



# **Occupational Hazards and Safety Practices of Medical Radiation Workers in Port Harcourt Metropolis of Rivers State, Nigeria**

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## **ABSTRACT**

There is no occupation without hazards. This study investigated the occupational hazards and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State. A descriptive cross sectional survey design was adopted for the study. The sample size of this study was 344 medical radiation workers. A multi-stage sampling procedure was adopted for the study which was presented in three stages to select the sample for the study. The instrument for eliciting information for this study was a structured questionnaire. The reliability coefficient value of 0.86 was obtained using Pearson Products Moment Correlation Coefficient. The result of this study indicated that there was a significant relationship between physical hazard ( $p<0.05$ ), chemical hazard ( $p<0.05$ ), biological hazard ( $p<0.05$ ), psychosocial hazard ( $p<0.05$ ), mechanical hazard ( $p<0.05$ ) ergonomic hazard ( $p<0.05$ ) and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State. In regards to this study, it was concluded that medical radiation workers are exposed to occupational hazards such as physical, chemical, biological, psychosocial, ergonomic and mechanical hazards. However, the findings of this study revealed that medical radiation workers exhibit good safety practices. The following recommendations were made among others that medical radiation workers should prioritize their health by complying with the several safety measures before and during radio-diagnostic proceedings so as to reduce the consequences of health hazards.

**Keywords:** occupational hazards, safety practices, medical radiation workers, Port Harcourt Metropolis.

## **INTRODUCTION**

Medical radiation workers represent the largest group of workers who are occupationally exposed to radiation. There is no occupation without hazards or risks and safety measures the hallmark of accident and hazards preventions in any workplace. It is pertinent that workers in the hospital setting are exposure to hazards such as biological, chemical, physical, psychosocial, ergonomic and mechanical hazards most especially among medical radiation workers. O'Sullivan, et al (2010) reported that 87% good number of radiation workers had not received safety protection instruction and measures as it may exposes them physical hazards. Medical radiological workers are working in the x-ray department may be exposed to radiation and might not be comply with safety measures at all time. Lee, et al (2014) indicated in their study that 77% of radiological workers had underestimated doses of radiation as they carry out x-ray diagnosis. Additionally, Biswas, et al (2021) put up that more average number of workers suffered for health problems attributed to occupational hazards and excess dose of radiations.

Physical hazard has to do things such as noise, vibration, objects, radiation among others that may create the chances of accident to occur. X-ray radiation is a form physical hazards that has the potentials of triggering health problems and long term health implications on the radiologists. Biswas, et al (2021)

revealed that with  $\geq 50\%$  representation of women was 33% of physical occupational hazard solely from medical radiation. Naithani, et al (2021) is of the view that improvement in knowledge of occupational hazards and safety measures, which was found to be statistically significant with p-value of 0.001 for all categories. Adejumo, et al (2012) asserted that compliance to safety measures among radio-diagnostic workers would reduce the chances of occupational hazards due to increase in knowledge. Radiations are more dangerous to the health of the workers that needs consistent compliance to safety measures resulting from exposure to physical hazards.

Chemical hazards are chemicals such as film developing solution in making radiograph from radiological examination. The chemicals use for preparation of x-ray films are hazardous to health the workers as it may contain corrosive chemicals or substances. Naithani, et al (2021) revealed that radiation workers are over 11 times more likely to encounter chemical hazards than any others form of hazards. Biswas, et al (2021) indicated that less than average (35%) of radiation of workers are exposure to chemical occupational hazard such as developer and activating solutions of x-ray. Additionally, Badawy, et al (2016) buttressed that the use of safety device such as hand gloves may reduce that effects of chemical substances thereby minimize occupational hazards. Erkan, et al (2019) added indicated that practicing radiation measures and safety devices are necessary for effective utilization to improve the standard of occupation.

