SPOT EVALUATION OF DOSIMETRY COMPLIANCE AMONGST DIAGNOSTIC RADIOLOGY STAFF IN A MEDICAL FACILITY

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Medicine in Diagnostic Radiology (MMed Rad.D)

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Declaration

I, Letlhogonolo Patrick Selemela, declare that this research report is my own work. It is submitted for the degree of MMed (Rad.D) to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to this or any other university.

Dr Letlhogonolo Patrick Selemela
On this ..... th day of .... 2018.

DEDICATION

This study is dedicated to my wife, my children, and my friends and colleagues who gave me encouragement during this study.

Publications and presentations

This study has never been published and has never been presented at a congress.

Abstract

INTRODUCTION

It is important for radiation workers to wear a dosimeter while working in a radiology department as part of their daily practice. This is one of the requirements for radiation control set by the Department of Health (DoH). Dosimeters are used for monitoring the amount of radiation received by radiation workers while at work.

AIM

The aim of this study was to assess compliance with the wearing and correct placing of radiation dosimeters by radiation workers in four medical facilities.

METHOD

A prospective descriptive study was performed in the radiology departments of the Helen Joseph Hospital (HJH), Chris Hani Baragwanath Academic Hospital (CHBAH), Rahima Moosa Mother and Child Hospital (RHM), and Charlotte Maxeke Johannesburg Academic Hospital (CMJAH).

Radiology staff workers were interviewed on an individual basis to determine whether they were wearing their dosimeter badge, and if so, whether they were wearing it in the correct manner. Unannounced spot checks and interviews were done on a random day. Data were collected in the general X-ray, computed-tomography (CT), fluoroscopy, and mammography units of each of the hospitals concerned.

RESULTS

Of the 85 participants, almost half (49.41%) did not have their dosimeter while working in their usual work environment. Of those who had their dosimeter on their person, 38% were wearing their dosimeter on either their collar or their chest pocket. In the sample, 25% of the consultant radiologists, 56% of the qualified radiographers, 41% of the radiology registrars and 83% of the radiographer students were wearing their dosimeter while at work. Sixty-seven per cent of the participants under the age of 32 were wearing their dosimeter, while only 30% of the participants between the ages of 33 and 65 had their dosimeter at work.

CONCLUSIONS

As shown by this study, there was a low level of dosimeter compliance among senior radiographers and radiologists, and a non-existent level of compliance among nursing staff, working in the radiology departments concerned. The study highlighted a need for the introduction of targeted work-related educational and reinforcement programmes that would improve the knowledge and increase the awareness of radiation safety of all staff working in radiology departments.

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I should like to acknowledge the following people who gave me advice, support and guidance while doing the research: Dr Hlabangana, Mr Van Wyk, Prof Andronikou, Dr Lucas, and Miss Refilwe Ngqobe.

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List of abbreviations and terminology

CHBAH	Chris Hani Baragwaneth Academic Hospital
CMJAH	Charlotte Maxeke Johannesburg Academic Hospital
CT	Computed Tomography
DoH	Department of Health
HJH	Helen Joseph Hospital
ICRP	International Commission on Radiological Protection
IQR	Interquartile range
MRI	Magnetic Resonance Imaging
OSL	optically-stimulated luminescence (dosimeter)
RHM	Rahima Moosa Mother and Child Hospital
SABS	South African Bureau of Standards
TL	thermoluminescence (dosimeter)

1 Background information

1.1 Introduction

Diagnostic imaging has great medical benefits, such as early cancer detection, accurate medical diagnosis, and proper surgical planning. However, it also has a potential to cause harm. There is a risk of developing cancer with the use of diagnostic X-rays, and care should be taken while working in an X-ray environment (1).

Radiation can be detrimental in that it can have deterministic (damage caused by a dose of radiation above a certain threshold) and stochastic (damage caused by accumulation of a radiation dose over a longer period of time) effects (2). In the latter case complications often show up after years of exposure. The probability of a stochastic effect increases as the dose to an individual increases, and there is no associated threshold.

1.2 Scatter radiation

Most of the occupational exposure of radiation workers comes from scatter radiation. When X-ray beams intercept an object, it causes the rays to scatter in all directions.

The patient is usually the recipient of scatter radiation during diagnostic X-rays or fluoroscopic X-rays (2). The amount of scatter is directly proportional to the amount of energy produced by the X-ray source. This energy is regulated by the radiographer and is used for producing the image.

Scatter can be affected by the actual size of the X-ray field, the amount of X-ray reflected from the patient and the design of the room where the X-ray is taken(2). Hence, scatter radiation can affect a radiologist or radiographer even though he/she is not in the path of the primary radiation beam.

1.3 Radiation limits

The maximum amount of radiation that medical workers can receive is 20mSv per year, averaged over five years, with no more than 50mSv in one year. The skin, hands and feet may not be exposed to more than 500mSv per year (3). In 2011, the International

Commission on Radiological Protection (ICRP) reduced the radiation dose limit to the eye from 150mSv to 20msv (4, 5).

1.3.1 Radiation protection

Radiation protection involves justification, dose limitation, and optimisation. Justification of the use of radiation is weighed against its potential harm to the patient. It is important to adhere to the limitations for an occupational setting set by the IRCP. Radiation exposure is optimised when done in the shortest period of time, when there is a significant distance between the source and the user, and when there is appropriate shielding (3).

The appropriate safe distance for protection against scatter radiation is determined by the inverse square law, which relates to the attenuation of radiation and the distance from the source. If one were to double the distance from a source of ionising radiation, exposure would be reduced by a factor of four (6).

Many garments used for shielding against radiation are made of lead. Shielding devices made of lead for eye, thyroid, hand and body have been proven to be effective(7).

1.3.2 South Africa

In South Africa, the practice of radiation is governed by the division of radiation control in the Department of Health (DoH). There are various regulations pertaining to the use of radiation, all of them based on the Hazardous Substances Act 15 of 1973. Under these regulations, there is no rule stating that health workers in radiology should make use of a hand shield (8) In fluoroscopy, it is recommended to make use of leaded glass and thyroid shields. The equivalent dose limits to staff members' hands and feet, lens and whole body are taken from the ICRP (9).

1.3.3 Personal dosimeters

Exposures to both direct and scatter radiation are measured by using personal dosimeters, which are small devices worn by healthcare workers in the radiology, radiation-oncology or nuclear-medicine departments. Dosimeters are also worn by anyone exposed to environments that may contain radiation, such as by workers in nuclear power plants and those working at in radiation sterilisation facilities (10).

There are two main types of dosimeter, namely self-reading and non-self-reading dosimeters, with film badges, thermoluminescence (TL) dosimeters, and optically-stimulated luminescence (OSL) dosimeters being examples of the latter.

