# The level of compliance with the use of personal radiation monitoring devises by qualified radiographers at Provincial hospitals in the city of Tshwane

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## Abstract

When researchers accompanied radiography students during their work integrated learning, it was observed that there is non-compliance with regards the use of personal radiation monitoring devices by radiographers in the Radiology Departments at Provincial hospitals in the Tshwane district area. The aim of this research study was to identify the level of compliance with the use of radiation monitoring devices by radiographers. A quantitative descriptive study method was used, and the data collection tool was questionnaires that were hand delivered to all settings. The sample size of radiographers was 96, and consent was received from 61 participants. The data was collated in a Microsoft Excel® spreadsheet, and the variables were statistically analyzed for frequencies and percentages. The Fisher's exact test was used for association to answer the level of compliance and management of the radiation monitoring device. Results showed compliance of radiographers in the wearing of radiation monitoring devices but inconsistency as to where the radiation monitoring device should be worn. A lack of awareness about policies from the Radiation Board was also noted.

*Keywords: Radiation dose, radiation monitoring device, radiation protection,* compliance

## INTRODUCTION

Occupational dose is the amount of radiation dose received by a radiation worker in the working environment, where work involves being exposed to ionizing radiation or a radioactive material. Occupational dose is monitored using a personal radiation monitoring device. The effective dose system is used to calculate the occupational dose limit (Nomura et al. 2015). The unit of measurement used to report the amount of radiation received is mSv (millisievert). The Department of Health prescribed the following whole body dose limits for occupational exposure: An effective accumulated dose of 20 mSv per year, averaged over a period of 5 years and a maximum of 50 mSv accumulated in any 1 year (Ehrlich and Coakes 2017). An annual equivalent dose should be to the skin at 500 mSv; the hands and feet at 500 mSv. The dose on the lens of the eye should be 20 mSv per year, averaged over defined periods of 5 years (Cantone et al. 2017). These limits must be read in conjunction with International Commission on Radiological Protection (ICRP) Report 60 and the Regulations Relating to Group IV Hazardous Substances (Government Notice R247 of 26 February 1993) (Ehrlich and Coakes 2017).

For occupational dose measurements to be effective as well as efficient, radiographers should adhere to wearing personal radiation monitoring devices at all times when performing radiation work in their work places and return them within the recommended wearing period. In South Africa, radiographers and other personnel who are exposed to radiation wear a TLD radiation monitoring device (Panasonic UD-8023AT) that is placed in a clear sealed plastic bag.

The personal radiation monitoring devices allocated to a person are to be worn by that person only (Ehrlich and Coakes 2017). Different color codes are used for wearing periods, so that the replacement radiation monitoring device will have a different color label from the one it is replacing. This is a visual management tool to aid in the exchange of radiation monitoring devices and compliance. A new radiation monitoring device for the next wearing period is issued in advance and should reach the wearer before the end of the current wearing period.

In South Africa, the overall regulation of electronic products falls under the control of the directorate for Radiation Control within the National Department of Health (DoH) (Hazardous substance Act 15 of 1973). The Radiation Control is guided by the Codes of

Practice of Electronic Products (Hazardous substance Act 15 of 1973). The Hazardous Substance Act of 1973 is the legislative document providing the framework for hazardous substance control. Radiation protection is emphasized in the Code of Practice in the Radiation Control Directorate of the National Department of Health (DoH). Radiation protection principles are based on justification of the practice, optimization of protection by keeping the occupationally exposed doses and that of patients to the as low as reasonably achievable (ALARA) principle.

Studies have shown that problems concerning radiation assessment and safety for diagnostic radiographers occur due to a lack of standardized orientation on radiation. New radiation workers, for example student radiographers, require a thorough and formal radiation orientation before they engage in radiography practice, where they are exposed for the first time to the use of personal radiation monitoring devices and other radiation protection tools (Van Der Merwe 2014).

Studies done on personal radiation monitoring of radiographers in government hospitals in Africa showed non-compliance with the international monitoring standards (Van Der Merwe 2014). Observations showed that most radiographers did not comply with the wearing periods due to long delays that occurred before collection of personal radiation monitoring devices for data analysis (Modiba 2014; Botwe et al. 2015).