Biological hazards involved the pathogenic contamination on the workers either from the client and objects that cause health problems. Naithani, et al (2021) revealed that medical radiation workers are 2 times more likely to encounter biological hazards that result into short and long term effects. Similarly, Abuzaid, et al (2019) buttressed that poor adherence to radiographic safety measures may contribute to significant occupational hazards hence safety measure remain the major prevention of hazards among workers. Psychosocial hazards involve the relationship between the man and his work environment that may deleteriously affect health. Verbal abuse, discrimination, burnout, and poor communication affects the relationship with the work. Kawthalkar, et al (2019) revealed that significant correlation was found between repetitive stress injuries and burnout while 46% reported either physical or verbal abuse from patient. Significant correlation was found between increasing number of USG examinations performed per day and the prevalence of neck pain, low back pain, and shoulder pain ( $P < 0.05$ ) (Kawthalkar, et al 2019). Salama, et al (2016) revealed that there are is an significant association between the levels of radiation exposure in all selected hospitals concerning imaging and waiting X-ray and CT-scan operating room ( $P < 0.01$ ). For radiation safety, most hospitals have lead aprons and thyroid shields in place, but only about 50% have lead glasses and lead shields, showing that many hospitals still lack essential equipment. Lee, et al (2018) added that female workers had a higher risk of radiation-related excess cancer, although they were exposed to lower radiation doses than male workers. Cha, et al (2020) indicated that high exposure to occupational hazard in radiological laboratory contribute to cardiovascular disorders.

Safety measures are series of practices that safety and avoidance of accidence hence it promotes and maintain the welfare of the radiation workers. This may involve the use of safety device such as lead apron, hand gloves, medical shoe, face mark and shield, eye goggle among others to reduce the exposure to hazards from radiological examination. Lee, et al (2018) revealed medical radiation workers who adhered to safety measures are 5 times less likely to expose to occupational risks and potential health risks. Salama, et al (2016) added that average percentage of workers (50%) that worn lead glasses and lead shield may have radiation safety as compared with those without safety device. Similarly, Abuzaid, et al (2019) in their study buttressed that total adherence to radiation protection practices (75%) are less expose to occupational hazards. It is plausible radiological workers who obey safety rule and regulations are free from hazards to a large extent. However most the safety device necessary for protection from radiation are likely not available for the disposition of workers whereas some workers are carefree concerning the compliance to safety measures hence they are higher risk of occupational hazards. In the light of this background that this study investigated the occupational hazards and safety practices associated with medical radiation workers in Port Harcourt metropolis.

## METHODOLOGY

A descriptive cross sectional survey design was adopted for the study. The estimated population of medical radiation workers in Port Harcourt metropolis is estimated to be 1502 (Nigeria Medical Association, Rivers State Chapter, 2021). The sample size of this study is 344 medical radiation workers. The sample size for the study was estimated using Taro Yamane formula for a large population.

The sample size for this study was 344. A multi-stage sampling procedure was adopted for the study which was presented in three stages in order to select the sample for the study.

**Stage one:** Simple random sampling technique was used to select Port Harcourt city and Obio/Akpor Local Government Areas of Rivers State out of five L.G.As by balloting without replacement.

**Stage two:** simple sampling technique was used to select five government owned and five private owned medical radiation centers in Port Harcourt city and Obio/Akpor Local Government Areas of Rivers State respectively for the respondents

**Stage three:** disproportionate sampling technique was employed to select radiological workers both technician and technologists from government and private radiological and x-ray centers used for the study to enable the researcher gather data from the sample.