Non-self-reading dosimeters do not provide information on a real-time basis, but store the information, to be interpreted at a later stage. Self-reading dosimeters, on the other hand, can measure, and instantly display, the amount of dose acquired, and some of them can even warn the person wearing it of having reached the acceptable dose limit by vibrating or sounding an alarm(10).

Radiation workers wear their radiation badge at collar or chest level, or at the belt or the torso. Workers with water-resistant protective equipment would wear their dosimeter underneath their waterproof outerwear (10), whereas pregnant radiation staff workers would wear a dosimeter on the abdomen, under the protective garment, in order to determine the foetal radiation dose (11).

It is recommended by the ICRP that staff members wear two dosimeters - one under the lead apron, and one at collar level above the apron (5). It is also recommended that the dosimeter of radiologists and radiographers be replaced on a monthly basis, in order to identify activities leading to high radiation exposure and change in work habit (5).

The current practice in the radiology departments under study is that each radiographer, radiologist, radiology registrar, student radiographer and nurse working in the departments is given a TL dosimeter to wear while at work for a month, after which the dosimeter must be submitted to the South African Bureau of Standards (SABS) for an evaluation of the amount of radiation received. A further standard practice is that each radiation worker is expected to wear his/her dosimeter at the collar or the chest pocket.

1.3.4 Dosimeter compliance

Many medical-imaging departments globally have radiation-safety divisions, the responsibility of which is to teach and train radiation staff workers regarding the dangers of radiation and the importance of using dosimeters.

A good example of such a radiation-safety division is that of Duke University in North Carolina, the United States of America, which has a policy document called the *Responsibility of the radiation dosimeter wearer*, according to which staff members (wearers) agree to wear a dosimeter in the proper manner, complete an online training course on the wearing of a dosimeter, and periodically review their occupational exposure (12). At present, the departments under study have no such radiation-safety division.

1.3.5 Compliance with radiation-safety protocols by medical professionals

There have been several studies evaluating the extent to which medical professionals understand the principles of radiation safety and comply with the protocols in that regard.

In 1992, for example, Nakfoor and Brooks in a study of compliance with radiation-safety protocols in the dental school of the University of Michigan in the United States of America found that 51% of the Michigan dentists did not wear the lead protective cervical collar required (13).(14)

In 2003, Sharalkar et al, having compiled a questionnaire listing the most commonly requested radiological investigations, interviewed over 130 doctors ranging from senior house officers to consultant radiologists in hospitals in South Wales and Oxford in the United Kingdom and found there to be a lack of knowledge of radiation-safety practices among the doctors concerned. None of the participants for instance knew the approximate dose of radiation received by a patient having a chest X-ray (15).

In 2014, Modiba, in a qualitative descriptive study using a questionnaire, investigated compliance with radiation-safety protocols among radiographers and dental professionals in the Waterberg district hospital in Limpopo, South Africa, and found that 59% of the radiographers, 17% of the oral hygienists and dental therapists and 38% of the dentists claimed to wear a dosimeter on a regular basis whilst at work (16).

In 2015, using a questionnaire, Jentzsch et al found that 54% of the medical staff in the department of surgery of the university hospital in Zurich, Switzerland, made use of dosimetry, wearing an apron and a thyroid shield made of lead on a regular basis(17)

The above studies indicated that a lack of knowledge of the dangers of radiation, a lack of programmes for continued training and poor inspection and supervision were some of the common causes of poor compliance with radiation-safety protocols.

1.3.6 Study in context

This study was a quality assurance, spot evaluation of dosimeter compliance among radiation staff workers in four medical-imaging departments in and around Johannesburg, South Africa. It is important for radiation staff to be aware of how much radiation exposure they had in the course of a year. It is also important for the management of radiation facilities to know whether their staff members use a dosimeter for monitoring the amount of radiation that they are exposed to.

1.4 Study objectives

The primary objectives of this study were as follows:

1. To determine, through spot checks in the departments, how many members of the radiation staff were wearing their dosimeter badge.
2. To determine how many members of the radiation staff were wearing their dosimeter badge in the correct manner.

The secondary objectives of this study were as follows:

1. To categorise user compliance according to gender, age, and current job description (e.g. radiography student, qualified radiographer, registrar, and consultant), and the area that they were working in at that particular time of the audit.
2. To determine the difference in dosimeter compliance between the age groups.

2 Materials and methods

2.1 Study population

A prospective descriptive study was performed in the radiology departments of the Helen Joseph, Chris Hani Baragwanath Academic, Rahima Moosa Mother and Child, and Charlotte Maxeke Johannesburg Academic hospitals. The study population consisted of radiation staff members working in the radiology department (i.e. consultant radiologists, radiology registrars, qualified radiographers, student radiographers, and radiology nurses) who were on duty in the above-mentioned hospitals.

2.2 Methodology

Using the questionnaire in appendix A, radiation staff workers were interviewed on an individual basis in order to determine whether they were wearing their dosimeter badge. Also assessed was the correct way of wearing the badge. The gender and age of, and area in which, that radiation staff member was working on that day were determined. The spot checks and interviews took place unannounced and on a random day. The data of each hospital were collected from the general X-ray, CT, fluoroscopy and mammography units

2.3 Ethics

Ethics clearance was obtained from the Human Research Ethics Committee of the University of the Witwatersrand (appendix B). Prior to the study taking place, the researcher wrote a letter to the head of both the radiology and the radiography departments seeking consent for the study to be performed. The heads of department then informed their staff members of the study to take place.

At the time of data collection, the researcher approached the radiation workers working in the units concerned individually, explained the study to them and provided them with an information sheet about the study (appendix C).

Permission to participate in the study was requested verbally from the participants. Upon consent, the participants were asked to sign a consent form (appendix D) before the data collection took place. The following information was gathered: age, gender, years of experience in the radiology department, and whether the participant was wearing his/her dosimeter or not, as detailed in the data-collection sheet (appendix A).

2.4 Inclusion and exclusion criteria

The following staff members were included in the study: radiologists, radiology registrars, radiographers, radiography students, and nurses on duty in the general X-ray, CT, fluoroscopy and mammography units of each of the institutions concerned on the day of the study.

Staff members not directly working with ionising radiation such as cleaners, clerks, porters, and staff members working in the ultrasound and the Magnetic Resonance Imaging (MRI) units were excluded from the study.

2.5 Data collection

A data-collection sheet (appendix A) was used for recording the location of staff members' dosimeter. If a staff member was not wearing his/her dosimeter at the time of the spot check, he/she was asked where it was.

Staff members were also asked for their personal details such as age, years of experience in the department and category of health worker (radiologist, radiology registrar, radiographer, nurse, etc) if that was not obvious. All data were recorded for analysis on an anonymous basis.