Radiographers were not motivated to wear their personal radiation monitoring devices during work due to a lack of feedback on results from the service provider. Other radiographers lacked knowledge regarding the usage of personal radiation monitoring devices. Not all radiographers wore their radiation monitoring devices during work. There was a scarcity of radiation protection advisors and experts to supervise and ensure that the safety standards of operations were being carried out. This created violations of local and international guidelines concerning the use of personal radiation monitoring devices and the period set for monitoring device collection for radiation readings (Botwe et al. 2015). In South Africa, the service provider has all the records on computers and the user can acquire full radiation dosage history records by supplying their unique identification numbers. This way the user can always monitor their own radiation dosage. The service provider issues monthly radiation dosage reports to the employers, which usually accompanies the new batch of radiation monitoring devices

In South Eastern Nigeria, a survey evaluation of personnel radiation monitoring was conducted amongst radiographers working in government-owned hospitals ($^0$ Okaro et al. 2010). Results showed that personal radiation monitoring was not carried out in all hospitals. Not all radiographers were registered as radiation workers. Radiation monitoring devices were found to be read regularly every quarter of the year, but it took more than 3 years for new supplies of radiation monitoring devices to be made in the hospitals where radiation monitoring was carried out, so not all radiographers wore monitoring devices during work. Consistent with research findings in Ghana, there was scarcity of radiation protection advisers and experts to supervise and ensure that the safety standards of operations were being carried out consistently (Botwe et al. 2015; Okaro et al. 2010). Dosimetric records of staff were not given any consideration during recruitment of new staff. Personnel radiation monitoring was inadequate because radiation risks were not assessed and no corrective measures were taken (Okaro et al. 2010).

The harmful effect of ionizing radiation is very often underestimated by radiographers and other healthcare workers. Many believe that the dose they receive is safe, although scientifically it is contradicted as there is no proof that any radiation exposure is totally safe. This perception explains why many radiographers do not realize the need for wearing radiation monitoring devices and the value of wearing the radiation monitoring device (Van Der Merwe 2014). By wearing personal radiation monitoring devices, the effective and equivalent doses can be measured and accumulated doses can also be monitored and recorded during the career as radiation worker (Le Heron et al. 2010).

There is a need to monitor the amount of radiation radiographers receive due to an increase in the amount of ionizing radiation that is used for treatment as well as diagnosis. Emphasis is placed on the fact that more radiographers are exposed to radiation than in earlier years. More complicated procedures are done that require x-ray imaging, and the radiographer gets exposed to higher radiation doses since they are required to assist in these procedures (Okaro et al. 2010)

Currently, the only personal monitoring devices being used are devices worn by the radiation worker that require processing to determine radiation dose. New technology is

being tested that can, in later developments, measure radiation dose in real time by connecting wirelessly to a station that can show the dose received in real time. Amendments can be made quicker to ensure that less radiation is received (Le Heron et al. 2010).

To assess the situation in the Tshwane district of South Africa, a study was designed to collect information from radiographers in several provincial hospitals. The aim of this research was to identify the reasons for non-compliance amongst the radiographers.

## MATERIALS AND METHODS

A quantitative descriptive design was used for this study. Data was collected from qualified radiographers working in provincial hospitals in the city of Tshwane at the time of the study. Radiographers working in ultrasound departments who do not wear personal radiation monitoring devices were excluded in this study.

Permission was granted by the Research Ethics Committee in the Faculty of Health Sciences, as well as the relevant heads of x-ray departments and the chief executive officers of the different Hospitals.

Written consent was acquired from the radiographers before data collection commenced. The study was conducted in the respective Radiology departments of the Provincial hospitals in the city of Tshwane.

All qualified radiographers working at the Provincial hospitals at the time of the study were invited to participate in the study. Based on the staff establishment the total population was 105 diagnostic radiographers. Purposive sampling was used. All the radiographers that consented to participate in the study were contacted in their working environments by the research team and issued with questionnaires, which were completed and returned to the research team by the departmental heads of the respective departments by hand.

The data collection tool was questionnaires. The questionnaires have been adopted from literature and adapted to align with objectives of this study (Okaro et al. 2010). The researchers were not present during completion of the research

questionnaires. And the participants completed the questionnaires anonymously. All ethical principles were adhered to.

The 15-item questionnaire was divided into two sections consisting of closed- and open-ended questions that focused on capturing information on the level of compliance with the use of personal radiation monitoring devices by qualified radiographers. Section A sought demographic information such as sex, hospital of practice, years of clinical experience, level in radiography, and qualifications and the area of specialization. Section B sought information on the importance of compliance with the use of personal radiation monitoring devices.