The instrument for eliciting information for this study was structured questionnaire titled Questionnaire on Occupational Hazards, and Safety Practices among Medical Radiation Workers (QOHSPMRA). This instrument is in four sections A, B, C. & section A depicts information on socio-demographic variables of the respondents such as age, gender, year of service, level of education, employment status, religious background, work experience, among others. While section B revealed the information on occupational hazards with the response item of Yes and No; section C illustrated the safety practices with the response options such as Always, Sometimes, Rarely, and Never respectively. The instrument was validated by the supervisor and two experts in occupational health and safety, from the department of Human Kinetics Health and Safety Education for content, construct and face validity. The criticism, amendment and correction were used to redesign the instrument. Hence the instrument was valid and used for the study. . The Reliability coefficient value of 0.86 was obtained using Pearson Products Moment Correlation Coefficient. Hence the instrument was reliable and used for the study. Collected data were coded and analyzed using Statistical Products for Service Solution (SPSS) version 25.0).

**RESULTS**

**Table 1: Socio-demographic data**

Variables	Frequency	Percentages
<b>Age</b>		
< 20 years	69	20.9
21-30 years	153	46.4
31-40 years	66	20.0
41-50 years	42	12.7
<b>Gender</b>		
Male	256	77.6
Female	74	22.4
<b>Work experience</b>		
1-5 years	113	34.2
6-10 years	136	41.2
11 years and above	81	24.5
<b>Education</b>		
Secondary	55	16.7
Tertiary	275	83.3
<b>Training</b>		
Yes	292	88.5
No	38	11.5
<b>Work status</b>		
Employed	201	60.9
Casual	50	15.2
Technician	79	23.9
Total	330	100.0

Table 1 showed the socio-demographic data of respondents. The result showed that 69(20.9%) of the respondents were aged <20 years, 153(46.4%) were aged 21-30 years, 66(20.0%) 31-40 years and 42(12.7%) were aged 41-50 years. For gender, 256(77.6%) were males and 74(22.4%) were females. For work experience, 113(34.2%) had worked for 1-5 years, 136(41.2%) worked for 6-10 years and 81(24.5%) worked for 11 years and above. About 55(16.7%) had secondary education and 275(83.3%) had tertiary education. For training, 292(88.5%) had training and 38(11.5%) had no training. However, for work status, 201(60.9%) were employed, 50(15.2%) were casual and 79(23.9%) were technicians.

Hypothesis 1: There is no significant relationship between physical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State;

**Table 2: Chi-square test showing significant relationship between physical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State**

Variables	Safety practices		Total Freq (%)	df	X <sup>2</sup> -value	p-value	Decision
	Good Freq (%)	Poor Freq (%)					
<b>Physical hazards</b>							
High	157(64.3)	87(35.7)	244(100)	1	9.272	0.001	Rejected
Low	63(73.3)	23(26.7)	86(100)				
Total	220(66.7)	110(33.3)	330(100)				

\*Statistical significant (p<0.05)

Table 2 summarize the finding of the study which showed that there is significant relationship between physical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $X^2$ -value = 9.272; df = 1,  $p < 0.05$ ). Therefore, the null hypothesis which states that there was no significant relationship between physical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State was rejected.

**Hypothesis 2:** There is no significant relationship between chemical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State;

**Table 3: Chi-square test showing significant relationship between chemical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State**

Variables	Safety practices		Total Freq (%)	df	X <sup>2</sup> -value	p-value	Decision
	Good Freq (%)	Poor Freq (%)					
Chemical hazards							
High	169(62.1)	103(37.9)	272(100)	1	14.318	0.000	Rejected
Low	51(87.9)	7(12.1)	58(100)				
Total	220(66.7)	110(33.3)	330(100)				

\*Statistical significant ( $p < 0.05$ )

The finding of the study showed that there is significant relationship between chemical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $X^2$ -value = 14.318; df = 1,  $p < 0.05$ ). Therefore, the null hypothesis which states that there was no significant relationship between chemical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State was rejected.

**Hypothesis 3:** There is no significant relationship between biological hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State;

**Table 4: Chi-square test showing significant relationship between biological hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State**

Variables	Safety practices		Total Freq (%)	df	X <sup>2</sup> -value	p-value	Decision
	Good Freq (%)	Poor Freq (%)					
Biological hazards							
High	147(58.3)	105(41.7)	252(100)	1	33.317	0.000	Rejected
Low	73(93.6)	5(6.4)	78(100)				
Total	220(66.7)	110(33.3)	330(100)				

\*Statistical significant ( $p < 0.05$ )

The finding of the study showed that there is significant relationship between biological hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $X^2$ -value = 33.317; df = 1,  $p < 0.05$ ). Therefore, the null hypothesis which states that there was no significant relationship between biological hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State was rejected.