2.6 Statistical analysis

The data were presented as frequencies and proportions/percentages. Using the chi-square test, the nominal variable of the presence or absence of dosimeter badges versus the unordered categories of male/female and the radiation workers' level of experience was assessed to determine whether there was any association between experience and compliance. As the study took place in the form of a spot evaluation, the sample size was determined by the number of radiation workers present at work at the time of that evaluation. There was therefore no specific statistical calculation performed.

3 Results

The sample population consisted of 85 different Staff members working in the radiology department of the four hospitals under study on that particular day.

Table 3.1: Demographics of the sample population

Total number of participants	85
Age: (median) (IQR) Age groups 19 - 32 yrs (below the mean age of the study participants) 33 - 65 yrs (above the mean age of the study participants)	32 (25 - 37) 45 40
Years of experience (median) (IQR)	4 years (3 - 10)
Gender (%)	Males 21 (24,7%) Females 64 (75,3%)

Table 3.1 above reflects the baseline characteristics of the study participants. As can be seen, 75% of the participants were female, and 25% were male.

As far as age distribution (see fig 3.1 below) was concerned, 50% of the participants (median age were 32 years old, with an interquartile range of 25 to 37 years. Forty-five of the participants were between 19 and 32 years old, and 40 participants were between 33 and 65 years old. Divided in terms of mean age, there were therefore a younger(aged 19 - 32), and an older (aged 33 and above) group.

The work-experience median was 4 years, with an interquartile range of 3 – 10 years.

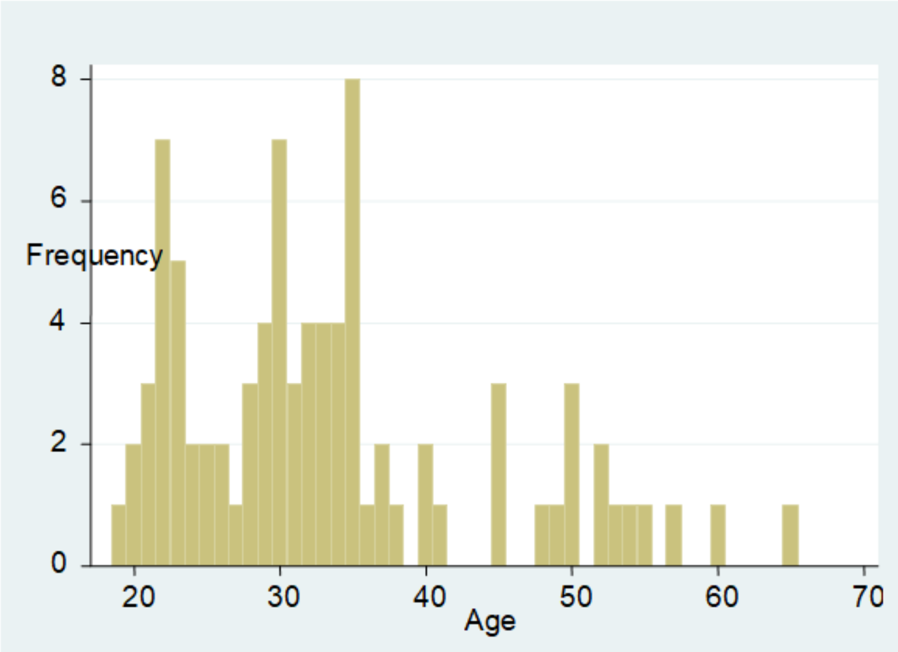

Figure 3.1: Age distribution of the participants

As shown in figure 3.2 below, radiographers represented the largest proportion (43.53%), and nurses represented the smallest proportion (4.71%), of the participants.

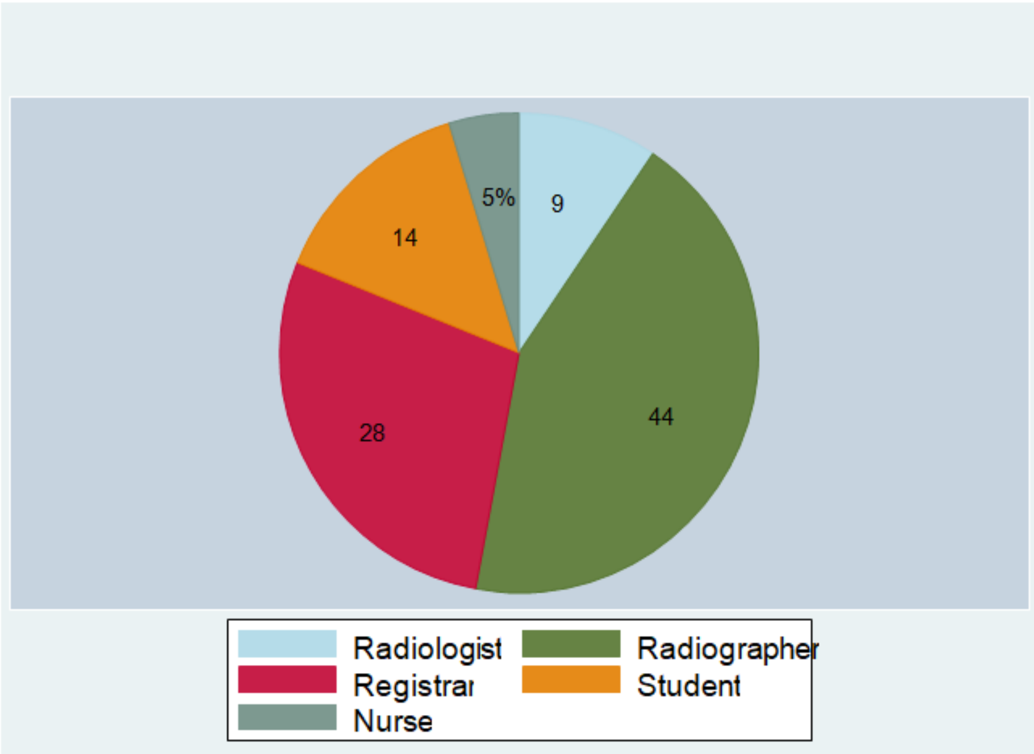

Figure 3.2: Distribution of the participants by status

As far as the workplace of the participants was concerned, the largest proportion of the participants were from the CHBH, whereas the smallest proportion were from the RMH (see fig 3.3 below).