The data was collated in a Microsoft Excel® spreadsheet and the variables were statistically analyzed for frequencies and percentages. The Fischer's exact test was done to cross tabulate variables to check for association.

## RESULTS

The participants of the study were recruited from five hospitals (two Tertiary and three district hospitals). Of the 96 questionnaires sent out to the provincial hospitals in the Tshwane district area, 61 were returned, with a response rate of 63.5%.

Each question was coded from 1 to 4 depending on the variables per question. The data was collated in a Microsoft Excel® spreadsheet and the variables were statistically analyzed for frequencies and percentages. The first value in the cell is the frequency and the second value is the percentage. The demographic data is presented in Table 1, Fig. 1 (sex and hospitals in Tshwane district area) as well as Fig. 2 (years of experience and level of qualification). The type of uniform and where participants are wearing their radiation monitoring device is presented in Table 2. The compliance to the wearing of the radiation monitoring device and the management thereof is presented in Table 3 and Fig. 3, presented as awareness of non-compliance to policies.

**Table 1**: Demographic data.

| | Male | Female | 1 – 4 years | 5 – 9 years | 10 + years | Qualified Radiographer | Community Healthcare worker (Radiographer) | Supplementary Radiographer | Supplementary | Diploma | Degree | B.Tech | Honours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sex** | 13 21.4% | 48 78.6% | | | | | | | | | | | |
| **Years' experience** | | | 23 37.6% | 19 31.2% | 19 31.2% | | | | | | | | |
| **Level of Qualification** | | | | | | 49 80.3% | 10 16.4% | 2 3.3% | | | | | |
| **Type of Qualification** | | | | | | | | | 2 33% | 24 39.3% | 27 44.3% | 4 6.6% | 4 6.6% |

