

# Knowledge and practice of radiation safety among health professionals in Trinidad

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## Abstract

**Objective:** To determine the practices and knowledge of radiation safety measures among health care providers in tertiary institutions in Trinidad.

**Design & Method:** A cross-sectional survey of health care professionals within two public hospitals was conducted using a questionnaire distributed to individuals working in Cardiology, General Surgery, Internal medicine, Orthopaedics, Radiology and Urology who require the use of ionizing radiation machines. The questionnaire comprised of 30 questions divided into five subcategories including demographic data, usage of the ionizing radiation machines, basic knowledge, and attitude towards personal protective equipment as well as radiation exposure measurement. Questionnaire results were tabulated and analysed using Microsoft Excel and Stata v11 with comparative statistical analysis being done using the one-way analysis of variance test.

**Results:** A total of 118 health care professionals participated in this study. The majority (85/118 (72%)) of individuals revealed that they had no formal training regarding safe practices when working with ionizing radiation despite the daily use of the fluoroscopy machines by at least 25% of participants. Individuals who had formal training in the use of ionizing radiation were found to score significantly higher than those without training ( $p < 0.0001$ ). Participants' knowledge regarding the proper positioning of the C-arm image intensifier to reduce radiation exposure was low with 46% of individuals providing a correct response.

**Conclusions:** The level of knowledge among the individuals who participate in the operation of ionizing radiation equipment throughout the country is low. The benefit of training in the use of the C-arm image intensifier is highlighted by the revelation that the individuals who had formal training in the use of these machines performed better than those individuals without training. Annual recertification courses should be implemented such that individuals are kept abreast with current changes and reminded of commonly neglected safety practices.

## Keywords

Radiation, safety, health care

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## Introduction

Recently, there has been a heightened awareness regarding the lack of knowledge of effective dose about radiation dose in clinical diagnostic radiological procedures.<sup>1</sup> The use of imaging equipment in a hospital and surgical speciality. In recent years, the use of X-ray and computed tomography (CT) can have contributed to an increase in the mean of accumulated diagnostic radiation condition. The most available equipment is available.<sup>2–4</sup> As a result, radiation and hospital staff are exposed to increasing dose of ionizing radiation in comparison to other professions. In 2006, American nuclear energy employees

experienced a much higher ionizing radiation dose from medical procedures than in the early 1980s.<sup>5</sup>

Over the past 20 years, the medical facilities in Trinidad have experienced a tremendous increase in the radiological

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facilities available for diagnosis, monitoring, and treatment of a patient. The availability of X-ray, CT and magnetic resonance imaging (MRI) can increase the diagnostic and therapeutic value of the machine. Modern hospital and surgery have become increasingly characterized by the use of technology. The availability and usage of the computer in the hospital have increased in keeping with the development of the computer-aided diagnosis. The operation of the machine should be done by a qualified technician who is using a radiograph. However, due to the lack of sufficient radiography staff, the hospital, the machine is not always used efficiently. The main reason for this is that the machine is not used efficiently. The machine is not used efficiently because of the lack of sufficient radiography staff. The machine is not used efficiently because of the lack of sufficient radiography staff.

This study was designed to determine the accuracy and knowledge of diagnosis among health care staff in a tertiary institution in the country. The aim of the study was to determine the knowledge of diagnosis among health care staff in a tertiary institution in the country. The aim of the study was to determine the knowledge of diagnosis among health care staff in a tertiary institution in the country. The aim of the study was to determine the knowledge of diagnosis among health care staff in a tertiary institution in the country.

## Methodology

A cross-sectional study of health care professionals working in the tertiary institution (San Fernando General Hospital and Polyclinic of Saint General Hospital) who were in the field of radiology and use of machine for diagnosis and treatment of patients was conducted.

## Study population

All health care professionals who were occupationally involved in diagnosis and treatment of patients were included in the study. This study included a cross-section of individuals who were involved in diagnosis and treatment of patients. The study included a cross-section of individuals who were involved in diagnosis and treatment of patients. The study included a cross-section of individuals who were involved in diagnosis and treatment of patients. The study included a cross-section of individuals who were involved in diagnosis and treatment of patients.