**Hypothesis 4:** There is no significant relationship between ergonomic hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State;

**Table 5: Chi-square test showing significant relationship between ergonomic hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State**

Variables	Safety practices		Total Freq (%)	df	X <sup>2</sup> -value	p-value	Decision
	Good Freq (%)	Poor Freq (%)					
Ergonomic hazards							
High	136(81.9)	30(18.1)	166(100)	1	109.309	0.000	Rejected
Low	6(8.7)	63(91.3)	69(100)				
Total	142(60.4)	93(39.6)	235(100)				

\*Statistical significant (p<0.05)

The finding of the study showed that there is significant relationship between ergonomic hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State (X<sup>2</sup>-value = 109.309; df = 1, p<0.05). Therefore, the null hypothesis which states that there was no significant relationship between ergonomic hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State was rejected.

**Hypothesis 5:** There is no significant relationship between psychosocial hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State;

**Table 6: Chi-square test showing significant relationship between psychosocial hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State**

Variables	Safety practices		Total Freq (%)	df	X <sup>2</sup> -value	p-value	Decision
	Good Freq (%)	Poor Freq (%)					
Psychosocial hazards							
High	217(88.9)	27(11.1)	244(100)	1	208.916	0.000	Rejected
Low	3(3.5)	83(96.5)	86(100)				
Total	220(66.7)	110(33.3)	330(100)				

\*Statistical significant (p<0.05)

The finding of the study showed that there is significant relationship between psychosocial hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State (X<sup>2</sup>-value = 208.916; df = 1, p<0.05). Therefore, the null hypothesis which states that there was no significant relationship between psychosocial hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State was rejected.

**Hypothesis 6:** There is no significant relationship between mechanical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State;

**Table 7: Chi-square test showing significant relationship between mechanical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State**

Variables	Safety practices		Total Freq (%)	df	X <sup>2</sup> -value	p-value	Decision
	Good Freq (%)	Poor Freq (%)					
Mechanical hazards							
High	213(88.8)	27(11.3)	240(100)	1	193.119	0.000	Rejected
Low	7(7.8)	83(92.2)	90(100)				
Total	220(66.7)	110(33.3)	330(100)				

\*Statistical significant (p<0.05)

The finding of the study showed that there is significant relationship between mechanical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $X^2$ -value = 193.119; df = 1,  $p < 0.05$ ). Therefore, the null hypothesis which states that there was no significant relationship between mechanical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State was rejected.

## **DISCUSSION OF THE FINDINGS**

### **Physical Hazards of Medical Radiation Workers**

The finding of the study showed that there was significant relationship between chemical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $p < 0.05$ ). The result of this study is expected because workers in radiological department are working with X-ray devices to emitting hazardous substances that have long term health effects on the client and workers. The result of this study is in line with study of Cha, et al (2020) that regular exposure to doses of x-ray radiation creates the tendency for health care problems to occur. Also the result of this is findings is in consonance with Ogenyi, et al (2018) that medical radiation workers are to a large extent expose to wide range of occupational hazards such as vibration from x-ray machines, heat among that contribute immensely to chronic health problems. Kawthalkar, et al (2019) buttressed that medical radiation or radiological workers are affected by the exposure to slip and falls leading injuries and was significantly correlated with physical hazards ( $P < 0.05$ ). Salama, et al (2016) affirmed that both radiation workers and clients were exposure to X-ray, CT- scan radiation and tools used in the radiological laboratory. Lee, et al (2018) revealed that several health problems such as cancer have been attributed to exposure to radiation from the x-ray during diagnostics. It is plausible because radiation workers are the one manipulating the radiological machines to perform diagnostic procedure. As of the time of this study, there was no prior study that contradicts with the findings of this study. Hence, physical hazards are prevalent among medical radiation workers.