**Fig. 1**: Years' experience and level of qualification.

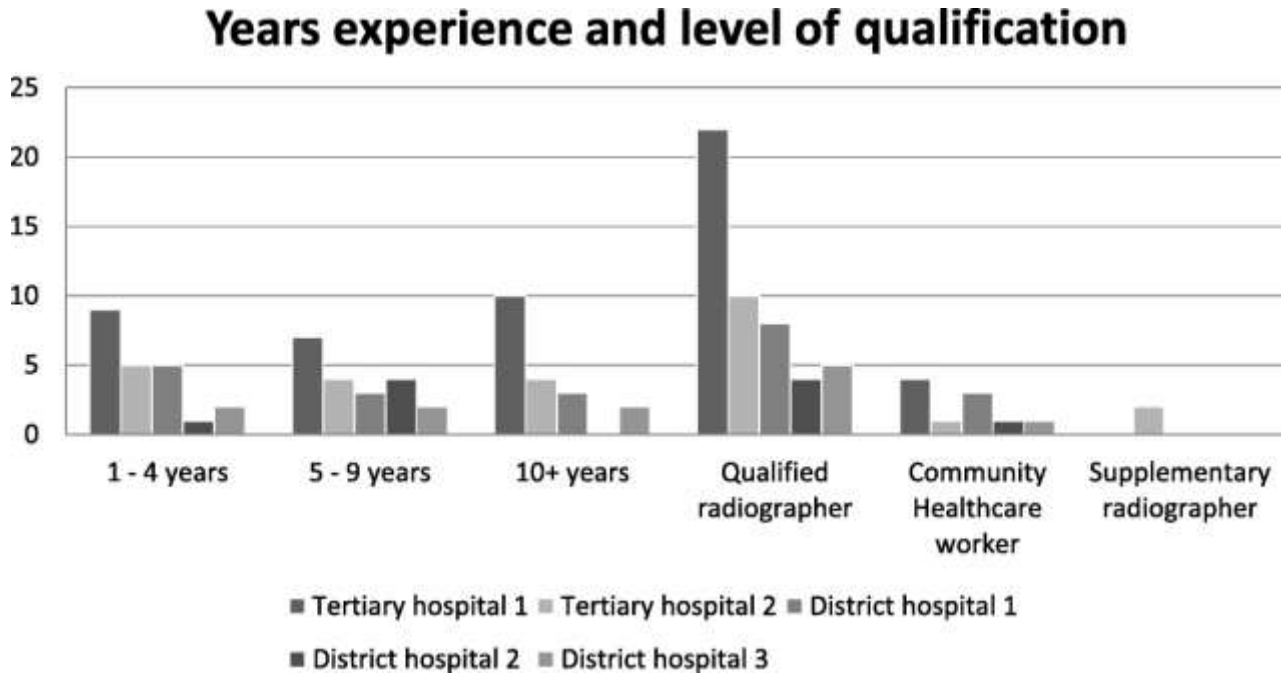



**Fig. 2:** Sex and hospitals in Tshwane district area.

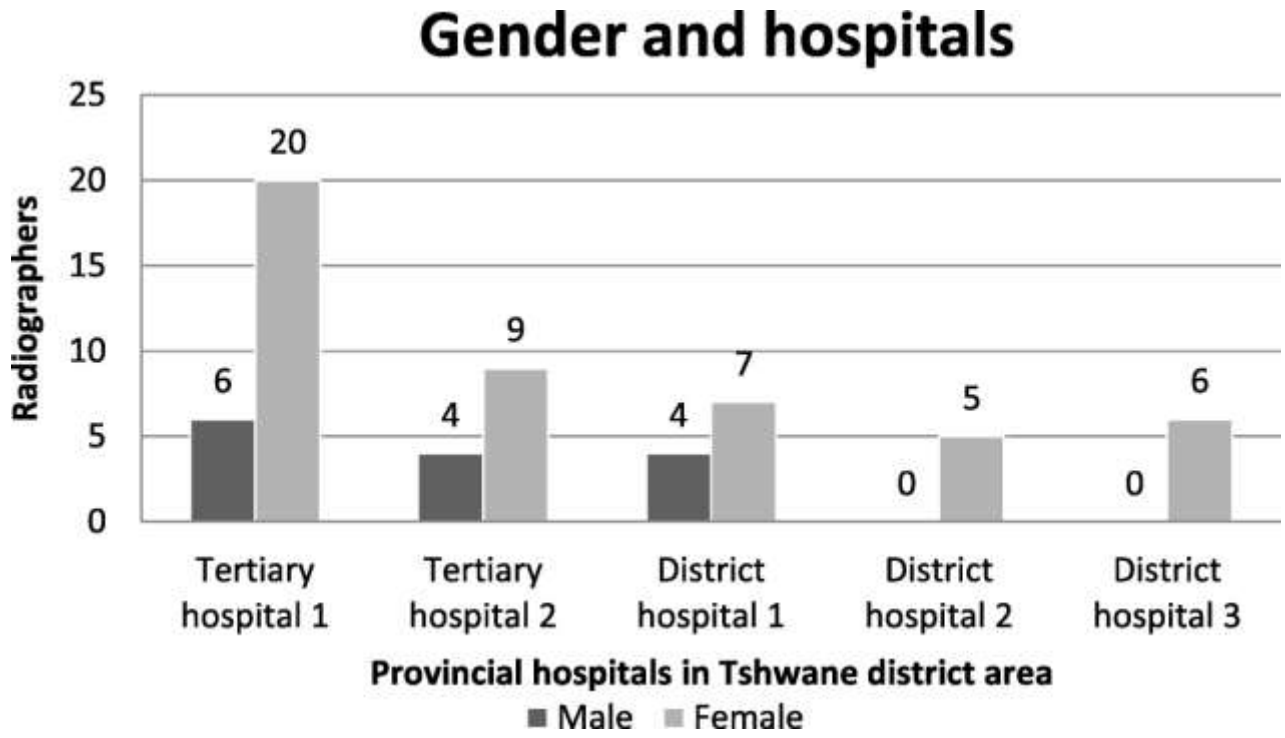


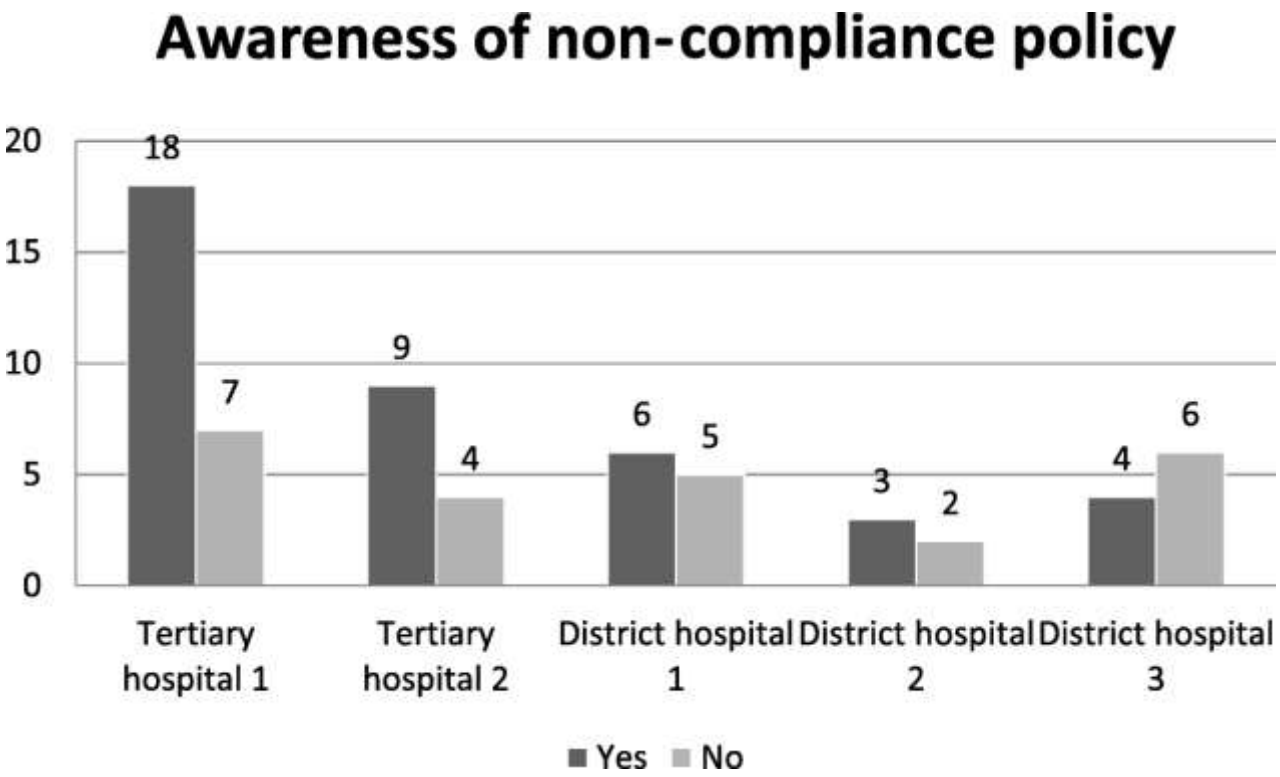
**Table 2:** Uniform and where participants are wearing their radiation monitoring device

| | Scrubs | Shirt with collar | Shirt without a collar | Other | Clipped to collar | Clipped to waist | Attached to lanyard | Attach to nametag at breast area | Inside the lead apron | Outside the lead apron on collar | Outside lead apron on the apron itself | Inside the lead apron | Outside the lead apron |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **What type of uniform are you wearing?** | 10 17% | 10 17% | 14 23.7% | 25 43.4% | | | | | | | | | |
| **Where are you wearing your radiation monitoring device?** | | | | | 14 23.7% | 17 28.8% | 5 8.5% | 22 37.3% | | | | | |
| **Where do you wear the radiation monitoring device when wearing a lead apron?** | | | | | | | | | 29 47.5% | 23 37.7% | 9 14.8% | | |
| **Where do you wear the radiation monitoring device when wearing a lead apron and thyroid shield?** | | | | | | | | | | | | 43 75.4% | 14 24.6% |