## Questionnaire

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## Analysis and statistical methods

All completed questionnaires and data were entered into Microsoft Excel 2010 and analyzed using SPSS version 11.5. The data were analyzed using SPSS version 11.5. The data were analyzed using SPSS version 11.5. The data were analyzed using SPSS version 11.5. The data were analyzed using SPSS version 11.5.

## Results

A total of 118 individuals participated in the study. The study was conducted in the field of medicine. The study was conducted in the field of medicine. The study was conducted in the field of medicine. The study was conducted in the field of medicine.

**Table 1.** Distribution of participating health care professionals and their mean performance scores based on specialty (N=118).

Specialty	No. of participants	Mean score (%)
Orthopaedics	29	51.0
Radiology	29	58.1
General surgery	22	42.3
Urology	12	45.2
Internal medicine	10	35.2
Cardiology	9	47.4
Other	7	39.8

**Table 2.** Summary of participating health care professionals overall score based on their job title (N=118).

Job title	No. of participants	Mean score (%)
Consultant	6	46.5
Registrar	10	50.0
House officer	66	44.6
Radiographer	27	58.7
Registered nurse	8	47.4
Nursing assistant	1	36.8

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## Discussion

The lack of knowledge and awareness of medical professionals regarding the understanding of ionizing radiation of the effects of electromagnetic interference in the workplace has been identified as a highlighted by the authors.<sup>10-15</sup> The primary aim of this study was to determine the availability,

**Table 3.** Summary of correct responses from participating health care professionals regarding radiation exposure based on their specialty (N = 118).

Questions	Cardiology (N = 9) No. (%)	General surgery (N = 22) No. (%)	Internal medicine (N = 10) No. (%)	Orthopaedics (N = 29) No. (%)	Radiology (N = 29) No. (%)	Urology (N = 12) No. (%)	Other (N = 7) No. (%)
What is the normal background radiation exposure per year?	2 (22.2)	3 (13.6)	0 (0)	2 (7)	6 (20.7)	0 (0)	0 (0)
How much radiation does one chest x-ray impart?	4 (44.4)	7 (31.8)	2 (20)	4 (13.8)	17 (58.6)	3 (25)	2 (28.6)
What is the relative risk of causing a cancer from doing a CT scan of the abdomen with contrast?	3 (33.3)	7 (31.8)	1 (10)	10 (34.5)	10 (34.5)	2 (16.7)	2 (28.6)
How much more radiation is an MRI abdomen versus CT scan abdomen with contrast?	2 (22.2)	12 (54.5)	4 (40)	18 (62.1)	24 (82.8)	9 (75)	2 (28.6)
At what period of gestation is the threat of radiation to the foetus greatest?	4 (44.4)	20 (90.9)	7 (70)	20 (69)	22 (75.9)	10 (83.3)	6 (85.7)
Is radiation exposure decreased significantly by wooden objects, for example, doors?	3 (33.3)	17 (77.3)	7 (70)	20 (69)	22 (75.9)	11 (91.7)	6 (85.7)

CT: computed tomography; MRI: magnetic resonance imaging.

**Table 4.** Comparison of health care professionals correct responses regarding radiation machine usage based on formal training (N = 118).

Questions	With formal training (N = 33) No. (%)	Without formal training (N = 85) No. (%)
At what distance does radiation exposure from image intensifier approach natural background radiation?	20 (60.6)	23 (27.1)
Which position of the image intensifier gives the best image quality?	16 (48.5)	38 (44.7)
Which position of the tube reduces exposure to surgeon when doing fluoroscopy x-rays?	11 (33.3)	16 (18.8)

**Table 5.** Summary of health care professionals responses regarding equipment availability in their institution (N = 118).

Question	No. of positive responses (%)
Is there sufficient protective equipment for use with such machinery?	25 (21.2)
Do you think a lead apron provides sufficient protection during surgical or interventional cardiology procedures?	

