RADIATION SAFETY STANDARDS AT PUBLIC HOSPITALS IN LIMPOPO PROVINCE, SOUTH AFRICA

MASTER OF PUBLIC HEALTH (MPH)

M.R SHIKA

2012

RADIATION SAFETY STANDARDS AT PUBLIC HOSPITALS IN LIMPOPO PROVINCE, SOUTH AFRICA

by

MATSEPANE REBECCA SHIKA

RESEARCH DISSERTATION

Submitted in fulfillment of the requirements for the degree of

MASTER OF PUBLIC HEALTH

In the

FACULTY OF HEALTH SCIENCES
(School of Public Health)

At the

UNIVERSITY OF LIMPOPO

SUPERVISOR: **Dr. M.B.L. Mpolokeng**

CO-SUPERVISOR: **Mr. M.P. Kekana**

2012

DECLARATION

I declare that the mini-dissertation hereby submitted to the University of Limpopo, for the degree of Master of Public Health (degree & field of research) has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

_____ _____

Shika, M.R (Mrs) **Date**

[redacted]

ACKNOWLEDGEMENTS

I would like to thank the following persons for their support and encouragement:

- Dr Mpolokeng my research supervisor
- Mr. Kekana – co-supervisor
- Mrs Olwagen who provided expertise and knowledge in data analysis.
- Dr Maphanga for motivation
- Radiographers for participating in the study
- Radiography district co-ordinators for distributing and collecting questionnaire
- My family and friends especially my husband who is also a librarian for support and assistance in helping me locate numerous literature sources for my study.
- The Department of Health and Social Development for granting me the permission to collect data in all hospitals in Limpopo.

ABSTRACT

RADIATION SAFETY STANDARDS AT PUBLIC HOSPITALS IN LIMPOPO PROVINCE, SOUTH AFRICA

AIM: The aim of the study was to assess compliance to Radiation Safety standards by radiographers at public hospitals in Limpopo Province.

SETTING: Limpopo province

METHOD: A survey in the form of questionnaires was given to 90 radiographers in the public service in Limpopo to complete. Data was captured from questionnaires completed.

FINDINGS: Response rate was 72% (n=65/90).
Respondents were from districts (48%), tertiary (27%) and regional (23%) hospitals. About 46% of radiographers had a university degree and 56% had a diploma qualification. There were 53% with less than ten years experience and 47% with more than ten years experience. About 89% of respondent were Africans.

Radiation safety standards pertaining to the availability and use of gonad shields, lead gloves and thyroid collars were less than 50% in Vhembe, Capricorn and Mopani districts. The radiation safety practices including quality control tests and tools were less than 50% in four districts. There was a significant difference between districts ($F = 5.855$ $df = 4$, $P < 0.005$).

Respondents indicated that the areas of non compliance were attributed to budget constraints (21.5%) and short falls in procurement systems (12.3%).There were significant differences among districts in compliance to radiation safety standards.

Recommendations included committing a budget at provincial level to ensure compliance to radiation safety standards.

DEFINITION OF CONCEPTS AND ABBREVIATIONS

International Commission on Radiological Protection (ICRP)

Is an international body consisting of experts in the fields of radiology, physics, radiation protection, biology, genetics, biochemistry and biophysics functioning to prepare, review and publish recommendations for the promotion of effective radiation protection (Radiation Control Policy, 2000).

IRR 2000 - International Radiation Regulation 2000

The regulation that requires the employer to manage radiation protection of patients, employees and the public (Radiation Control Policy, 2000).

Occupational exposure

All exposures workers receive as a direct and necessary condition of their occupation, business or employment (Hazardous Substance Act 15 of 1973).

Medical exposure

Exposure received by patients as part of their treatment or diagnosis (Safety series no.15, 1996).

Radiation Dose

The amount of radiation absorbed per unit mass of matter. It provides a measure to gauge the potential for biological effects (Robert, A. P. Sharon, A.G. & Benjamin, R.A., 1999).

Dose limitation

Refers to the use of radiation protective clothing as an effective way of reducing radiation dose to the patients (Engel-Hills, 2006).

Optimisation

Means that all exposures should be kept As Low As Reasonable and Achievable (Engel-Hills, 2006).

Equivalent Dose

It is used to stipulate the radiobiological effect of dose as radiation absorbed per unit mass (Robert, A. P. Sharon, A.G. & Benjamin, R.A., 1999).

Stochastic effects

Refers to those that the probability of an effect to occur increases as the radiation dose increases (Robert, A. P. Sharon, A.G. & Benjamin, R.A., 1999).

.

Non - stochastic effects

Refers to those where the severity of the effect increases with the dose (Robert, A. P. Sharon, A.G. & Benjamin, R.A., 1999).

Dose limit

Refers to the maximum dose that a body or any specific part of a body of a member of the public or radiation worker is permitted to receive in a stated period of time. The dose limits ensures that all the dose received is below the threshold

for any biological effect (Hazardous Substances Act 15 of 1973).

Ionising radiation

Any radiation emanating from listed electronic product, capable of producing ions directly or indirectly in its passage through matter (Hazardous Substance Act 15 of 1973).

Personal Radiation Monitoring Device (PRMD)

Is a radiation sensor designed to measure the radiation dose received by a person who is occupationally exposed to radiation over a specified period of time (Hazardous Substance Act, 15 of 1973).

Listed electronic products

Refers to any manufactured product which and when in operation contains or act as part of electronic circuit and emits radiation which may cause injury, ill health or death to human beings (Hazardous Substance Act,15 of 1973; Public Health Bill, 1999).

License

Refers to a legal document issued by the regulatory body granting permission to perform specified activities using listed electronic product in a regulated area (Hazardous Substance Act, 15 of 1973).

Quality assurance program

It is a system of plans, tests, reviews, reports, records and actions of which the purpose is to protect the public and radiation workers from unnecessary exposure to radiation and to reduce the occurrence of misdiagnosis caused by faulty equipment and operator error (Radiation Control Policy, 2000).

S**eal**

Means prohibition from using an electronic product (Hazardous Substance Act, 15 of 1973).

Members of public

Any person in the population (Hazardous Substance Act, 15 of 1973).

TABLE OF CONTENTS

CHAPTER 3: METHODOLOGY

CHAPTER 4: RESULTS

CHAPTER 5: DISCUSSION, CONCLUSION AND RECOMMENDATION

7 APPENDICES

7.1 APPENDIX 1: Data collection tool (Questionnaire).

7.2 APPENDIX 2: Copy of Permission to conduct study and collect data from the Department of Health and Social Development

7.3 APPENDIX 3: Copy of Ethical clearance letter from University of Limpopo.

List of figures **Page**

List of tables **Page**

CHAPTER 1

1.1 Introduction

This chapter focuses on the introduction, background information, problem statement, research question, aim of study, objectives of the study, motivation of the study and conclusion.

1.2 Background

The discovery of X- rays by Roentgen in 1895 was a great achievement for the medical field. The medical application of x-rays developed and increased dramatically across all medical fields namely, application in dentistry, orthopeadics, surgery and paediatrics for producing body images for diagnostic purpose. X - Radiation is dangerous and yet it is used extensively in medicine. Its use is regulated and monitored to protect staff, patients and general public from the dangers associated with the application of x-rays (Bushong, 2001).

The Hazardous Substance Act 15 of 1973, regulates all the listed electronic products. Institutions apply to the Directorate Radiation Control of the National Department of Health for an authorization which is in the form of licenses. The license authorises institutions to procure, install and use x-ray machines. The license is issued with the conditions and guidelines that have to be satisfied in order to continue using the x-ray machines. Compliance is enforced by inspectors from the Radiation Control Directorate through periodic inspections. Failure to meet these requirements during inspections constitutes a danger to the public and justifies an action of sealing equipment.

The main objective of the Occupational Health and Safety Act, 85 of 1993 is to provide health and safety to employees in the workplace and the people in a community who are affected by the activities around them. The employer is responsible for ensuring that appropriate protective measures are set up and implemented such as safe working environment, protective clothing and radiation monitoring devices. The employees should comply with safety rules and procedures specified by the employer. The employees must adhere to appropriate use of protective clothing and radiation monitoring devices ensuring protection for themselves, the clients and general public from exposure to radiation.