**Table 3:** Compliance to the management of wearing the radiation monitoring device

| | Yes | No | It is law | Issued | Do not know | Other | Two weeks | Monthly | Quarterly | When I remember |
|---|---|---|---|---|---|---|---|---|---|---|
| **Do you always wear your radiation monitoring device?** | 41 67.2% | 19 31.2% | | | | | | | | |
| **Why do you wear a radiation monitoring device?** | | | 53 86.9% | 3 4.9% | 0 | 5 8.2% | | | | |
| **How often do you change your personal radiation monitoring device?** | | | | | | | 1 1.6% | 58 95.1% | 0 | 2 3.3% |
| **Are you aware of the policies that are in place regarding non-compliance of personal radiation monitoring device usage?** | 40 65.6% | 21 34.4% | | | | | | | | |
| **Are you aware of the policies that are in place regarding negligence in returning personal radiation monitoring devices?** | 45 73.8% | 16 26.2% | | | | | | | | |

**Fig. 3**: Awareness of non-compliance policy.




The Fisher's exact test was used for association to answers the level of compliance and management of the radiation monitoring device. The keys used to

present of the data were frequency, row %, and column %. The results are presented in Tables 4a, 4b, and 4c. Only Question 14 and 15, which tested the knowledge and compliance regarding the policy, showed any correlation.

