Perceptions of radiographers regarding establishing a self-regulatory body for radiation safety in Eswatini

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Abstract

Introduction : Eswatini remains one of the countries in Southern Africa without a regulating authority for radiation safety in the radiography departments. Quality control (QC) tests and radiation protection practices are unmonitored. This study sought to explore radiographers' perceptions regarding establishing a self-regulatory body that will formulate, implement and monitor compliance of standardised guidelines for radiation safety.

Methods: A qualitative, exploratory and descriptive research approach was undertaken. Radiographers currently registered and practicing in Eswatini were purposively selected and invited to participate. Data was collected using semi-structured interviews. Audiotapes and field notes were used. Audio taped interviews were transcribed verbatim and then analyzed using qualitative content analysis.

Results: Six themes emerged from the analysis of data, namely; a) awareness of the need for QC tests, b) radiation protection and safety in the radiography departments, c) radiographers' responsibility towards radiation protection, d) education and training in radiation safety for radiographers and other stakeholders, e) support from governmental and management structures and f) the need for the self-regulatory body in the radiography departments.

Conclusion: The study demonstrated that there is awareness among radiographers in Eswatini that radiation safety practices are necessary in the radiography departments. Continuous education and training were deemed as imperative to improve radiation safety in the radiography departments. There is also support for the idea of establishing the self-regulatory body.

Implications for practice: The need for monitoring structures in order to ensure radiation safety in the radiography departments is highlighted in this study. Government officials and hospital management are crucial in ensuring radiation safety in radiography departments.

Keywords: Radiation safety ; Radiation protection ; Quality assurance ; Quality control ; Regulation

Introduction

The International Atomic Energy Agency (IAEA) emphasises that activities such as the medical uses of ionizing radiation in radiography departments need to be subjected to standards of safety. The agency further states that regulating safety in terms of ionizing radiation must be a national responsibility.[1] Many African countries have established regulatory bodies for radiation safety, however, there have been reports that there are still challenges with regards to effectively implementing and adhering to standards in the radiography departments.[2, 3, 4] Some of these challenges include the absence of policies and adequate regulation for radiation protection practices.[5]

At the time of writing this article, there was no formal regulatory authority for radiation control services in Eswatini. This is despite the country being a member state of the IAEA since 15 February 2013.[6] The IAEA visited Eswatini in 2018 and held workshops during which the country was strongly advised to improve its regulatory infrastructure by establishing and adopting a nuclear law as well as strengthening the regulatory control of radiation sources in accordance with the IAEA safety standards.[6] This then required that the Ministry of Health officials take up initiative for national standards of radiation safety and in drafting the radiation control bill. There seemed to be challenges when it comes to these initiatives as at the time of writing this article there are still no set radiation safety standards for radiography departments. In the meantime, the use of x-rays in the radiography departments remains uncontrolled without guiding radiation safety standards.

Radiographers receive training in radiation safety as part of their undergraduate education.[7] They are therefore knowledgeable and well positioned to establish their own set of rules regarding radiation safety practices, to ensure protection of themselves, patients and the public from the harmful effects of ionizing radiation. Self-regulating organisations keep control of their standards including determining the conditions and rules for their activities.[8] WHO also stated that some countries are interested in introducing minimum enforceable standards of practice for health professions who provide a service that is not regulated and this can be achieved by self-regulatory mechanisms.[9] This study aimed to describe radiographers' perceptions regarding establishing a self-regulatory body that will formulate, implement and monitor compliance to guidelines for radiation safety practices.

According to the IAEA, regulatory bodies are responsible for establishing radiation safety principles, regulations and guidelines.[5] In diagnostic radiography these can include establishing radiation safety programs. These programs encompass quality assurance (QA).[9] QA programs include equipment quality control (QC) tests which are done to ensure proper functioning of equipment. Establishing guidelines which include routine performance of these QC tests by radiographers should be a mandate of the regulatory body. Further, establishing a dosimetry service which includes monitoring of patient and staff absorbed doses which are effectively affected by the performance of the diagnostic radiography equipment is imperative.[5] Lastly, establishing guidelines which encompass the principles of radiation protection namely; justification of medical exposure by establishing imaging referral guidelines, establishing protocols for optimization of radiation doses and implementation of diagnostic reference levels (DRLs) should be an important responsibility of the regulatory body.[1]

Methods

Design

A qualitative, exploratory and descriptive research approach was found to be appropriate for this study. This allowed the researchers to explore participants' perceptions regarding the idea of establishing a self-regulatory body for the radiography departments. The study was directed by the following research objectives, a) to describe radiographers' views regarding the performance of QC tests in the radiography departments in Eswatini; b) to establish whether radiographers apply radiation protection measures in the radiography departments in Eswatini and c) to describe radiographers' views regarding establishing a self-regulatory body that will monitor radiation safety in the radiography departments in Eswatini.

Research participants

Purposive sampling was used to select the appropriate participants for the study. The target population comprised of all radiographers registered with the Eswatini Medical and Dental Council. These radiographers were purposively selected because they were key informants to the research problem being investigated. Permission was sought from head of departments in each hospital to conduct interviews with radiographers. After permission was granted, invitations were then hand delivered to the radiographers in the departments and the sample was drawn from those that agreed to participate.

Ethical considerations

Ethical approval to conduct the study was granted by the Faculty of Health Sciences Research Ethics Committee of the University of Pretoria (reference no. 465/2018) as well as the National Health Research Review Board in Eswatini. Access to hospitals was granted by the Ministry of Health. Participants gave written consent to be interviewed and audio recorded. Interviews were conducted in the radiography departments in a quiet area. The researcher also made sure not to disturb workflow in the departments and therefore interviews were conducted at a time predetermined by participants. As will be noted in the results section, the identity of the participants was concealed and codes were used instead.