The Public Health Bill of 1999 stipulates that the registrars shall keep a register of hospitals, institutions, premises and places using, keeping, storing or handling hazardous substances. Hospitals shall keep appropriate records regarding the performance of their responsibilities. Radiographers are registered with the registrar as radiation workers. The radiation workers are medically examined before employment and are subjected to annual medical examinations.

The Health Professions Council of South Africa (HPCSA), under the professional code of conduct requires radiographers to protect themselves, the patients, co-workers and the general public from radiation exposure. The Council also expects Radiographers to be involved in continuous professional development to update themselves with professional developments and maintain their skills (Adler & Carlton, 1999; HPCSA, 2006).

Compliance to the radiation safety standards is a concern in the Department of Health in South Africa. Failure to comply was demonstrated by the outcome of inspection done in 2005 and 2006 by the Radiation Control Directorate. Several x-ray machines were sealed in Limpopo (Radiation Control reports, 2006).

The definition of radiation safety for this study will relate to licensing of listed electronic products, availability and use of lead protective clothing and radiation monitoring devices, implementation of quality assurance program and proper management of radiation records. The implication of the definition will indicate how radiographers conduct themselves in the workplace, their knowledge, attitudes, perceptions, ethical values and performance (Limpopo Radiography Service Delivery, 2005).

The radiation protection studies that were conducted overseas (Adam & Smith, 2003) did not explore the challenges faced by radiographers in implementing radiation protection measures. Therefore this study was aimed at investigating compliance to Radiation safety standards in Radiography departments, and evaluates the level of compliance and challenges radiographers face in the implementation of radiation safety standards. Insufficient research in radiography and the fact that the study was never done in Limpopo motivated the conduct of the study.

1.3 Research problem

There is an indication that some Radiography departments in Limpopo are not complying with radiation safety standards. The Directorate Radiation Control inspectors visited some hospitals in Limpopo from April 2006 to July 2009 and confirmed that

some hospitals do not comply with the licensing conditions of x-ray equipments. A number of radiography departments received warning notices and some x-ray machines were sealed until they comply with the licensing conditions. The availability of adequate protective clothing such as lead aprons, thyroid collars, lead gloves, gonad shields, written protocols and quality assurance were also a concern (Radiation Control report, 2006).

The increasing use of radiation has stimulated a concern for potential harmful radiation effects. The complexity of radiography procedures, lack of quality control programme and specific training on radiation protection may result in an occurrence of deterministic effects. The potential for increased stochastic effects is a major public health concern (Efstahopoulus et al., 2006).

There are rapid developments with regard to radiation safety measures that radiographers are expected to comply with. Radiographers are challenged to keep abreast with these developments. The HPCSA is enforcing compulsory continuing professional development for radiographers ensuring that they are updated with new developments in their profession to remain competent (HPCSA, 2006).

1.4 Research question

What is the current status of compliance to radiation safety standards in public hospitals in Limpopo Province?

1.5 Aim of study

The aim of the study was to assess compliance to Radiation Safety standards by Radiographers in the different public hospitals in Limpopo Province.

1.6 Objectives of study

- To generate demographic profile of public service radiographers in Limpopo;
- To evaluate the level of compliance to the implementation of radiation safety standards; and
- To investigate challenges faced by radiographers in the implementation of radiation safety standards.

1.7 Motivation of the study

The motivation to conduct the study was the fact that there were insufficient research in radiography and that the study was never done in Limpopo.

1.8 Significance of the study

Findings of the proposed study will establish level of compliance to radiation safety standards and challenges faced by radiographers in Limpopo public hospitals. Solutions will be suggested and, inputs will be made to assist policy makers of the Department of Health and Social Development.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter is about literature review. Literature review focuses on the introduction, background information, previous research on the subject, radiation safety principles and conclusion.

2.2 Background

Ionising radiation is one of the few cancer- causing agents for which substantial data is available to estimate risk. The epidemiological studies of populations exposed to radiation such as the survivors of the Second World War atomic explosions demonstrated that exposure to radiation has delayed induction of malignancies (Dewey et al., 2005).The increasing use of radiation has stimulated a concern for potential harmful radiation effects**.**

The effects of radiation are classified into stochastic and non-stochastic. Stochastic effects occur where a cell exposed to radiation is modified and over a long period may develop into cancer or genetic mutations. Non - stochastic effects occur when a tissue is exposed to high dose of radiation within a short period of time resulting in death of a cell and delayed cell division, for example skin changes, and gonodal cell damage leading to infertility (Dewey et al., 2005).

The effects of radiation led to the radiation safety statutory regulations that are based on the concern for late effects of radiation to patients, radiation workers and the public. Radiation safety regulations issued include licensing of premises and x-ray machines, registration of radiation workers, monitoring radiation exposure of radiation workers, implementing quality assurance programme, providing protective clothing for patients, staff and public and keeping an appropriate radiation records of staff, patients and x-ray machines (Public Health Bill, 1999).

2.3 Previous research

In a study conducted to evaluate the adequacy of patient data and clinical information transmitted to radiology department by referring clinicians. A number of x-ray request forms were not properly completed. Diagnostic information that justifies x-ray examinations requested was not fully provided. The study concluded that the request forms for radiography procedures were mostly not justified (Triantopoulou et al., 2004).

Another study confirmed that the use of x-radiation without appropriate radiation protection measures cause cancer. The study was used in monitoring Orthopaedic surgeons participating in the use of x- radiation during surgical procedures. The use of x-rays in Orthopaedic surgical practices without appropriate thyroid lead protection resulted in them developing thyroid cancer (Dewey et. al., 2005).

A radiation control study conducted to evaluate the implementation of radiation protection and safety measures such as quality assurance program and methods of dose limitation. The findings were that there was generally poor implementation

of quality assurance program resulting in poor processing conditions of x-ray films which resulted in poor quality radiographs. The researcher concluded that radiation protection measures were not adhered to in radiography workplaces (Horner, 1995).

In a retrospective study conducted to evaluate the availability and utilisation of gonad shielding during x-ray examination of the pelvis. The gonodal shielding during x-ray procedures is an effective way of reducing radiation exposure to reproductive organs. Pelvic radiographs of both males and females were examined in four hospitals (Doolan et al., 2004).

The findings were that radiographs with gonodal protection were malpositioned with bony structures obscured or gonads insufficiently protected. Some hospitals surveyed had inadequate supplies of gonodal shields in the general radiography rooms. The investigation concluded that patients in the hospitals under study received avoidable radiation to the gonads due to malpositioning or omissions during pelvic examinations (Doolan et al., 2004).

2.4 Radiation protection and safety

Radiation protection and safety is based on the principles of justification, optimization and dose limitation. Justification involves the responsibility of the referring doctor to conduct correct assessment and collection of the clinical indications for the requested examination, communicate knowledge of the expected results and the way the results

are expected to influence diagnosis and subsequent patient management (Dewey et al., 2005).

Medical exposure to radiation should follow a principle that no practice involving exposure to radiation should be adopted unless it produces a net benefit to the individual. The risk benefit equation is hard for somatic effects and even harder for hereditary effects. Parents who receive the benefit of being diagnosed and treated properly are at risk of giving birth to children who inherit damaged genes. The manifestations of abnormal genes will be visible in future generations (Engel – Hills 2006; Dewey et al., 2005).

Optimisation involves keeping radiation exposure to the patient and radiation workers to minimum by using appropriate exposure factors and limiting number of repeat exposures. The radiation control of radiation workers is more structured and controlled than in the case of patients where rules and regulations are difficult to standardise. Justifying x-ray requests results in effective management of patients ensuring optimisation of the cost to the benefit ratio (Triantopoulou et al., 2004).

Dose limitation requires the use of protective clothing and shields to limit radiation exposure to body parts. The dose equivalent to individuals shall not exceed the limits recommended for the appropriate circumstances. The exposure of individuals should be subjected to dose limits. The annual whole body Dose Equivalent for occupationally exposed persons is 20msv/year and for members of the public is 1msv/year (Dewey et al., 2005).