**Table 4a:** Association between type of uniform (Q7) and wearing of the radiation monitoring device (Q10)

| | | Q10/1 | Q10/2 | Q10/3 | Q10/4 | Total |
|---|---|---|---|---|---|---|
| **Q7/1** | % correlation | 10.00 | 20.00 | 20.00 | 50.00 | 100.00 |
| | Frequency correlation | 7.14 | 12.50 | 40.00 | 22.73 | 17.54 |
| **Q7/2** | % correlation | 40.00 | 30.00 | 10.00 | 20.00 | 100.00 |
| | Frequency correlation | 28.57 | 18.75 | 20.00 | 9.09 | 17.54 |
| **Q7/3** | % correlation | 21.43 | 35.71 | 7.14 | 35.71 | 100.00 |
| | Frequency correlation | 21.43 | 31.25 | 20.00 | 22.73 | 24.56 |
| **Q7/4** | % correlation | 26.09 | 26.09 | 4.35 | 43.48 | 100.00 |
| | Frequency correlation | 42.86 | 37.50 | 20.00 | 45.45 | 40.35 |
| **Total** | Frequency | 24.56 | 28.07 | 8.77 | 38.60 | 100.00 |
| | Column % | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

P-value = 0.753.

**Table 4b**: Association between wearing radiation monitoring device when wearing lead apron (Q11) and lead apron with thyroid shield (Q12)

| | | Q12/1 | Q12/2 | Total |
|---|---|---|---|---|
| **Q11/1** | % correlation | 81.48 | 18.52 | 100.00 |
| | Frequency correlation | 52.38 | 35.71 | 48.21 |
| **Q11/2** | % correlation | 73.68 | 26.32 | 100.00 |
| | Frequency correlation | 33.33 | 35.71 | 33.93 |
| **Q11/3** | % correlation | 60.00 | 40.00 | 100.00 |
| | Frequency correlation | 14.29 | 28.57 | 17.86 |
| **Total** | Frequency | 75.00 | 25.00 | 100.00 |
| | Column % | 100.00 | 100.00 | 100.00 |

P-value = 0.396.

**Table 4c**: Association between awareness regarding non-compliance (Q14) and non-returning (Q15) policies

| | | Q15/1 | Q15/2 | Total |
|---|---|---|---|---|
| **Q14/1** | % correlation | 87.50 | 12.50 | 100.00 |
| | Frequency correlation | 77.78 | 31.25 | 65.57 |
| **Q14/2** | % correlation | 47.62 | 52.38 | 100.00 |
| | Frequency correlation | 22.22 | 68.75 | 34.43 |
| **Total** | Frequency | 73.77 | 26.23 | 100.00 |
| | Column % | 100.00 | 100.00 | 100.00 |

**P-value = 0.002.**

## DISCUSSION

From the demographic results it was noted that more female (78.6%) than male (21.4%) radiographers are employed at the five hospitals (Table 1). Tertiary hospital 1 (Fig. 1) is the biggest hospital in the Tshwane district area and consists of 20 female and

6 male radiographers; the other hospitals' staff establishments are also presented in Fig. 1.

From the 61 participants, 49 are qualified radiographers, 10 are community healthcare workers, and 2 are supplementary radiographers (Table 1). Community healthcare workers are graduates who are obligated by the South African Government to do one year compulsory community service before they can register as independent radiographers with the Health Professions Council of South Africa (HPCSA). The supplementary radiographer has a basic qualification and is an assistant for the diagnostic radiographer. The majority of the participants have either a diploma (39.3%) or a degree (44.3%) in diagnostic radiography (Table 1 and Fig. 1). The experience varied with the majority having less than 5 y (37.7%) experience; only 31.2% had more than 10 y experience (Table 1 and Fig. 1).