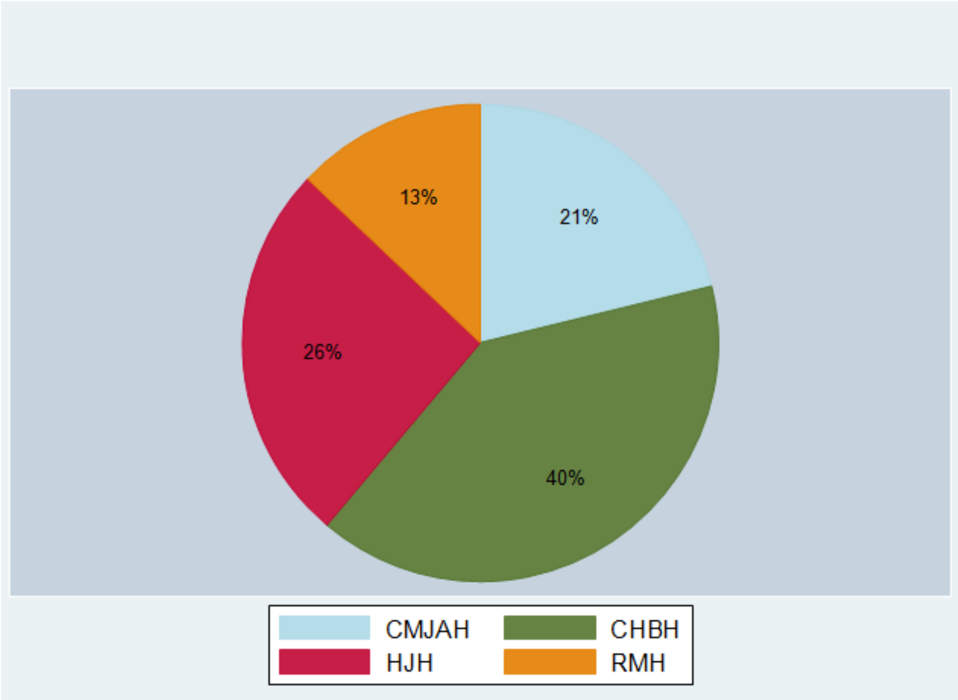

Figure 3.3: Distribution of the participants by workplace

Figure 3.4 shows the distribution of the participants based on their location within the X-ray department during data collection.

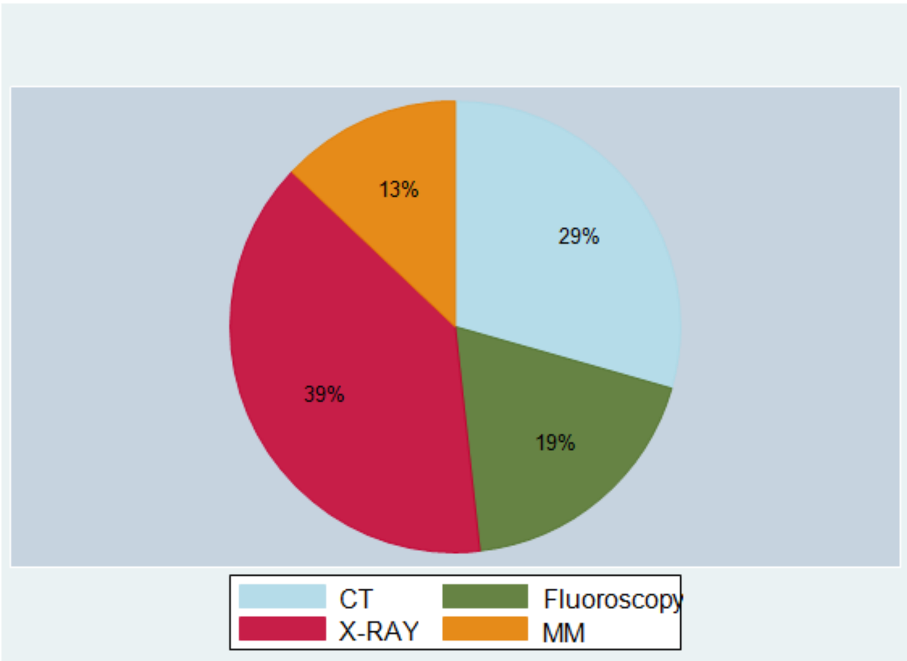

Figure 3.4: Distribution of the participants by department

It was found that 49% of the participants did not have their dosimeter at work (fig 3.5). Of the 51% of the participants who did have their dosimeter at work, only 37,6% were wearing it in the correct manner, while 12,94% were carrying it in their handbag. Those participants who did not have their dosimeter at work said that their dosimeter was at home (18.82%), or or was lost or misplaced (30.59%) (fig 3.6).