Radiation protection of the patient involves medical and technical decisions. Technical decisions (dose limitation and optimisation) involve the actions taken by the radiographer to ensure the selection of appropriate technique, equipment, following a strict administrative procedure, training and efficient storage and retrieval of previous x-ray images to avoid repeat investigations. Quality assurance program needs to be in place to govern and control the administration with respect to radiation dose to the patient. The use of radiation should be regulated and monitored (Engel-Hills, 2006).

.

Medical decisions (justification) involves the actions taken by the clinician to collect data around clinical information and previous x-ray examinations already done and communicate the information to assist radiology staff to decide as to whether or not an examination is necessary and which examination will be the most appropriate (Engel-Hills, 2006).

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter deals with research methodology and focuses on introduction, study site, study design, sampling, data collection, ethical consideration and conclusion.

3.2 Study site

The study was conducted in all x-ray departments of the Department of Health, Limpopo Province, South Africa. Limpopo is one of the nine provinces of South Africa. It shares borders with Mpumalanga, Gauteng, North West, Zimbabwe, Botswana and Mozambique. The capital city of Limpopo is Polokwane. Limpopo consists of five districts namely, Mopani, Vhembe, Sekhukhuni, Waterberg and Capricorn.

The Department of Health and Social Development administers 40 hospitals of which 37 hospitals have x-ray facilities. There are eight in Mopani, seven in Vhembe, seven in Sekhukhuni, seven in Capricorn and eight in Waterberg districts.

3.3 Study design

A quantitative descriptive survey research design was used for this study. According to Punch, (2005), quantitative approach provides information in numerical form and will assist in making comparison between districts and measuring compliance to radiation safety standards.

3.4 Ethical considerations

The Higher degrees Committee of the School of Public Health approved the research proposal, upon which further approval obtained from the University of Limpopo Ethics Committee to conduct the study. Permission was also granted from Department of Health's Ethics Committee to collect data.

Participants were informed about the aims and purpose of the study, that their participation was voluntary and have the right to abstain from participation at any time. Confidentiality of information collected from the participants' was maintained.

3.5 Sampling

The sample of this study included 90 radiographers working in radiography departments of 37 public hospitals. The whole population was used due to its small size. According to Morgan and Krejcie table of sampling, a population of 90 qualifies for a sample size of 73 participants to justify the results. A follow up case study comprising of 10 people was selected randomly from the population to obtain more information on matters that still needed to be clarified.

3.6 Data collection

A self administered questionnaire was used. Section A comprised of questions regarding demographic data and section B comprised of questions about radiation safety standards. Open ended question was added at the end of group of questions

The questionnaires were hand delivered to district coordinators who distributed them to radiographers in their districts. The completed questionnaires where collected and returned within a period of one month. Questionnaires were chosen for this study because they are affordable and feasible.

CHAPTER 4:

RESULTS

4.1 Introduction

The data was gathered by means of questionnaires. The results is hereby analysed and presented according to the objectives of the study. The response rate was 72 %.
(n = 65/90)

4.2 Results

4.2.1 Demographic profile

In this study demography means:-

- Respondents per level of hospital, gender of respondents, race of respondents, qualifications of respondents, age group of respondents and work experience of respondents per district.

4.2.1.1 Respondents per level of hospitals in the district

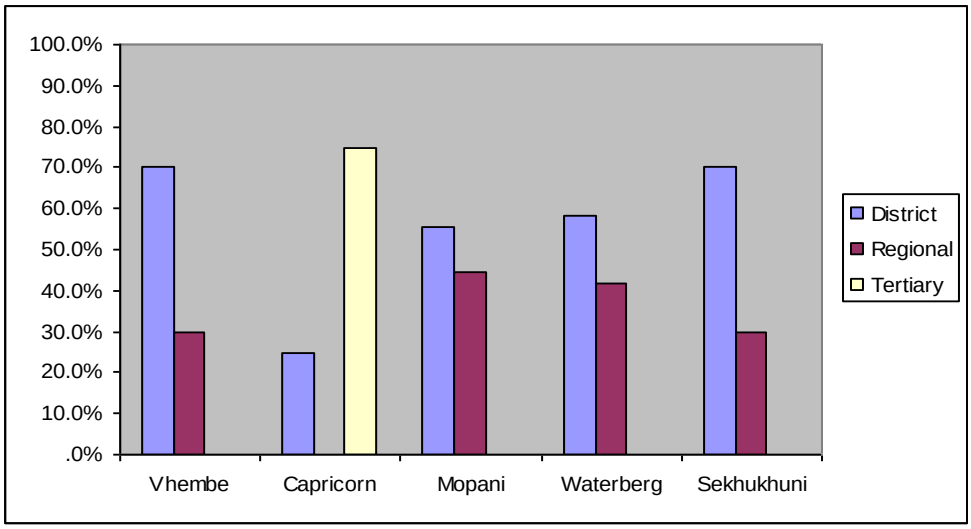

Fig 4.1 Respondents per level of hospitals in the district

Figure 4.1 shows that 75% of the respondents were from the tertiary in Capricorn, 70% from both Vhembe and Sekhukhuni, 60% from Waterberg and 55% from Mopani districts.

4.2.1.2 Gender of respondents per district

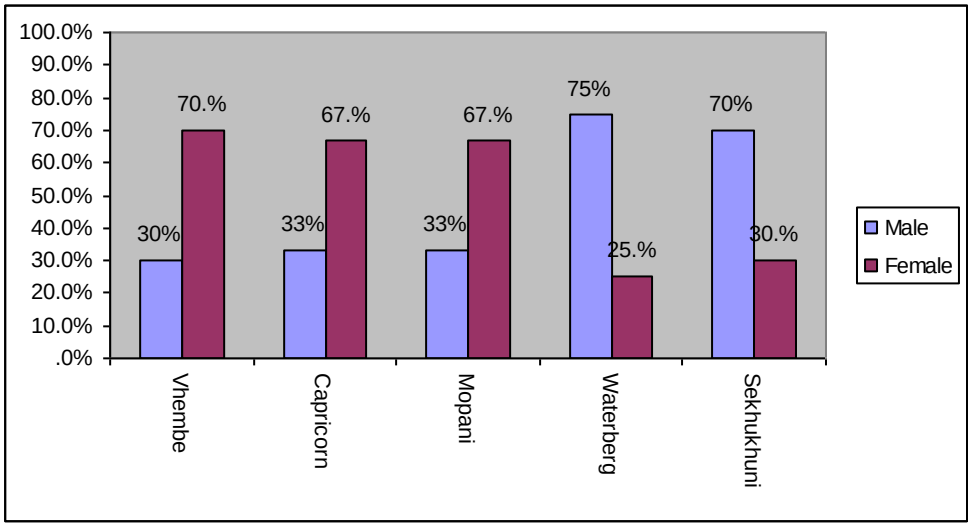

Fig 4.2 Gender of respondents per district

Figure 4.2 show that 75% and 70% of the respondents were males in Waterberg and Sekhukhuni districts respectively. 70% of the respondents were females in Vhembe, 67% females in Capricorn and Mopani respectively.