Scrubs used to be a protective gown worn by surgeons and other personnel in an operating room, or "scrubbed" environment. Now scrubs are any medical uniform consisting of a short-sleeved shirt without a collar and drawstring pants. Wearing scrubs extends outside the operating room and radiographers also wear scrubs as their uniform in the x-ray departments. Recommended dress code for radiographers includes scrubs with plenty of pockets for a pen, notebook and devices (University of Akron, Radiography School Dress Code Policy 2018). Different Radiology departments wear different colour scrubs. Other acceptable radiographer uniforms approved in hospitals are white lab coats with long or short sleeves worn over a professional outfit, cardigan sweaters, vest, and pullovers may be worn, to ensure that a professional image is maintained, and for easy identification (Byrne 2016).

The majority of radiographers (43.4%) wore other types of uniforms, which was described as sleeveless casual clothing or a dress with a pullover. A total of 40.7% radiographers wore shirts without a collar and scrubs, and only 17% wore shirts with a collar (Table 2). When asked if they were wearing the radiation monitoring device, 23.7% indicated clipped to the collar, 28.8% clipped to waist, 8.5% attached to lanyard, and 37.3% indicated attached to nametag at breast area (Table 2). The Fisher's exact test was used to determine if there was a correlation between the type of uniform and

placement of the radiation monitoring device. It showed no correlation with a p-value of 0.753 (Table 4).

Results showed 52.5% of the participants wearing the radiation monitoring device outside the lead apron and 47.5% are wearing the radiation monitoring device inside the lead apron (Table 2). The policy on where radiation monitoring devices must be worn is on the outside of a lead apron if a lead apron is used without thyroid and eye shielding. A lead apron is effective only when it is worn properly, matched with the appropriate radiation energy, and used in a safe and regularly inspected environment. Regulations established by the Department of Health Directorate mandate that healthcare organizations perform annual inspections of medical equipment, including lead aprons (Department of Health Directorate 2017). The results on this question showed that there is a lack of understanding and compliance to the policy.

When both the lead apron and thyroid shield are worn, the radiation monitoring device must be worn outside the lead apron and thyroid shield. Results showed that 75.4% of the participants wore it inside the lead apron and 24.6% wore it outside the lead apron (Table 2). A typical 0.5-mm lead-equivalent apron or thyroid shield provides 85–95% attenuation of scattered fluoroscopic x rays. Both lead aprons and thyroid shields should be tested on a regular basis to ensure their integrity. The Fisher's exact test was used to determine if there is a correlation between the placements of the radiation monitoring device when wearing a lead apron alone or combined with a thyroid shield. It showed correlation with a p-value of 0.396 (Table 4).

Other body parts, such as the hands, can potentially receive a high dose of radiation, particularly during procedures, when working near the source of an x-ray or gamma-ray beam. A ring radiation monitoring device reflects the amount of radiation exposure the hands receive. They also suggested that a lead screen be used to protect the legs of personnel involved with interventional procedures. Diagnostic radiographers do not wear protective eye shielding or upper extremity radiation monitoring devices, it is too expensive. These devices are issued to radiologists and cardiologist as they are working in the direct x-ray beam.

According to a publication released by the American Thyroid Association (ATA), the thyroid is among the most susceptible sites to radiation-induced cancer ([ATA 2013]). The

ATA states that an “increase in the use of diagnostic x-rays, necessitates the protection of the thyroid gland” to reduce thyroid cancer risk. Wearing thyroid shielding is in line with standards for radiation protection, which also include time spent exposed, and the distance from the radiation source.

A radiation monitoring device does not protect the wearer from radiation; it is a device that is used for detecting and measuring cumulated exposure to ionizing radiation over a determined period. In medical radiological imaging, radiographers are constantly exposed to scatter radiation with increased radiation dose especially during interventional radiography, fluoroscopy, in-theatre fluoroscopy, and during mobile examinations. In agreement with (Van der Merwe (2014), radiographers should always wear a personal radiation monitoring device when at work. The study showed that 67.7% always wear their radiation monitoring device while 31.2% do not always wear it. 86.9% of radiographers knew that a radiation monitoring device was required, 4.9% wore it because it was issued, and 8.2% knew that it was for monitoring and checking radiation dose (Table 3). To enlighten the radiographers on personnel monitoring regulations and also ensure they are kept abreast with current trends and techniques, the researcher supports Botwe’s recommendation of implementing effective training and periodic re-training of personnel (Botwe et al. 2015). Botwe and Modiba found that various non-compliance patterns were attributed to the participants and others to the employer (Modiba 2014). Personal reasons given were forgetting to wear a radiation monitoring device because it was left in a handbag or at home; not received or forgotten; and it was lost and waiting for money to pay for a new one. Departmental mismanagement included new devices not delivered due to a delay of hospital payment to the South African Bureau of Standards and due to quality control not in place to monitor the radiation workers.