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The & al<sub>3</sub> a. ion of U olog> .he a e e onnel' a<sub>1</sub> a ene abo<sub>3</sub> . ion<sub>1</sub> ing adia.ion in T<sub>3</sub> ke> h<sub>1</sub> e d .ha de i e .he T<sub>3</sub> ki h Radia.ion Safe. > Reg<sub>3</sub> la. ion ecommending .ha. an indit id<sub>3</sub> al canno. e ceed .hei adia.ion do e limi. , on< 46.5% of a.ici an. s ed do ime. e badge fo moni. o ing of .hei e o<sub>3</sub> e.<sup>21</sup> O<sub>3</sub> o<sub>3</sub> la. ion, h<sub>1</sub> e & e , no. g<sub>1</sub> e ned b> s ch eg<sub>3</sub> la. ion, <sub>1</sub> a able. o a ecia. e .he nece i> fo adia.ion do e badge al. ho<sub>3</sub> gh. hei & ailabili. > and kn<sub>1</sub> l- edge on .hei o e s e<sub>1</sub> e e l<sub>1</sub> .

Con. in<sub>3</sub> o<sub>3</sub> medical ed<sub>3</sub> ca. ion <sub>1</sub> i h ega d. o adia.ion o. ec. ion ac. ice i nece a> .o ceae a<sub>1</sub> a ene among .he indit id<sub>3</sub> al <sub>1</sub> ho a e o c<sub>3</sub> a. ionall> e o ed. o ion<sub>1</sub> ing adia.ion ince i. i belit ed .ha a<sub>1</sub> a ene i .he fi . . e befo e ado. ion, com liance, and adhe ence. o a na. ion al eg<sub>3</sub> la i> f am<sub>1</sub> o k.<sup>22</sup> A . e en. , og amme ega ding afe adia.ion ac. ice fo heal. h ca e ofe - i onal a e s n<sub>1</sub> ailable in T inidad and h<sub>1</sub> e. o be inde - den. l> o<sub>3</sub> ced b> indit id<sub>3</sub> al fom in. e na. ion al in .i. s .ion . The a<sub>3</sub> .ho . ongl> ecommend. ha con. in<sub>3</sub> - o<sub>3</sub> medical ed<sub>3</sub> ca. ion og amme be de igned and d<sub>1</sub> el- o ed fo heal. h ca e ofe i onal <sub>1</sub> ho <sub>1</sub> o k in field .ha e s i e .he<sub>3</sub> e of s ch machine . In 2015, S<sub>3</sub> a mach



e. al.<sup>23</sup> suggested that medical personnel should undergo periodic training regarding radiological protection regarding the use of the ionization and length of the tube. According to the results of the study, individuals who had a history of training could significantly better understand the training ( $<0.0001$ ). The need for certification and the increased accessibility of the training are important factors for individuals who have been trained in all of them.

The study does have a few limitations. The sample did not include individuals who are training in the use of the machine as well as a medical resident who will be employed in the training. The selection of the study was a choice of location, which lends itself to the risk of bias and the effect of the one-way learning of the study. The lack of knowledge demonstrated among individuals in each category was only addressed again in individuals training in the use of the machine. However, the data analysis is considered to demonstrate the effectiveness can be attributed to the effectiveness of individuals.

## Conclusion

Based on the effectiveness of the study, the study has concluded that formal training in the use of ionizing radiation is important in the use of both the staff and the patient. Personal protection of both individuals should be made more readily available to the health professional who uses the machine. Limitations of the study are remembered in the inclusion of 'A Low A Reusable' Achievable training in the machine in order to educate the radiation professionals and the staff in the use of the machine. Annual certification of the staff is important and the individuals should be kept abreast of the changes and reminded of common negligence.

## Declaration of conflicting interests

The author(s) declared no potential conflict of interest in the study.

## Ethical approval

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## Informed consent

Written informed consent was obtained from all subjects before the study.

## Supplemental material

Supplemental material for this article is available online.

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