4.2.1.3 Race groups of respondents per district

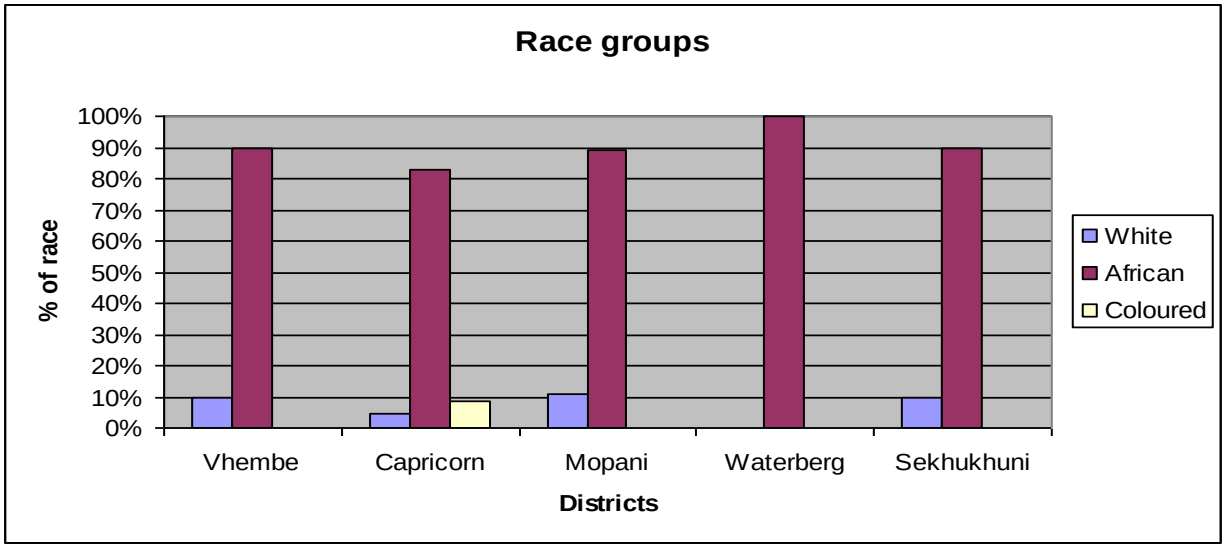

Fig 4.3 Race groups of respondents per district

Figure 4.3 show that greater numbers of respondents were Africans at 100% in Waterberg, 90% in Vhembe and Sekhukhuni, 88.9% in Mopani and 82.6% in Capricorn districts.

4.2.1.4 Qualification of respondents per district

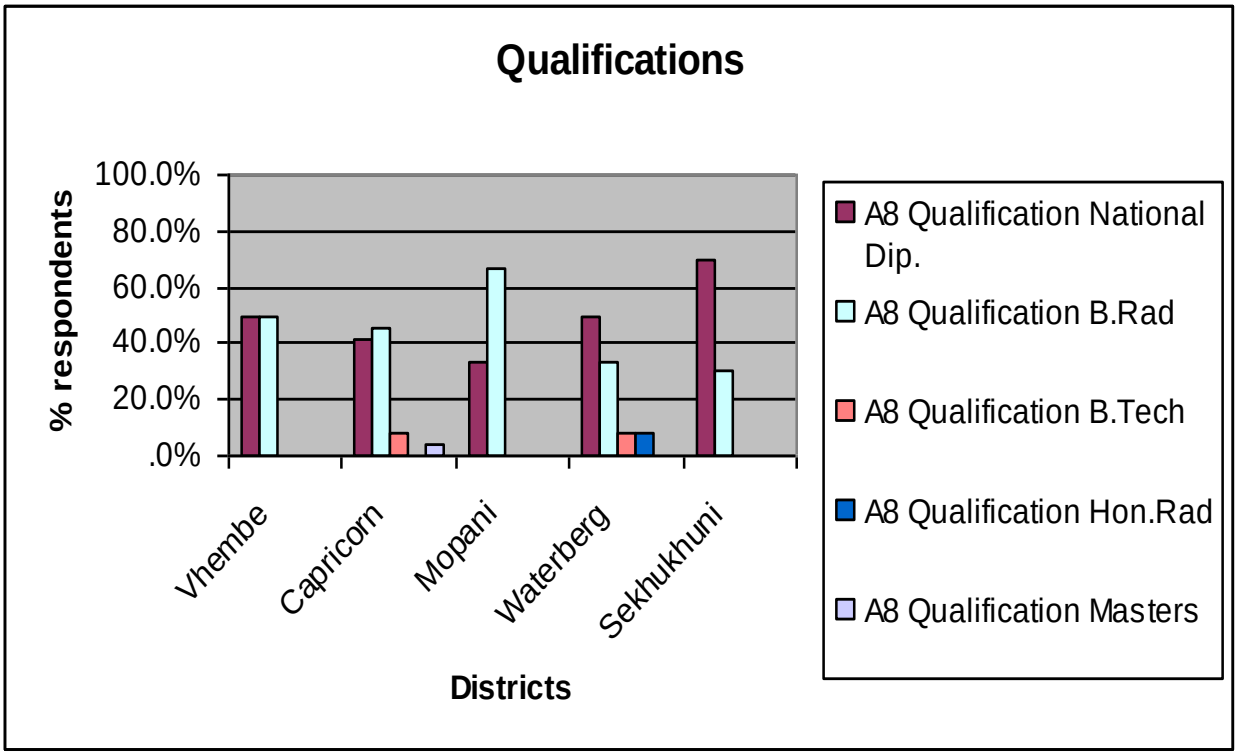

Fig 4.4 Qualification of respondents per district.

Figure 4.4 show that 70% of the respondents had national diplomas in Sekhukhuni and 66, 7% in Mopani. There were equal number of respondents (50%) who had diplomas and degrees in Vhembe district.

4.2.1.5 Age groups of respondents per district

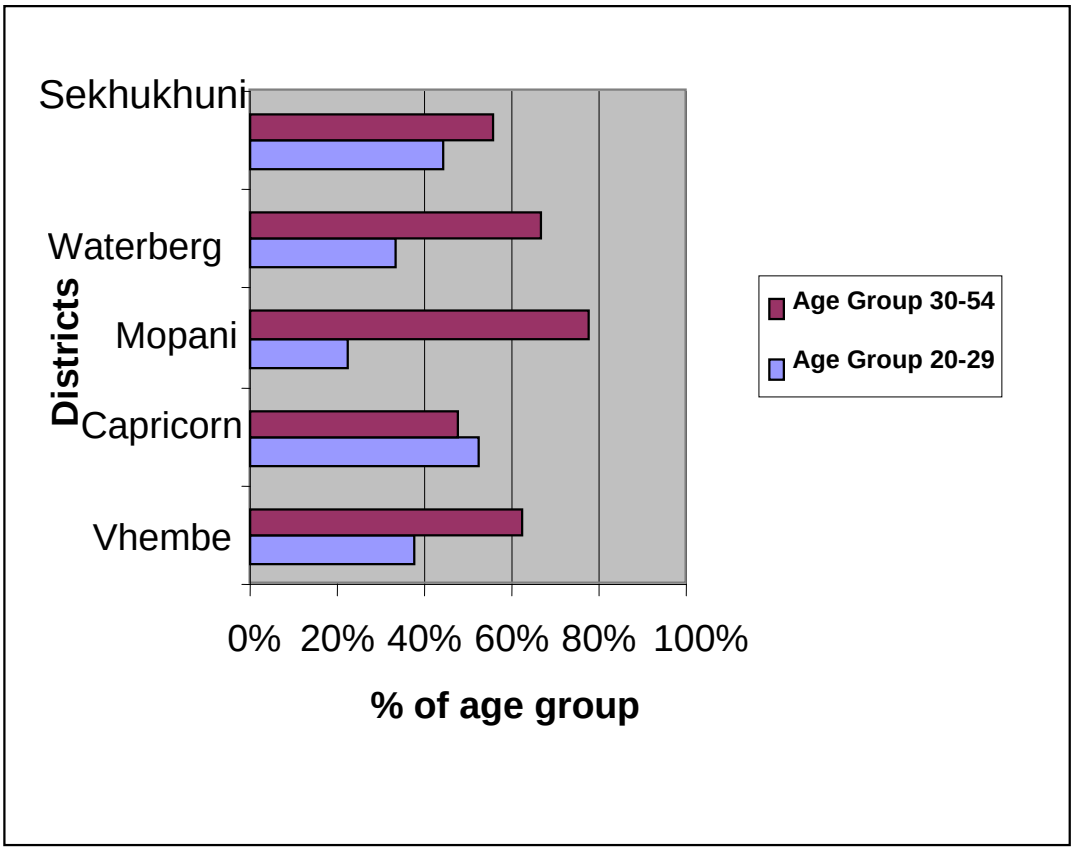

Fig.4.5 Age groups of respondents

Figure 4.5 shows that there were more respondents at age group 30 -54 years in Vhembe (62.5%), Waterberg (66.7%), Mopani (77.8%) and Sekhukhuni (55.6 %.) districts. 52.2% of respondents are at 20-29 age group in Capricorn.