The fact that 31.2% of participants were non-compliant in wearing radiation monitoring devices is worrisome. Modiba expressed the same views that radiographers are professionals whose daily job is to take x rays, yet they do not see the need to protect themselves from the ionizing radiation (Modiba 2014). Readings from the radiation monitoring device are analyzed on a monthly basis by the South African Bureau of Standards. Reports are sent to institutions if abnormalities are detected. For those who

do not wear radiation monitoring devices, it becomes a wasteful expenditure for the department and a health risk.

Only 34.4% of participants were not aware of the policies in place regarding non-compliance of personal radiation monitoring device usage. It is the radiographers' responsibility to return their monitoring devices on time and to report damaged or lost devices to Radiation Protection Service immediately (Radiation Protection Service 2016).The study results showed a 95.1% compliance with changing devices on time at the end of the wearing period, which is after 28 d. 3.3% of participants changed devices only when they remembered to do so, sometimes after a month's use (Table 3).

In the study, 26.2% participants were not aware of the policies that were in place regarding negligence in returning personal radiation monitoring devices (Table 3). It was noted that the majority of participants know about the non-compliance policy with only 1 district hospital as the exception (Fig. 3). The Fisher's exact test was done to determine a correlation between the awareness regarding non-compliance and non-return policies that are in place. There was a correlation with a p-value of 0.002 (Table 4).

The Radiation Protection Service charges a non-refundable fee for each radiation monitoring device lost or not received back within 20 weeks after the end of the wearing period (Radiation Protection Service 2016). Currently, the employer, which is Gauteng Health, pays these accounts; however, due to a lack of funds, the administrator for the radiation monitoring devices for a specific hospital follows this up and sends individual accounts to each user to reimburse the hospital for these fees. The Radiation Protection Service reserves the right to suspend service to clients or radiographers who consistently do not return their radiation monitoring devices. A radiation monitoring device is considered late if it is not returned to the provider by the due date. A lost (non-returned) personnel radiation monitoring device causes a permanent gap in the individual's exposure history record. Lost radiation monitoring device must be reported (Radiation Protection Service 2016).

The ALARA principle means that radiographers should strive to use procedures and controls based on sound radiation protection principles to achieve occupational doses that are as low as reasonably achievable. The requirements for the protection of workers are that only the staff and the ancillary personnel required for the medical

procedure or training shall be in the x-ray room during the radiation exposure. Staff and ancillary personnel shall be protected from the direct scatter radiation by protective aprons or whole body protective barriers of not less than 0.25 mm of lead equivalent.

## RECOMMENDATIONS

The threshold dose requirement for having to wear a radiation monitoring device is usually 10% of the annual limit to the portion of the body exposed. Individuals who operate fluoroscopic equipment or portable x-ray equipment are required to wear radiation monitoring devices to monitor whole body radiation. When high-level controls are used, personnel should move back as far as they reasonably can and seek the shelter of a lead shield. If they cannot do this, then that person must wear a radiation monitoring device.

When personal radiation monitoring devices are required, they should be worn at the prescribed area such as on the torso, pelvic region, or at the collar region with the label facing out. Due to the fact that the dose limit to the eye lens has been reduced to 20 mSv and radiographers are issued with only one radiation monitoring device, it is recommended that radiographers wear their radiation monitoring devices clipped to the collar or in the collar region to effectively measure the dose to the eyes.

It is also recommended that a protocol should be established in all departments on where the radiation monitoring device must be worn when wearing a lead apron and thyroid shield. The majority of the participants are wearing it inside the lead apron, which indicates that they are not aware it does not give an accurate received radiation dose reading.

Awareness should be created in the radiography departments regarding the policies of radiation monitoring devices. It should be part of the induction program when starting at a new department. It cannot be assumed that all students receive training on the radiation monitoring devices when they are issued for the first time at the undergraduate level.

## CONCLUSION

The results of this study showed compliance of radiographers in wearing radiation monitoring devices but inconsistency on where the radiation monitoring device should be worn. A lack of awareness about policies from the Radiation Board was also noted.

## CONFLICT OF INTEREST STATEMENT

None declared.

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