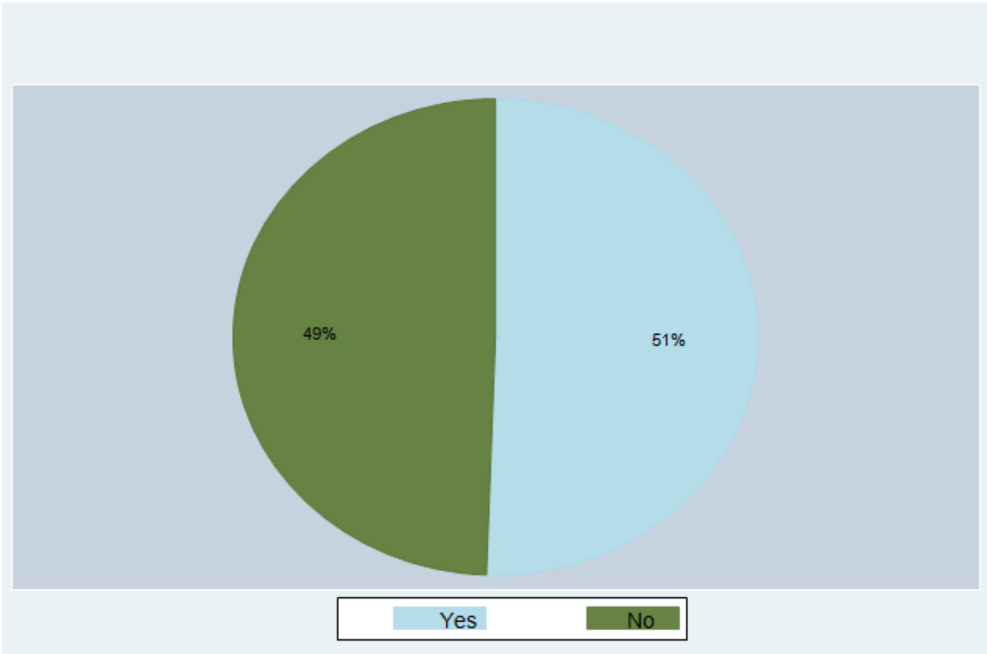

Figure 3.5: Participants having their dosimeter with them at work

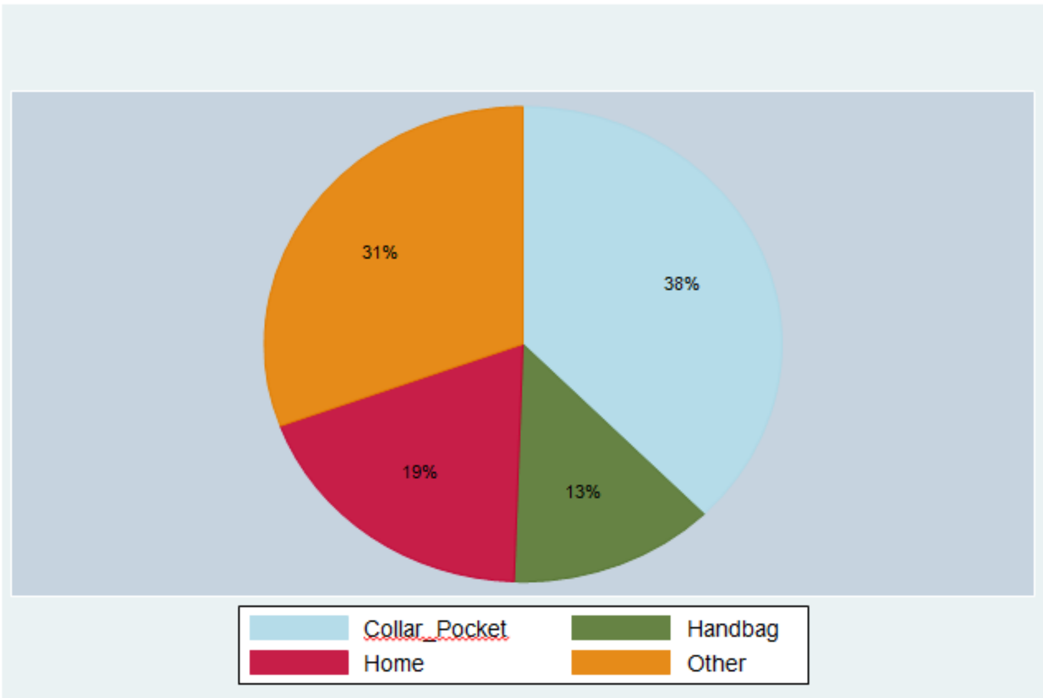

Figure 3.6: Distribution of the participants based on the location of their dosimeter

As part of the secondary objectives, the association between baseline characteristics and the wearing of a dosimeter was analysed (see table 3.2 below).

Table 3.2: Association between baseline characteristics and the wearing of a dosimeter

Characteristics	Wearing of a dosimeter		p-value
	Yes	**No**	
Age (median) (IQR)	30 (22 – 35)	34 (29 – 45)	0.001*
Age groups	N (%)	N (%)	
19 - 32 yrs (total = 45)	68,8	31.1	
33 - 65 yrs (total = 40)	30.0	70.0	
Gender	N (%)	N (%)	
Males (total = 21)	(61.90)	(38.10)	0.23
Females (total = 64)	(46.88)	(53.13)	
Status of the operator<*?*>			
Radiologist (total = 8)	(25.00)	(75.00)	
Radiographer (total = 37)	(56.76)	(43.24)	
Registrar (total = 24)	(41.67)	(58.33)	0.01^{F*}
Student (total = 12)	(83.33)	(16.67)	
Nurse (total = 4)	(0.00)	(100.00)	
Workplace			
CMJAH (total = 18)	(50.00)	(50.00)	
CHBH (total = 34)	(29.41)	(70.59)	0.001*
HJH (total = 24)	(72.73)	(27.27)	
RMH (total = 12)	(72.73)	(27.27)	
Department<*Unit?*>			
CT (total = 25)	(48.00)	(52.00)	
Fluoroscopy (total = 16)	(50.00)	(50.00)	0.29
X-ray (total = 33)	(60.61)	(39.39)	
MMG (total = 13)	(27.27)	(72.73)	

Note: **F**igures in the table refers to Pearson’s chi-squared test.

N = number of participants (indicated as percentages)

The study also found that the status of the participants was statistically significantly associated with compliance. This is clearly shown in figures 3.7, 3.8 and 3.9 below, demonstrating that the wearing of a dosimeter was more prevalent among students (83%), followed by radiographers (57%) and registrars (42%). The study highlighted the fact that more senior staff members were less likely to wear a dosimeter. It was a matter of concern that none of the nursing staff – who play a significant role in the radiology department – was wearing a dosimeter.