4.2.1.6 Work experience of respondents per district

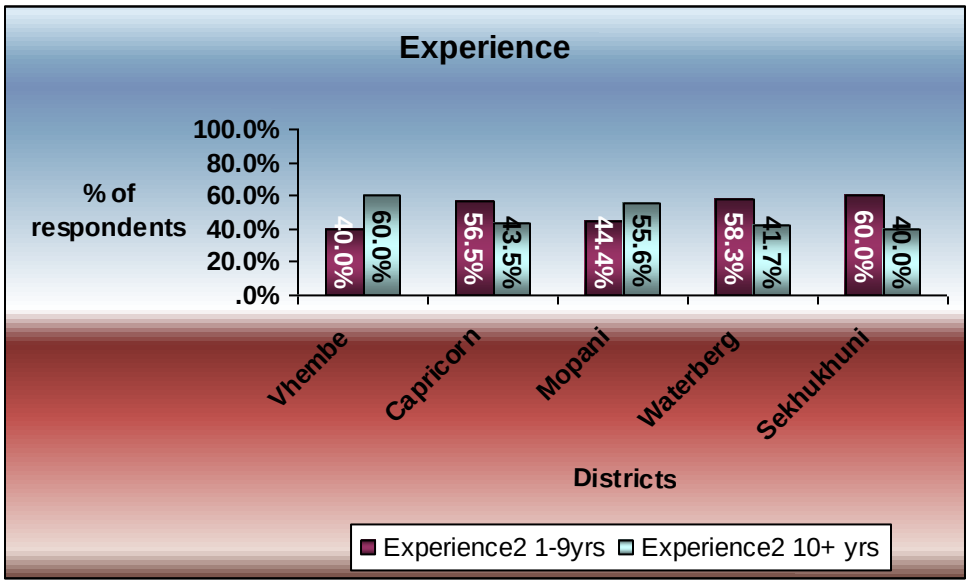

Fig 4.6Work experience of respondents

Figure 4.6 shows that more respondents had 1-9 years experience in Capricorn (56.5%), Waterberg (58.3%) and Sekhukhuni (60%). Respondents with 10+ years of experience were at 60% in Vhembe and 55.6% in Mopani districts.

4.2 Level of compliance to Radiation safety standards

4.2.2.1 Availability of lead protective garments

Table 4.1 shows that the respondents indicated level of the availability of lead protective garments were at an average of 58% gonad shields and lead gloves, 73% lead aprons FB, and 89% lead aprons F, 92% waist aprons and 63% thyroid collars as provincial averages.

The respondents indicated that the availability of lead gloves (22%) and thyroid collars (33.3%) in Mopani and gonad shield 50% in Waterberg were at the lowest.

Table 4.1: Frequency distribution of the availability of lead protective garments

$B1Avail*A3Distr Cross tabulation

			A3 District					
			Vhembe	Capricorn	Mopani	Waterberg	Sekhukhuni	Total
B1 Available	B1.1 Apron FB	Count	9	18	9	8	4	48
		% within A3Distr	90.0%	75.0%	100.0%	66.7%	40.0%	73%
	B1.2 Gonad	Count	4	15	6	6	7	38
		% within A3Distr	40.0%	62.5%	66.7%	50.0%	70.0%	58%
	B1.3 Apron F	Count	6	22	9	12	9	58
		% within A3Distr	60.0%	91.7%	100.0%	100.0%	90.0%	89%
	B1.4 Waist A	Count	9	21	9	12	9	60
		% within A3Distr	90.0%	87.5%	100.0%	100.0%	90.0%	92%
	B1.5 Lead glove	Count	5	18	2	7	6	38
		% within A3Distr	50.0%	75.0%	22.2%	58.3%	60.0%	58%
	B1.6 Thyroid C	Count	5	18	3	9	6	41
		% within A3Distr	50.0%	75.0%	33.3%	75.0%	60.0%	63%
		Average	63.3%	77.8%	64.7%	75%	68%	72.%
Total		Count	10	24	9	12	10	65

Percentages and totals are based on respondents.

4.2.2.2 Usage of lead protective garments

Table 4.2 shows that the respondents indicated that the usage of Apron FB were at 66.7%, Apron F 75%, Waist A 89%, Lead glove 55%, Thyroid 53% and gonad shields 40%.

The usage of lead gloves (33.3%) and thyroid shields (33.3%) in Mopani and gonad shield 20.8% in Capricorn, 44.4% in Mopani and 40% in Vhembe were at the lowest level.

Table 4.2: Frequency distribution of usage of lead protective garments

$B2Use*A3Distr Cross tabulation

			A3 District					
			Vhembe	Capricorn	Mopani	Waterberg	Sekhukhuni	Total
B2 Use	B2.1Apron FB	Count	6	16	9	8	4	43
		% within A3Distr	60.0%	66.7%	100.0%	66.7%	40.0%	66.7 %
	B2.2 Apron f	Count	4	21	5	12	7	49
		% within A3Distr	40.0%	87.5%	55.6%	100.0%	70.0%	75%
	B2.3 Waist A	Count	8	20	9	12	9	58
		% within A3Distr	80.0%	83.3%	100.0%	100.0%	90.0%	89%
	B2.4Lead glove	Count	5	10	3	9	9	36
		% within A3Distr	50.0%	41.7%	33.3%	75.0%	90.0%	55%
	B2.5 Thyroid	Count	3	14	3	8	7	35
		% within A3Distr	30.0%	58.3%	33.3%	66.7%	70.0%	53%
	B2.6 Gonad	Count	4	5	4	7	6	26
		% within A3Distr	40.0%	20.8%	44.4%	58.3%	60.0%	40%
		Average	50%	59%	61%	77.8%	70%	63%
Total		Count	10	24	9	12	10	65

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1

4.2.2.3 Usage of radiation protection principles

Table 4.3 shows that the respondents indicated that the usage of radiation protection principles were at 47.7% optimisation, 80% ALARA, 83% 10 Day rule, 67.7% Inverse square law, 46% justification and 47.7% Optimisation.

Usage of justification in Mopani 22.2% and 43.5% Capricorn, optimization 20% Sekhukhuni and 34.8% Capricorn raised concern.

Table 4.3: Frequency distribution of usage of radiation protection principles

$B3Princ*A3Distr Cross tabulation

			A3 District					
			Vhembe	Capricorn	Mopani	Waterberg	Sekhukhuni	Total
B3 Principles	B3.1 ALARA	Count	8	19	8	11	6	52
		% within A3Distr	80.0%	82.6%	88.9%	91.7%	60.0%	80%
	B3.2 10 day rule	Count	9	20	6	11	8	54
		% within A3Distr	90.0%	87.0%	66.7%	91.7%	80.0%	83%
	B3.3 Inverse law	Count	5	16	6	9	8	44
		% within A3Distr	50.0%	69.6%	66.7%	75.0%	80.0%	67.7%
	B3.4 Justification	Count	5	10	2	8	5	30
		% within A3Distr	50.0%	43.5%	22.2%	66.7%	50.0%	46%
	B3.5 Optimize	Count	6	8	6	9	2	31
		% within A3Distr	60.0%	34.8%	66.7%	75.0%	20.0%	47.7%
	B3.6 Support	Count	5	13	7	10	5	40
		% within A3Distr	50.0%	56.5%	77.8%	83.3%	50.0%	61.5 %
		Average	63%	62%	64.8%	80.5%	56.7%	64%
Total		Count	10	23	9	12	10	64

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

4.2.2.4 Usage of safety techniques

Table 4.4 shows that the respondents indicated that the usage of safety techniques such as collimation 83%, communication 90.7%, High Kilo Voltage 83%, exposure chart 69.2% and Film- screen combination 86.2%.The usage of exposure charts (41.7%) in Capricorn was at the lowest.

