (51)
Quality control tests	42 (67)	6 (75)	8 (53)	4 (33)	4 (50)	64 (61)
Personnel monitoring devices	54 (85)	7 (88)	11 (73)	5 (42)	6 (75)	83 (78)
Radiation warning signs	49 (77)	5 (62)	8 (53)	0 (0)	4 (50)	66 (70)
Pass cosset	51 (81)	-	-	-	3 (60)	54 (79)

<sup>a</sup> Data are Presented as No. (%).

**Table 3.** The Conditions of Radiology Units about Health Criteria <sup>a</sup>

Factor	Simple Radiography	CT-Scan	Panorex	Portable X-Ray	Mammography	Total
Environmental health	41 (65)	5 (62)	9 (60)	-	5 (62)	60 (57)
Occupational health	37 (59)	6 (75)	8 (53)	5 (42)	4 (50)	60 (57)

<sup>a</sup> Data are Presented as No. (%).

## 4. Discussion

The result obtained of Tables 1, 2 and 3 demonstrated that the diagnostic radiology centers had obvious problems in terms of the Physical status, radiation protection principals and health criteria. Table 1 Shows that low percentages of different units had suitable situation at point of Physical status, especially for purposes of dark rooms, change room and film storage the deficiencies were experienced, and also in 53% of the units the health facilities were defective. However, the situation of CT-scan and panorex units is proportionally better than others, because they were mainly established at new and large centers. Regarding to the radiation protection term, the findings show that the situation was unfavorable in comparison with the physical status, particularly in the application of portable X-ray devices in the various wards of hospitals there were very considerable defects. Thus, the most part of radiography with this device accomplished without creation correct shielding for the patients and personnel. It was found that the risk of portable X-ray equipment was more than the other devices (Table 2). The study of Rahimi et al. in Mazandaran University of Medical Sciences, found that among 15 radiology centers, only 50 percent of them had the eligible situation in terms of radiation protection principals and shielding (9). In the current study, it was found that in Hamadan Province, the diagnostic radiology centers in view of environmental health conditions have certain defects, as sanitary toilet for patients and ventilation of radiation rooms and darkrooms. When it comes to = occupational health criteria, they have a similar status (Table 3). The major problems were lack of periodic examination and documentation of staff records. Also, similar results were reported by Rahimi's study (9). It suggests that the authorities did not enough notice this point. However, these data indicate that safety of the radiology units is a main problem in our country and necessitates awareness of authorities and decision makers for renovation as soon as possible. Moreover, we believe that the radiology wards in our province in the proportion of other provinces have worse conditions. However, high problem seen observe in the radiation protection terms that it's serious affair of radiology units on point of providing the staff and patient

health and safety, and they need better management and maintenance to achieve standards condition.

## 5. Conclusion

Although radiology equipments in Hamadan Province have potential capacity, but it is concluded from the results of the study, they need some repairs and maintenance and better management. Furthermore, the application of standards for the imaging system needs systematic and organized supervisory mechanisms. Thus, it is suggested that better management for optimal application in different centers according to the standards of each device. Of course, the safety of the radiology units is low which should be taken seriously.

## Funding/Support

This study (number 890916147872) was supported by a grant from the Vice Chancellor of Research of Mashhad University of Medical Sciences.

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