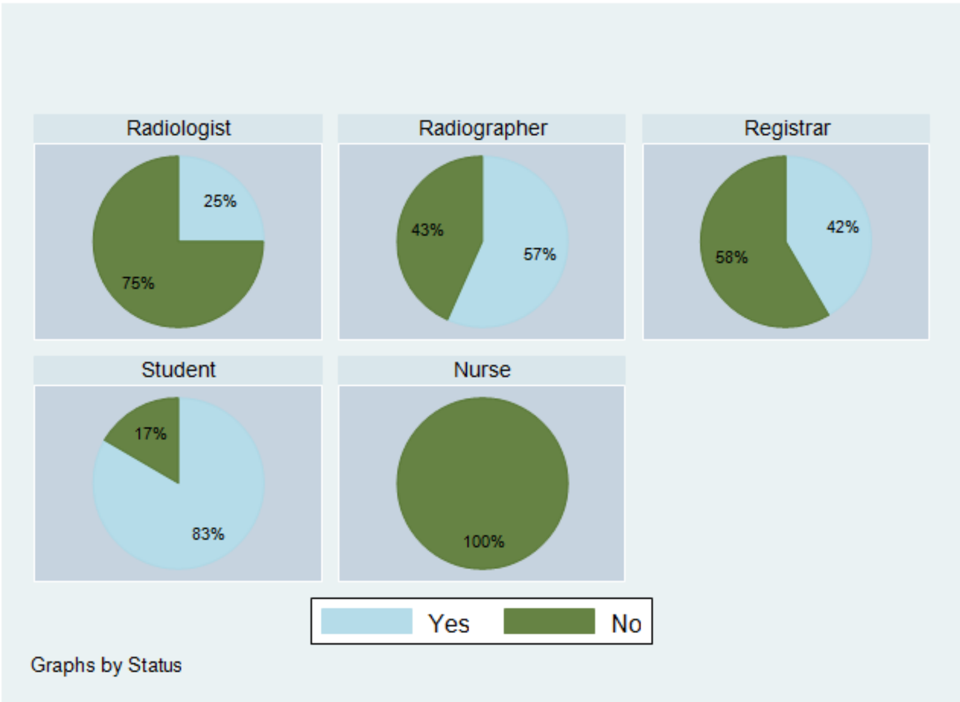

Figure 3.7: Wearing of a dosimeter by status

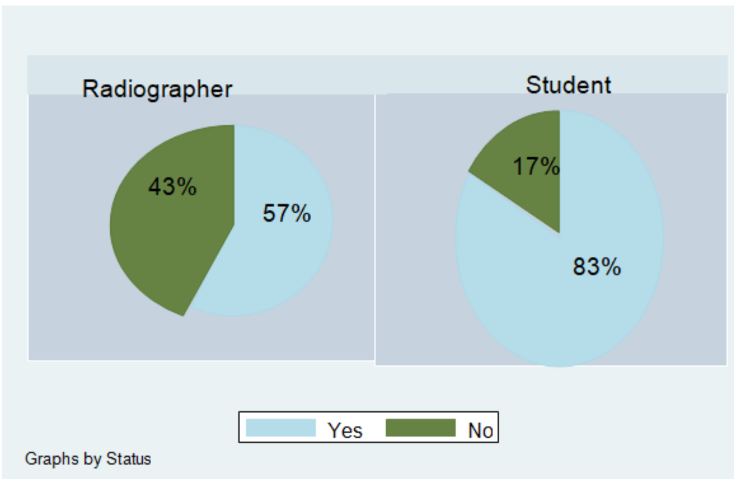

Figure 3.8: Comparison between radiographers and students

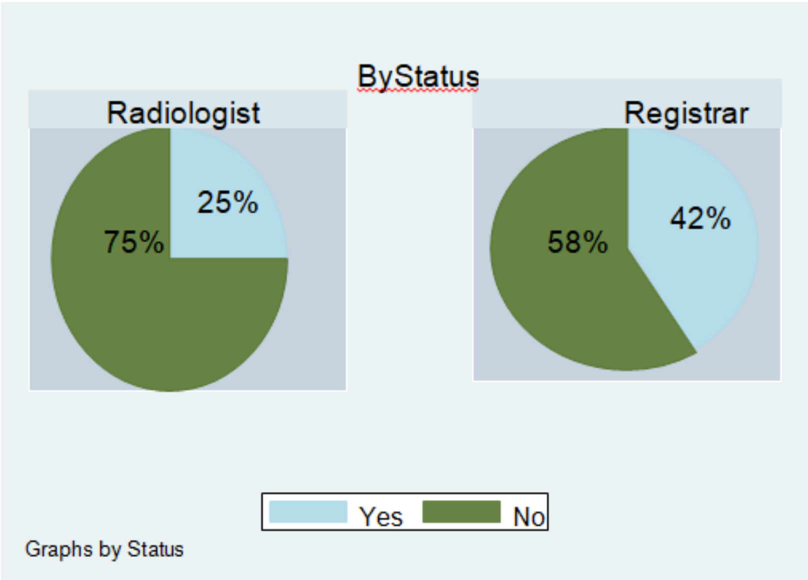

Figure 3.9: Comparison between radiologists and registrars

The study revealed a significant association between the wearing of a dosimeter and the workplace of the participants (p-value: 0.001). The results (see fig 3.10 below) indicated that staff members of the HJH and the RMH were more dosimeter compliant than staff members of the other two academic institutions .

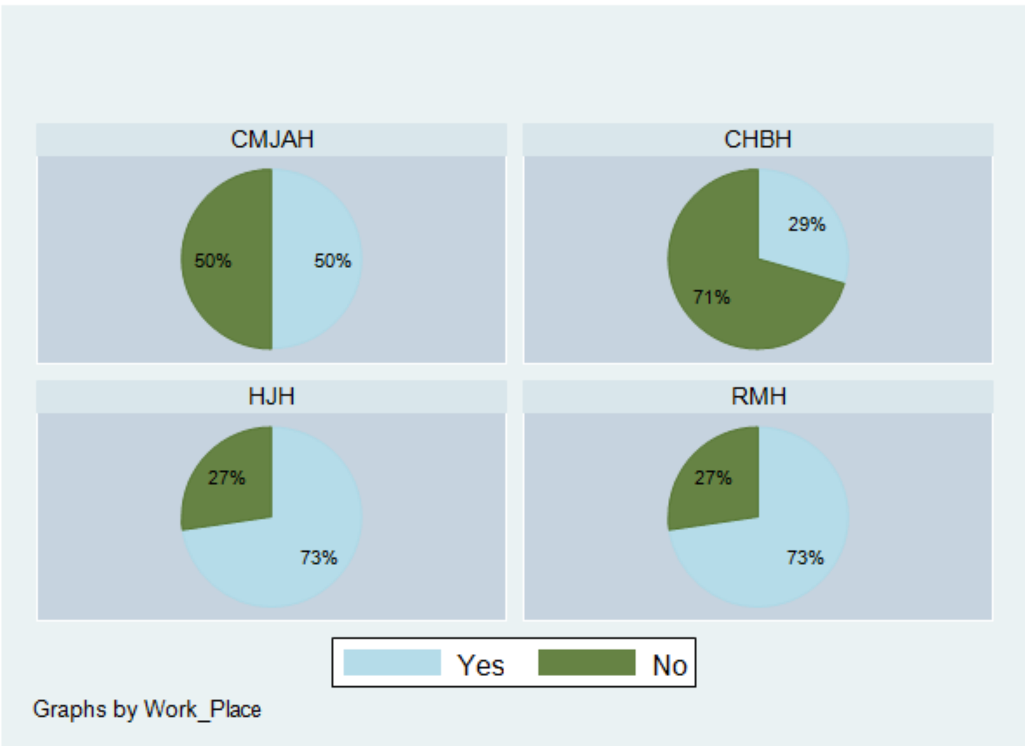

Figure 3.10: Wearing of a dosimeter by workplace

Further analysis included quantification of the the magnitude of the association found in table 3.3*below*. A simple logistic-regression model was fitted with the wearing of a dosimeter as the dependent variable. This allowed the study to predict the likelihood of staff members wearing a dosimeter. Such an investigation has clear implications in terms of policy for addressing challenges relating to poor complience to radiation protocol, as exposure beyond certain levels poses a great health risk to staff members.