Table 4.4 Frequency distribution of usage of safety techniques

B4Tech*A3Distr Cross tabulation

			A3 District					
			Vhembe	Capricorn	Mopani	Waterberg	Sekhukhuni	Total
B4 Techniques	B4.1Collimation	Count	9	15	9	11	10	54
		% within A3Distr	90.0%	62.5%	100.0%	91.7%	100.0%	83%
	B4.2 Communicate	Count	8	20	9	12	10	59
		% within A3Distr	80.0%	83.3%	100.0%	100.0%	100.0%	90.7%
	B4.3 High KV	Count	8	17	9	11	9	54
		% within A3Distr	80.0%	70.8%	100.0%	91.7%	90.0%	83%
	B4.4 Exp. chart	Count	8	10	8	9	10	45
		% within A3Distr	80.0%	41.7%	88.9%	75.0%	100.0%	69.2%
	B4.5 F/S comb	Count	7	20	9	10	10	56
		% within A3Distr	70.0%	83.3%	100.0%	83.3%	100.0%	86.2%
	B4.6 Support	Count	7	14	9	12	10	52
		% within A3Distr	70.0%	58.3%	100.0%	100.0%	100.0%	80%
		Average	78%	66.7%	98%	90%	98%	82%
Total		Count	10	24	9	12	10	65

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

4.2.2.4 Availability of Quality Assurance tool

Table 4.5 shows that the respondents indicated that the availability of quality control test tools were Densitometer 98%, Sensitometer 98%, Wire-mesh 47.7%, beam alignment 40% and focal spot 29%.

Availability of wire-mesh, Alignment and focal spot were at the lowest in Capricorn, Waterberg, Mopani and Vhembe districts.

Table 4.5: Frequency distribution of availability of QA tools

B5Tool*A3Distr Cross tabulation

			A3 District					
			Vhembe	Capricorn	Mopani	Waterberg	Sekhukhuni	Total
B5 Tools	B5.1 Densitometer	Count	10	23	9	12	10	64
		% within A3Distr	100.0%	95.8%	100.0%	100.0%	100.0%	98.2 %
	B5.2 Sensitometer	Count	9	24	9	12	10	64
		% within A3Distr	90.0%	100.0%	100.0%	100.0%	100.0%	98.2 %
	B5.3 Wire mesh	Count	4	12	1	5	9	31
		% within A3Distr	40.0%	50.0%	11.1%	41.7%	90.0%	47.7 %
	B5.4 Alignment	Count	4	9	1	4	8	26
		% within A3Distr	40.0%	37.5%	11.1%	33.3%	80.0%	40%
	B5.5 Focal spot	Count	3	4	0	5	7	19
		% within A3Distr	30.0%	16.7%	.0%	41.7%	70.0%	29.2 %
		Average	50%	50%	37%%	52.8%	73%	52.%
Total		Count	10	24	9	12	10	65

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

4.2.2.5 Quality control tests

Table 4.6 shows the respondents indicated that the quality control tests performed were sensitometry (93%), Reject film analysis (95.4%), Coincidence (73.9%), Safelight (8.5%) and film storage (52.3%).

Film storage test in Capricorn (41.7%) and Sekhukhuni (40%) were at the lowest level.

Table 4.6: Frequency distribution of Quality control tests

$B6Activ*A3Distr Cross tabulation

			A3 District					
			Vhembe	Capricorn	Mopani	Waterberg	Sekhukhuni	Total
B6 Activities	B6.1 Sensitometry	Count	9	24	9	11	8	61
		% within A3Distr	90.0%	100.0%	100.0%	91.7%	80.0%	93.9 %
	B6.2 RFA	Count	10	22	9	12	9	62
		% within A3Distr	100.0%	91.7%	100.0%	100.0%	90.0%	95.4 %
	B6.3 Coincide	Count	7	17	6	8	10	48
		% within A3Distr	70.0%	70.8%	66.7%	66.7%	100.0%	73.9 %
	B6.4 Safe light	Count	8	19	7	8	9	51
		% within A3Distr	80.0%	79.2%	77.8%	66.7%	90.0%	78.5 %
	B6.5 Film storage	Count	6	10	7	7	4	34
		% within A3Distr	60.0%	41.7%	77.8%	58.3%	40.0%	52.3 %
		Average	66.7%	63.9%	70%	63.9%	66.7%	65.7 %
Total		Count	10	24	9	12	10	65

4.2.2.7 Descriptive statistic on compliance to safety practices per district

Table 4.7 shows the Mean, standard deviations, standard errors, confidence interval of all districts. Standard deviations measure the variance around the means. Waterberg shows the highest mean compliance(X = 65.83) followed by Mopani (X = 65.78) Vhembe (X = 63.50) Sekhukhuni (X = 61.60) and Capricorn (X = 54.42).

Table 4.7: Mean scores of compliance to radiation safety among the districts

Descriptive

Practice Tot

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Maxim
					Lower Bound	Upper Bound		
Vhembe	10	63.50	8.515	2.693	57.41	69.59	42	73
Capricorn	24	54.42	7.360	1.502	51.31	57.52	44	70
Mopani	9	65.78	11.211	3.737	57.16	74.40	48	76
Waterberg	12	65.83	4.707	1.359	62.84	68.82	57	72
Sekhukhuni	10	61.60	10.024	3.170	54.43	68.77	44	73
Total	65	60.60	9.382	1.164	58.28	62.92	42	76

4.2.2. Comparison of practices between and within districts

The comparison between districts of compliance to the radiation safety practices demonstrated a significant mean difference between them (F = 5.855 df = 4, P < 0, 05).

Table 4.8 ANOVA test for comparison between districts on compliance to radiation safety practices.

Practice Tot	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1581.644	4	395.411	5.855	.000
Within Groups	4051.956	60	67.533		
Total	5633.600	64			

4.2.2.9 Post Hoc Test for multiple comparisons between districts

The comparisons between districts of the results from respondents about radiation safety standards demonstrate the significant differences between them. There is a significant differences between Vhembe and Capricorn with P value = 0.047.

Table 4.9 Post Hoc Test for multiple comparisons between districts

(I) A3 District	(J) A3 District	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Vhembe	Capricorn	9.083*	3.093	.047	.07	18.10
	Mopani	-2.278	3.776	1.000	-13.28	8.73
	Waterberg	-2.333	3.519	1.000	-12.59	7.92
	Sekhukhuni	1.900	3.675	1.000	-8.81	12.61
Capricorn	Vhembe	-9.083*	3.093	.047	-18.10	-.07
	Mopani	-11.361*	3.212	.008	-20.72	-2.00
	Waterberg	-11.417*	2.905	.002	-19.88	-2.95
	Sekhukhuni	-7.183	3.093	.236	-16.20	1.83
Mopani	Vhembe	2.278	3.776	1.000	-8.73	13.28
	Capricorn	11.361*	3.212	.008	2.00	20.72
	Waterberg	-.056	3.624	1.000	-10.62	10.51
	Sekhukhuni	4.178	3.776	1.000	-6.83	15.18
Waterberg	Vhembe	2.333	3.519	1.000	-7.92	12.59
	Capricorn	11.417*	2.905	.002	2.95	19.88
	Mopani	.056	3.624	1.000	-10.51	10.62
	Sekhukhuni	4.233	3.519	1.000	-6.02	14.49
Sekhukhuni	Vhembe	-1.900	3.675	1.000	-12.61	8.81
	Capricorn	7.183	3.093	.236	-1.83	16.20
	Mopani	-4.178	3.776	1.000	-15.18	6.83
	Waterberg	-4.233	3.519	1.000	-14.49	6.02

*. The mean difference is significant at the 0.05 level

4.2.3 Challenges faced by radiographers

In an open ended question, respondents were asked to give reasons for the area of non compliance. The respondents indicated that (40%) non compliance is due to lack of funds to procure the required items and (22.9%)indicated that non compliance was due to lack of knowledge in the procurement process.

Table 4.10 Challenges faced by radiographers

B1.7 Explain					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Nonsense	13	20.0	37.1	37.1
	Money	14	21.5	40.0	77.1
	Knowledge	8	12.3	22.9	100.0
	Total	35	53.8	100.0	
Missing	System	30	46.2		
Total		65	100.0		

4.24 Conclusion

In this chapter, data was analysed and presented. Descriptive statistic was used. Data from questionnaires were analysed and presented in tables or illustrated by means of column graphs.