### **Biological hazards of Medical Radiation Workers**

The finding of the study showed that there was significant relationship between biological hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $p < 0.05$ ). The result of this study is required because during diagnostic they might be exposed to fluid like water, saliva, blood and substance that may contain pathogen like fungi, virus, and bacteria among others which are hazardous to health of the staff. The result of this study is in credence with findings of Ogenyi, et al (2018) that most radiation workers are exposed to bodily fluids and splashes from infected pains which constitute hazards and are significant with all forms of occupational hazards. The result of this study is in line with studies of Naithani, et al (2021) that medical radiation workers are 2 times more likely to touch fluid from the patient during diagnostic procedure. Abuzaid, et al (2019) affirmed that x- ray workers are more likely to encounter microbes especially due to poor adherence to radiation measures and occupational health standard. It is pertinent to note that medical radiation workers are always at risks of hazards and risky conditions to provide health threat especially when working directing with the patient. As of the time of this study, there were no prior findings that contradict with outcome of this study. Hence, medical radiation workers are expose to biological hazards.

### **Chemical hazards of Medical Radiation Workers**

The finding of the study illustrated that there was significant relationship between chemical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $p < 0.05$ ). The result of this study is expected because certain chemicals and solutions are used for fixing and developing the radiograph and films after taking the x-ray which require the use hands to manipulate the chemicals hence causing skin and health problems to the workers. The result of this study is in credence with Amfo-Out and Agyemang (2016) that workers in an occupation like this are expose to chemical hazards such as fumes, acid and base that may cause dermatological disorders to the individual. Boschman, et al (2011) added that chemical hazards are more prevalent among those who operate in the medical facility especially in laboratory unit such X-ray department. Lee, et al (2014) and O'Sullivan, et al (2010) whose studies buttressed that radiological workers carrying out diagnostic imaging investigation are expose to

chemical substances during the process of developing the radiograph. In spite of the use of hand gloves medical radiation workers are exposed to chemicals that are dangerous to health such as acid and base which are mostly used in the x-ray department after taking the imaging. It is plausible that medical radiation workers must use these chemicals to prepare the films before viewing it. There were no prior studies that are in contrary with the findings of the study.

#### **Psychosocial hazards of Medical Radiation Workers**

The finding of the study revealed that there was significant relationship between psychosocial hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $p < 0.05$ ). The result of this study is required because workers are likely to face verbal abuse and poor relationships with patients/guardians as it endangers their health. The result of this study is in corroboration with studies of Biswas, et al (2021) that slightly above average number (59%) of medical radiation workers were exposed to psychological/psychosocial occupational hazard such as work stress, bullying and discrimination. Foley, et al (2013) affirmed that workers are stressed when patients are inattentive and incorporate during diagnostic procedure. Günalp, et al (2014) and O'Sullivan, et al (2010) whose studies reported that medical radiological workers are exposed to psychosocial hazards such as exposure to stress, verbal abuse, poor communication skill and social problems from patients and colleagues. Awadghanem, et al (2020) and Siyiza, et al (2013) whose studies buttressed that psychological problems are major issue face by radiological and radiation workers in medical settings. There was variation between the previous findings and current study especially as of the time of the study.