Table 3.3: Logistic-regression model for the wearing of a dosimeter

Characteristics	Bivariate logistic		Multivariate logistic	
	OR & 95% C.I	p-value	OR & 95% C.I	p-value
Age (median) (IQR)	0.93 (0.88 – 0.98)	0.003	0.96 (0.90 – 1.02)	0.19
Status of the Staff member				
Radiologist	0.07 (0.01 – 0.61)	0.02	0.11 (0.01 – 1.51)	0.10
Radiographer	0.26 (0.05 – 1.37)	0.11	0.61 (0.08 – 4.42)	0.62
Registrar	0.14 (0.03 – 0.80)	0.03	0.43 (0.06 – 3.18)	0.41
Student	1	-	1	-
Nurse	1	Ref	1	Ref
Workplace				
CMJAH	0.38 (0.74 – 1.89)	0.23	0.30 (0.05 – 2.00)	0.22
CHBH	0.16 (0.34 – 0.71)	0.02	0.15 (0.03 – 0.087)	0.03
HJH	1 (0.19 – 5.08)	1.00	1.79 (0.23 – 13.73)	0.57
RMH	1	Ref	1	Ref

As shown by the results of the logistic-regression model, compared with radiography students, radiologists were 11% less likely to wear a dosimeter, and compared with student radiographers, qualified radiographers were 29%, and registrars 57%, less likely to wear a dosimeter. As far as workplace was concerned, it was clear that staff members of the CMJAH were 70%, and those of the CHBH were 85%, less likely to wear a dosimeter, compared with staff members of the RMH and the HJH.

4 Discussion

The study revealed that even though 51% of the participants had their dosimeter at work, only a few of them had it properly fitted on their chest pocket or their collar, while the rest of the participants had it in their handbag. Those participants who did not have their dosimeter on them claimed to have it at home or in their car, or that they lost it .

The results of this study were in contradiction with those of Adejumo et al's study, in which 97% of the radiation staff workers in Nigeria were found to be compliant with radiation-safety protocols (18). The results were however consistent with those of Jentzsch et al's study , in which it was found that only 5% of technical-assistant radiographers regularly made use of radiation-protective devices such as thyroid shields at work (17). The findings were also consistent with meta-analysis done by Sharman and Hassan, which indicated poor compliance by radiation staff members in multiple studies (19).

Gender played a role in dosimeter compliance – 61,9% of the males and 46,8% of the females interviewed were found to be wearing their dosimeter on the day. Even though the results assumed males to be more dosimeter compliant, there were more female than male participants in the study, which could have contributed to the significant difference between the genders.

The status of the participants also played a significantl role in dosimeter compliance. The results showed radiography students (83%), followed by qualified radiographers (57%) and radiology registrars (42%), to be more compliant than radiology consultants. It was a matter of concern that none of the nursing staff had a dosimeter with them at work, even though all were given one upon commencing duties in the radiology department. Jentzsch et al also found medical students to be 80% more radiation-protection compliant than radiographers, registrars and medical consultants(16, 17). The fact that students, unlike senior staff members, have continued training in and workshops on radiation safety can contribute to the difference in compliance.

Another factor that played a role in dosimeter compliance, was age and work experience. Older staff members (i.e. those aged 32 and above) were less compliant than younger ones. This finding is comparable to a study by Paolicchi et al, who assessed radiation-protection awareness and knowledge about radiological-examination doses among Italian radiographers and found younger radiographers (with less than three years of experience) to have a higher level of knowledge, and of compliance, than experienced radiographers (20). Proximity to regular teaching that radiography students have at school as opposed to the lack of reinforcement with workshops and tutorials among older staff members could contribute to large differences in compliance by the two groups (20).

Smaller hospitals such as the RMH showed a higher level of compliance than larger hospitals such as the CHBAH, partly because of more constant monitoring and supervision in smaller hospitals than in larger ones. In the RMH, for example, there are constant staff meetings with students as well as senior staff members where radiation-safety protocols are revised and constantly emphasised. With smaller groups, the older and more experienced senior staff members often participate in student training and are thus constantly reminded of wearing their dosimeter.

In a meta-analysis by Sharman and Hassan, the following four factors were identified as influencing compliance with radiation-protection protocols by radiographers: knowledge, workplace, years of experience in practice, and the presence of inspection (19).

Sharman and Hassan indicated that knowledge of the dangers of ionising radiation of deterministic and stochastic effect greatly improved compliance with radiation-safety protocols. The environment in which radiographers work has an effect on compliance, because of the culture of learning and the opportunity for refresher courses in the department. The results of these authors further showed that knowledge and compliance did not depend on years in practice and that absence of inspection and supervision has a negative effect on compliance (19).

4.1 Limitations of the current study

Since this study was done by way of a spot evaluation of compliance on one particular day, it could not be determined whether those who were wearing their dosimeter in the correct manner on the day of the study do so on a continuous basis. Sampling over a longer period of time may alter the findings.

4.2 Future applications

Focused and frequent educational and reinforcement programmes about the risk of radiation exposure on the one hand and radiation protection on the other hand for radiographers, nurses and radiologists who work in the radiology centre would undoubtedly contribute to improved knowledge, insight and compliance.

Regular spot checks linked to performance appraisals would also improve compliance. Radiation-protection policies regarding the wearing of a dosimeter in place in the HJH and the RMH should be benchmarked to assess whether the methods used there are transferable to other centres. The establishment of a radiation-safety division within the department would enable proper monitoring and improved compliance. Information posters should be displayed throughout the radiology department and the hospital, with brochures explaining safety procedures for patients.

4.3 Recommendations for future research

Based on the findings of this study, the following are recommendations for future research:

- A follow-up study of compliance once an intervention has been attempted. This would help evaluate whether there has been an improvement in compliance.
- A comparative study of dosimeter compliance in a private radiology practice in South Africa.
- A study of dosimeter compliance among staff working in uranium mines and non-medical facilities.
- A study of factors influencing compliance with departmental protocols.

5 Conclusions

In the four hospitals investigated, there was found to be a low level of dosimeter compliance at work among radiology staff. Factors such as gender, age, years of experience, status and workplace of the participants were identified as affecting dosimeter compliance. The older, more experienced, senior staff members and those working in the larger hospitals were less compliant than the younger ones and those working in the smaller hospitals. Proximity to regular teaching and the presence of monitoring and supervision had a positive effect on compliance.

The study highlighted a need for the introduction of targeted educational and reinforcement programmes that would improve knowledge and increase awareness of radiation safety among all staff working in the radiology department. This would facilitate the correct use of dosimeters and improve the compliance of staff working in the radiology department.