CHAPTER 5

DISCUSSION LIMITATIONS CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

Research findings are summarised and presented within the framework of the research objectives. The aim of the study was to assess compliance to Radiation Safety standards by radiographers at public hospitals in Limpopo Province.

5.2.1 Demographic Profile of respondents

The demographic profile will assist the researcher to establish as to whether gender, work experience, age and qualification influences compliance to radiation safety standards.

5.2.2 Level of compliance to radiation safety standards

5.2.2.1 Lead protective garments

a. Availability

Provincial average of availability lead protective garments was at 72%. Districts availability was at Mopani at 64.7%, Vhembe at 63%, Capricorn at 77.8%, and Waterberg at 75% and Sekhukhuni at 68%. There was a need to procure gonad shields, lead gloves and thyroid collars for Vhembe, Mopani, and Apron FB for Sekhukhuni districts.

b. Usage

Provincial average usage of lead protective garments was at 63%. District usages were at 61% in Mopani, 50% Vhembe, 59.7% Capricorn, 77% Waterberg and 70% Sekhukhuni. There is a need to sensitise radiographers in Capricorn, Vhembe, and Mopani to use gonad shield, Capricorn and Mopani to use lead gloves, Vhembe and Mopani to use thyroid collars and Sekhukhuni to use Apron FB.

The provincially availability of lead protective garments were at 72% and use at 63%. The difference indicated that radiographers were not taking effort to protect patients during radiography procedures. Radiographers have ethical responsibility to make sure that lead protective garments are available and are used at all times to protect patients and public from primary radiation, especially sensitive parts of the body such as reproductive organs, thyroid glands and hands.

These findings are in agreement with the findings of other researchers (Doolan, 2004) where availability and use of gonad shielding were inadequate in hospitals in Dublin, lead gloves and thyroid collars (Dewey 2005) were often omitted and orthopaedic surgeons developed thyroid cancer due to exposure to radiation.

According to Radiation Control policy, (2000) lead garments should be available and be used to protect patients, staff and public from radiation exposure. The most radio sensitive parts of the body to be protected at all times include reproductive organs, thyroid glands and hands.

5.2.2.2 Application of radiation safety principles.

Provincial average was 64% application of radiation safety principles. The district averages were as follows Vhembe 63.3%, Capricorn 62%, Mopani 64.8%, Waterberg 80.5% and Sekhukhuni 56.7%. Justification of studies at both Mopani and Capricorn is of greatest concern.

Justification of radiographic studies provide assurance to the radiographer that the examination requested was the best for demonstrating the condition indicated on the clinical history provided. When x-ray examination requests are not justified means that some of the studies that will be performed are not necessary and radiation optimisation and dose limitation is compromised. Radiographers must enforce the justification of examinations requested in both Mopani and Capricorn districts.

Radiation safety principles such as ALARA, Ten day rule, Inverse square law, Justification and optimisation are recommended by ICRP in publication 26 and 60.

5.2.2.3 Application of radiation safety techniques.

The usage of communication, effective collimation, high KV technique, exposure charts, film screen combination and support minimise radiation dose to the client, public and health workers (Penelope Engel – Hills, 2005).

Provincial average was at 82% and districts average were as follows:- Vhembe 78%, Capricorn 66.7%, Mopani 98%, Waterberg 90% and Sekhukhuni 98%. Use of exposure charts was below 50% in Capricorn.

The use of exposure charts will ensure that radiographs of each patient taken on different days have the same standard of quality. Comparing them during follow up treatments will be easier and minimise radiation dose to patients due to repeat examinations.

5.2.2.4 Availability 0f Quality assurance tools

Provincial average was 52.7% and the districts average are as follows Vhembe 50%, Capricorn 50%, Mopani 37%, Waterberg 52.8% and Sekhukhuni 73%.

Quality control assurance tools are recommended by the Radiation control directorate in order to perform the compulsory tests for compliance that are stipulated as part of licensing conditions of listed electronic products (Code of practice for users of medical equipment, 2009).

5.2.2.5 Quality control tests

Provincial average was 65,7% performance of quality control tests. The district means are as follows Vhembe 66%, Capricorn 63%, Mopani 70%, Waterberg 63.9% and Sekhukhuni 66.7%.

Radiation control tests of equipment shall be performed as prescribed in the licensing conditions (Code of practice for users of medical equipment, 2009). Failure to perform the required quality control tests suggested that safety measures were not adhered to.

Quality control tests must be done to ensure that the equipments operate within safety limits before subjecting patients to radiation exposure.

5.2.2.6 Inspections

Inspectors from Radiation Control directorate visit institutions for inspections every 5 years. Licensing conditions are updated on a regular basis and new licences are issued with amended conditions to inform license holders. The licence holder is responsible for all the statutory requirements and compliance with the conditions specified in the license (Public Health Bill, 1999 and Hazardous Substance act, 1973).

5.2 Limitations

According to Burns and Groove (1993) limitations of the study are restrictions that result in negative effect on the generalisations of findings.

- The results of this study are limited to public hospitals of Limpopo
- The findings are limited to the period in which the study was conducted
- Some participants omitted some questions provided especially
- Some participants did not return completed questionnaires

5.3 Conclusions

The findings of compliance and non compliance in certain elements of the Radiation Safety standards in all districts suggest that:-

- Level of compliance to radiation safety standards was not influenced by any of the demographics.
- Each district has areas where they comply and areas where improvement is required.

The overall practice of radiographers' performance mean in relation to Radiation Safety standards of all districts were below 66% compliance level. See table 4.7 on page 25. According to the findings of the survey conducted, the researcher concluded that the level of compliance to radiation safety standards at public hospitals in Limpopo is at the level below 66%.

5.4 Recommendations

The data collected were comparing the districts and non compliance was evident in all districts, the researcher recommends the following:-

- To encourage further research to follow up on the analysis of results and recommend ways to deal with deficiencies identified in all districts.
- To suggest commitment of a budget provincially specifically for ensuring procurement of quality control tools and lead protective garments to improve compliance.
- To suggest to policy makers the need to outsource a technically professional quality control consultant accredited by SANAS to perform and supervise all quality control tests.
- Suggest quality improvement plan that will monitor, enforce and evaluate all areas of concern such as usage of lead protective garments, justification of x –ray examinations requested and other areas that require improvement.
- To encourage development of ways to enforce discipline – to regulate behaviour and induce commitment to perform according to professional norms and standards for accomplishing obligations effectively and efficiently (Becker, 1994).

REFERENCES

Adams, B.A. and Smith, T. 2003. Qualitative methods radiography research: proposed Framework. Elsievier Science Ltd Australia.

Adler, A.M & Carlton, R.R. 1999, Introduction to Radiography & Patient care. 2nd Ed. WB Saunders Co. Philadelphia.

Becker, L. 1994. Members strive diligently to fulfill aims South African Medical and Dental Council Bulletin.

Brink, H.I.L. 1990. Statistic for nurses, Pretoria, Academia.

Bushong, S.C. 2001. Radiologic Science for Technologist: Physics, Biology, and Protection, 7th Ed. St. Louis, Missouri: Mosby, Inc.

Burns, N & Grove, SK. 1997. The practice of nursing research: Conduct, critique and utilization. 3rd Ed. Philadelphia: Saunders.

Dewey, P. George, S. & Gray, A. 2005. Ionising radiation and orthopaedics. Elsievier Ltd Australia

Doolan, A. Brenman, P.C. Rainford, L.A. & Healy, J. 2004. Gonad protection for the antero-posterior projection of the pelvis. Elsievier Ireland.

Efstathopoulos, E.P. Brountzos, E.N. & Alexopoulou. E. 2006. Patient radiation exposure measurements during interventional procedures, Elsievier Ltd .Australia.

Engel-Hills, P. 2006. Radiation protection in medical imaging. Elsievier Ltd .Australia. 32

Frederick , L. 2006. Statistics: A gentle introduction, 2nd Ed. U.S.A. Sage publications, Inc.

Hazardous Substance Act 15 of 1973

Health Professional Council of South Africa; Radiographers Ethical Guideline for Good Practice, 2006.

Horner, K, Radiation protection in dental radiology, Br J Radiol 67(1994),

Limpopo Radiography Service Delivery Final draft policy; 2005.