#### **Ergonomic hazards of medical radiation workers**

The finding of the study indicated that there was significant relationship between ergonomic hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $p < 0.05$ ). In regard to this result, medical radiation workers are more likely to suffer for mismatch and poor positioning in the workplace resulting to falls and accidents. The result of this study is in keeping with studies of Naithani, et al (2021) that medical radiological workers are exposed to ergonomic hazard and statistically significant with occupational hazards. Biswas, et al (2021) buttressed that more than average percentage of medical workers suffer for musculoskeletal disorders such as pains at the back and neck which was significantly associated with occupational hazards ( $P < 0.05$ ). Al-Abdulsalam and Brindhaban (2014) added that suffer for poor positioning and mismatch with their duty in the workplace resulting to health care problems. Siyiza, et al (2013) buttressed that exposure to heavy object lifting, frequent bending of the back or rapid movement of limbs causing body pain (30%). Kawthalkar, et al (2019) affirmed in their study that the prevalence of neck pain, low back pain, and shoulder pain ( $P < 0.05$ ). It could be clear because medical diagnostic procedure is vigorous and stress that at the end of every daily activity, workers complain of health problems.

#### **Mechanical hazards of medical radiation workers**

The finding of the study depicted that there was significant relationship between mechanical hazard and safety practices of medical radiation workers in Port Harcourt metropolis of Rivers State ( $p < 0.05$ ). The result of this study is required because the radiation device must be repaired and fixed in carry out the diagnostic imaging procedure which in turn may cause injury and accidents. The result of this study is in line with studies of Kawthalkar, et al (2019) that faulty x-ray machines and radiological devices are hazardous to radiation workers which are traceable to mechanical hazards. Salama, et al (2016) added that there was a significant association between the levels of radiation exposure in all selected hospitals concerning imaging and waiting X-ray and CT-scan operating room ( $P < 0.01$ ). Cha, et al (2020) affirmed that radiation risks of cerebrovascular diseases and ischaemic heart disease were non-significantly increased due to exposure to occupational hazards including mechanical hazard. There was no variation between the prior studies and current findings.

#### **Safety Practices of Medical Radiation Workers**

The result showed that, the grand mean of  $1.76 \pm 0.76$  is greater than the criterion mean of 1.50, indicating a good safety practices. The results of this study is expected because medical radiation workers are aware of the safety and laboratory precautionary measures and might undergone training to provide them with safety methods especially in the hazardous workplace. The result of this study is in credence with studies

of Sima, et al (2017) adherence to safety precaution are more likely to reduce the chances of occupational hazards exposure. Briggs-Kamara, et al (2013) added that (58.7%) of the radiographers reported that they were aware of the dangers of ionizing radiation, while 52 (86.7%) of the patients expressed ignorance. Abuzaid, et al (2019) affirmed that the percentage of radiographers' adherence to practices related to environmental protection, patient protection and self-protection were 75.1%, 60.4% and 45.7%, respectively also overall adherence to radiation protection practices score was  $75.2\pm 18.5$ , where 57.4% of the radiographers exhibited good adherence. Dehghani, et al (2014) put up that 71.1% good radiation-safety awareness among medical staff. It is plausible because if medical radiation workers have good level of awareness of safety measures such as use of lead apron, hand gloves, face shield and mask, closed toe shoe among others may practice it effectively to protect themselves from health risks.

## **CONCLUSION AND RECOMMENDATIONS**

In regards to this study, it was concluded that medical radiation workers are expose to occupational hazards such as physical, chemical, biological, psychosocial, ergonomic and mechanical hazards. However, the findings of this study revealed that medical radiation workers exhibit good safety practices. In regards to this study, the following recommendations were made:

1. Ministry of health and other allied health professionals should structure a sensitization programme to create awareness and educate radiologists on common occupational health hazards and basic control needs.
2. Medical radiation workers should prioritize their health by complying with the several safety measures before and during radio-diagnostic proceedings so as to reduce the consequences of health hazards.
3. Manager of health and safety should form a monitoring team to ensure a strict adherence to radiation protection standard and set rules to be within radiation works dose limits.
4. Manager of health and safety should ensure new employees undertake radiation safety courses before launching full radiographic services so as to improve their level of awareness and compliance with safety measures.
5. Managements of the medical institutions especially medical imaging which are practicing radiation should take precautions with providing either personnel or necessary substructure in terms of equipment and necessary training.

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