6 References

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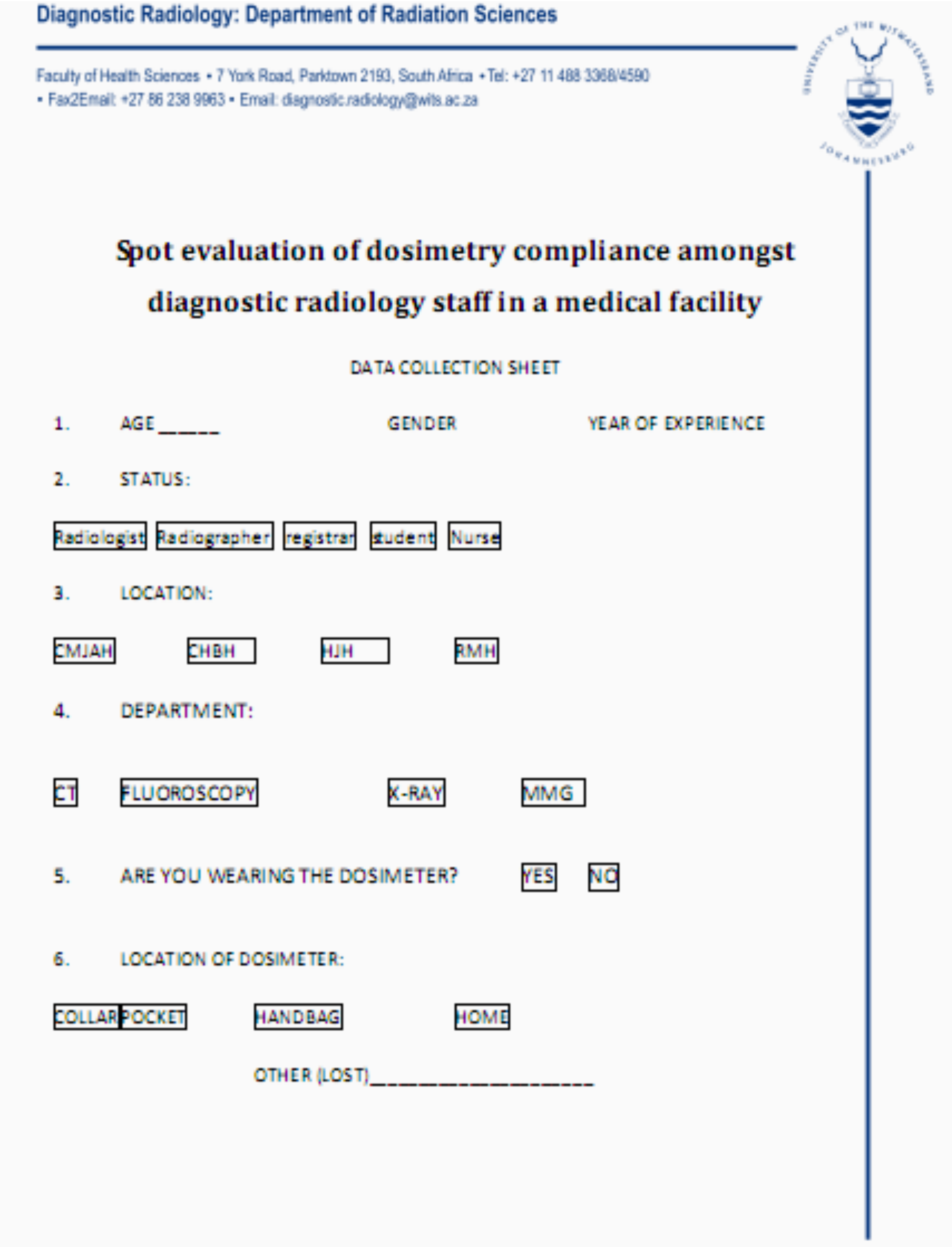
Appendix A: Data-collection sheet



Diagnostic Radiology: Department of Radiation Sciences

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• Fax2Email: +27 86 238 9963 • Email: diagnostic.radiology@wits.ac.za

Spot evaluation of dosimetry compliance amongst diagnostic radiology staff in a medical facility

DATA COLLECTION SHEET

1. AGE _____ GENDER YEAR OF EXPERIENCE

2. STATUS:

Radiologist Radiographer registrar student Nurse

3. LOCATION:

CMJAH CHBH HJH RMH

4. DEPARTMENT:

CT FLUOROSCOPY X-RAY MMG

5. ARE YOU WEARING THE DOSIMETER? YES NO

6. LOCATION OF DOSIMETER:

COLLAR POCKET HANDBAG HOME

OTHER (LOST)___________________

Appendix B: Ethics-clearance certificate

R14/49 Dr LP Selemela

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M150138

NAME: (Principal Investigator)	Dr LP Selemela
DEPARTMENT:	Radiology Charlotte Maxeke Johannesburg Academic Hospital Chris Hani Baragwanath Hospital Rahima Moosa Hospital Helen Joseph Hospital
PROJECT TITLE:	Spot Evaluation of Dosimeter Compliance Amongst Diagnostic Radiology Staff in a Medical Facility
DATE CONSIDERED:	30/01/2015
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr Hlabangana
APPROVED BY:	Professor P Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	22/07/2015

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**.

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix C: Research-information sheet

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PARTICIPANT INFORMTATION SHEET

RESEARCH TITLE: Spot evaluation of dosimetry compliance amongst diagnostic radiology staff in a medical facility.

My name is Dr Patrick Selemela. I am a Radiology registrar at the Charlotte Maxeke Johannesburg hospital. I am doing a study on Spot Evaluation of Dosimeter Compliance amongst Diagnostic Radiology Staff in a medical facility. My study assess whether diagnostic radiology staff wear their dosimeter correctly at any given time across the radiological department on the WITS circuit. The hospitals that will participate in the study are Chris Hani Baragwanath Hospital, Rahima Moosa Women and Child Hospital in Johannesburg, Helen Joseph Hospital, and Charlotte Maxeke Johannesburg Academic Hospital.

The purpose of the study is to determine the number of radiation staff members who have their dosimeter badges on their person during a single spot examination at a department. I also want to determine the number of radiation staff members who are wearing their dosimeter badges correctly (at the prescribed sites), and to categorize user compliance according to gender, age, current job description, (e.g. radiography students, qualified radiographers, registrars, and consultants), and the area they are working in at that particular time of the evaluation.

All data would be entered anonymously. There is no risk of harm associated with the study. The study is voluntary, and refusal to participate will involve no penalty or loss/benefits to which participant is otherwise entitled.

Kind regards

Dr L P Selemela
Principal researcher
0824298600

Appendix D: Participant consent form

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PARTICIPATION CONSENT FORM

RESEARCH TITLE: Spot evaluation of dosimetry complience amongst diagnostic radiology staff in a medical fcility

1. I confirm that I have read and understood the information sheet explaining the above research project and I have had the opportunity to ask questions about the project.
2. I understand that my participation is voluntary and that I am free to withdraw at anytime without giving any reasons and without there being a negative consequence.
3. I understand that my responses will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the the research materials and will not be identified or identifiable in the report that result from the research.
4. I agree for the data collected from me to be used in future research.
5. I agree to take part in the above research project.

_____________________ _________ _____________________

Name of Partcipant Date Signature

_____________________ _________ _____________________

Name of Person taking consent Date Signature