Martin, J.G. & Douglas, G.A. 1995. Statistic with confidence, Great Britain. The University Press Ltd.

Occupational Health and Safety Act 85 of 1993.

Public Health Bill, 1999

Radiation Control policy, 2000.

Punch,K.F. 2005. Introduction to Social Research, SAGE publication Great Britain.

Radiation Control reports: 2006.

Radiation Safety series No. 15 of 1996, Vienna.

Robert, A. P. Sharon, A.G. & Benjamin, R.A. 1999. Typical Patient Radiation Doses in Diagnostic Radiology. RSNA.

Triantopoulou, C. Tsalafoutas, P. & Maniatis, D 2004. Analysis of radiological examination request forms in conjunction with justification of X-ray exposures Elsievier Ltd .Australia.

APPENDIX 1

QUESTIONNAIRE

SECTION A: DEMOGRAPHIC DATA

Select the appropriate answer and mark with an "✓"

1. What is the Name of the hospital?

2. Hospital Type? ❑District
   ❑Regional
   ❑Tertiary

3. In which District is this hospital situated? ❑Vhembe ❑Capricorn
   ❑Mopani ❑ Waterburg ❑Sekhukhuni

4. What is your gender? ❑Male
   ❑Female

5. How old are you? _____yrs

6. What is your race? ❑White
   ❑African
   ❑Coloured
   ❑Indian
   ❑Other (specify)_____

7. How many years have you worked as a radiographer? _____yrs

8. Which highest qualification in radiography do you have?
   ❑ National Diploma
   ❑ B. Diagn. Radiography
   ❑ B.Tech. in radiography
   ❑ Hon. in Radiography
   ❑ Masters in radiography

SECTION B: RADIATION SAFETY STANDARDS

1. Which of the following lead protective garments are available in this hospital?		
Lead aprons full front and back	Yes	No
Gonad shields	Yes	No
Lead aprons full front	Yes	No
Waist aprons	Yes	No
Lead gloves	Yes	No
Thyroid collars	Yes	No
Gonad shields	Yes	No
Explain why you have some and not others		

2. Which of the following lead protective garments do you use in this hospital?		
Lead aprons full front and back	Yes	No
Lead aprons full front	Yes	No
Waist aprons	Yes	No
Lead gloves	Yes	No
Thyroid collars	Yes	No
Gonad shields	Yes	No
Explain why you use some and not others		

3. Which of the following basic principles of radiation protection is used in this hospital?		
ALARA	Yes	No
10 day rule	Yes	No
Inverse square law	Yes	No
Justification	Yes	No
Optimization	Yes	No
Does your working environment support the application of principles?	Yes	No

4. Which of the following radiation protection techniques do you employ in this hospital?		
Accurate collimation	Yes	No
Effective communication	Yes	No
High Kilo voltage technique	Yes	No
Adherence to exposure charts	Yes	No
High speed film screen combination	Yes	No
Does your working environment fully support the application?	Yes	No

5. Which of the following quality control tools are available in this hospital?		
Densitometer	Yes	No

Sensitometer	Yes	No
Wire-mesh	Yes	No
Beam alignment test tool	Yes	No
Focal spot test tool	Yes	No
How often are you using these quality control tools available in your hospital?		

6. Are you able to perform the following quality control activities and interpret the results?

Sensitometry	Yes	No
Reject Film analysis	Yes	No
Coincidence of x-ray field and collimator light beam	Yes	No
Safelights test	Yes	No
Test for film storage conditions	Yes	No
Mention the use of one test mentioned above		

Indicate the extent to which you agree or disagree with the following statements concerning practices. Use the following scale:

1 = Strongly disagree	2 = Disagree	3 = Don't know	4 = Agree	5 = Strongly Agree

7. Screening time spent on a patient during fluoroscopic examinations is always recorded.	1	2	3	4	5
8. Staff members present during fluoroscopy examinations always wear lead aprons.	1	2	3	4	5
9. Surgeons operating a patient using fluoroscopy procedure always wear thyroid shields.	1	2	3	4	5
10. Pregnant patients are done procedures using fluoroscopy	1	2	3	4	5
11. Pregnant radiographers are allowed to perform procedures using fluoroscopy.	1	2	3	4	5
12. All radiation workers in this hospital are registered with the Radiation Protection Services.	1	2	3	4	5
13. Radiation workers are issued with the radiation monitoring devices monthly.	1	2	3	4	5
14. There is sufficient space to keep patient radiation records.	1	2	3	4	5
15. There are sufficient shelves to file radiation records.	1	2	3	4	5
16. Radiation records of staff are kept for a lifetime.	1	2	3	4	5
17. Continuous professional Development program addresses quality control skills.	1	2	3	4	5
18. Radiographers in this hospital have necessary skills to implement quality control measures.	1	2	3	4	5
19. Patients are provided with lead protective clothing during radiography.	1	2	3	4	5
20. Other people in wards are warned during radiation exposure	1	2	3	4	5

to move away from the radiation source.					
21. The total number of exposures given during radiography are recorded on all request forms	1	2	3	4	5
22. Patient radiation records are available during follow-up consultation	1	2	3	4	5

23. Quality control tests on general x –ray equipment in this hospital are done as follows:-					
23.1 Visual inspection report is done monthly	1	2	3	4	5
23.2 Light beam alignment test is done quarterly	1	2	3	4	5
23.3 Quality assurance tests are done annually	1	2	3	4	5

24. Radiation records of patients in this hospital are kept for ----------Years					
25. Which of these forms are applicable for licensing a new x-ray machine?	RC001	RC002	RC007	RC008	RC009
	1	2	3	4	5
26. Which of these forms are applicable for de-licensing a new x-ray machine?	1	2	3	4	5
27. Which of these forms are used to register radiation workers?	1	2	3	4	5

28. How many x-ray machines in this hospital are sealed and why?					
29. What is the status of your hospital according to the latest Radiation control report	Do not know	Do not comply	Partially comply	Almost comply	comply
	1	2	3	4	5
30. Densitometer and Sensitometer are the only tools important in quality control of	X-ray unit	Printer	Mobiles	Film	Processor
	1	2	3	4	5
31. When did you last attend a course focusing on radiation protection and safety during your employment?	Never	A month	A year	5years	+ 5 years
	1	2	3	4	5

Thank you for participating in this study.

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT

ETHICS COMMITTEE
CLEARANCE CERTIFICATE
UNIVERSITY OF LIMPOPO
Polokwane/Mankweng Hospital Complex

UNIVERSITY OF LIMPOPO

PROJECT NUMBER: 073/2008

TITLE: Radiation Safety Standards at Public Hospitals in Limpopo Province, South Africa

RESEARCHER: Shika Matsepane Rebecca

ALL PARTICIPANTS: N/A

School of Public Health
Faculty of Health Sciences
University of Limpopo

Supervisor: DR M.B.L. Mpolokeng

Co supervisor: Mr M.P. Kekana

Date considered: 16.02.2009
Decision of Committee: Recommended for Approval

Date: 20.02.2009

Prof. A.J. Mbokazi

Chairman of Pietersburg Mankweng
Hospital Complex Ethics Committee

Note: The budget for research has to be considered separately. Ethics Committee is not providing any funds for projects.

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT

Enquiries: Ramalivhana NJ/Malomane EL

Ref: 4/2/2

9 March, 2009

Shika Matsepane Rebecca
Faculty of Health sciences
University of Limpopo

Dear Shika Matsepane Rebecca

"Radiation safety standards at public hospitals in Limpopo Province, South Africa"

Permission is hereby granted to Shika Matsepane Rebecca to conduct a study **at public hospitals in Limpopo Province, South Africa**

The Department of Health and Social Development will expect a copy of the completed research for its own resource centre after completion of the study.

- The researcher is expected to avoid disrupting services in the course of his study
- The Researcher/s should be prepared to assist in interpretation and implementation of the recommendations where possible
- The Institution management where the study is being conducted should be made aware of this,
- A copy of the permission letter can be forwarded to Management of the Institutions concerned

HEAD OF DEPARTMENT
HEALTH AND SOCIAL DEVELOPMENT
LIMPOPO PROVINCE