Data collection

Data was collected by means of face-to-face interviews conducted by the researcher. The interview guide was semi-structured and consisted of open-ended questions. Data collection was conducted during the period of January 2019 and February 2019. The purpose of the study was clearly explained before each interview began. The researcher explained that the interview will be audio taped in order to capture the responses of participants verbatim and that the researcher will be taking notes during the course of the interview. Voluntary participation was then sought and participants signed an informed consent. Interviews lasted about 30 min per participant. Participants were assured of their anonymity and that their results will not be communicated to any other participant. As soon as the participant was ready to begin the interview, the audio recorders were turned on and the interview started. Interviews continued with willing participants until data saturation was reached at the 18th interview.

Data analysis

Content analysis was found to be appropriate to use for the collected data. Hsieh and Shannon state that the content analysis process involves interpretation of the content of textual data through the systematic classification process of coding, categorising and identifying themes or patterns.[10] Zhang and Wildermouth steps to qualitative content analysis underpinned the analysis process in this study.[11] The researcher began by transcribing the audiotapes herself, which led to the identification of codes. Reading and re-reading enabled the researcher to identify similarities and differences among the codes. This led to the identification of categories. The researchers then searched for patterns across the categories independently in order to draw conclusions and extract themes. This ensured credibility of the study findings. Consensus meetings were held to verify the outcomes. Themes were then interpreted to report findings.

Throughout the data collection and analysis processes, the researchers strived to ensure trustworthiness. The researcher conducting the interviews asked participants to verify what they were saying from reading through the field notes at the end of each interview to ensure member checking.

Results

A heterogeneous sample of 18 participants was interviewed. There were nine males and nine females. The age groups varied from 20 to 60 with the majority between 30 and 40 years old. Participants possessed either a three year national diploma or a bachelor's degree in diagnostic radiography. This was also distributed evenly as nine participants possessed a diploma and nine participants possessed a degree. Years of experience varied from less than a year to more than 30 years with most participants falling in the five years or less of work experience.

Six themes emerged from the analysis process. These were; a) awareness of the need for QC tests, b) radiation protection and safety in the radiography departments, c) radiographers' responsibility towards radiation protection, d) education and training in radiation safety for radiographers and other stakeholders, e) support from governmental and management structures and, f) the need for the self-regulatory body in the radiography departments. The inductive approach was adopted to demonstrate clear links between the research objectives and the themes.[12] The way the emerging themes addressed the research objectives is presented in Fig. 1.

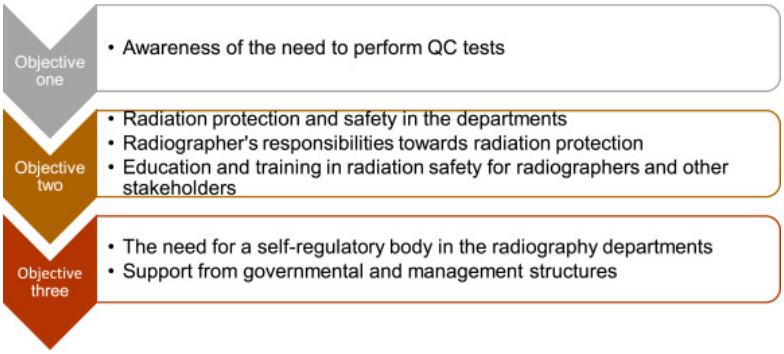

Figure 1. The emerging themes and the research objectives.

Discussion

a) Awareness of the need for quality control tests

The awareness for the need to have regular, periodic equipment QC tests by radiographers became evident in this study. Fig. 1 shows that this theme addressed objective one of the study which was to describe radiographers' views regarding the performance of QC tests in the radiography departments in Swaziland.

Participants' comments indicated that there were a few radiographers who mentioned that some QC tests were performed in their departments.

We just do the warm-up of the machine every morning …. [MC1]

We do also reject analysis, you indicate the reason why it hasn't been done properly, was the reason because of movement, motion I mean, or exposure factors or wrong marker … [MBC1]

WHO as well as Papp state that radiographers are expected to perform equipment QC tests such as tube warm up, beam alignment, collimation, inspection of protective wear, viewing boxes, cassette and imaging plates, film/reject analysis, assessing image quality as well as kV and mAs accuracy.[13,14] Maintaining records of these tests is also important. The IAEA emphasizes that equipment QC should be an integral part of quality systems in medical imaging.[15] This is because in some countries, equipment is often left without any performance evaluation tests as it has been observed in this study as well as other studies in developing countries.[3] This therefore leads to machines not performing well and therefore poor quality images and subsequently an increased repeat rate. Machines may also with age have radiation leaks if performance is not monitored. This can contribute a lot to increased radiation doses for the patients, staff and members of the public.[16] It is therefore crucial that there are standardised protocols outlining procedures on how to do equipment QC tests. Inspections need to be carried out as well which include monitoring radiographers' compliance to conducting equipment QC tests.

There were, however, other radiographers who said these tests were not performed in their departments as seen in these statements;

"The other thing is we don't have the tools. If maybe there was something I was given like a book as in film analysis where we write this was rejected because of poor positioning, exposure and such … [MG 1]

"There is no policy which is regulating the QA within the department. Even if I can do it, you can find that I'll be the only one who is doing it" [MG 5],

… We are short staffed. The moment we come in we are already packed with patients [MG 4]

Documenting policies and procedures in a QA program which encompass clearly outlined QC practices to be followed by staff is important if QC tests are to be conducted in an orderly manner. This is especially important in the absence of regulatory structures where the initiative to monitor safety is left up to each radiography department. The need for support from hospital management is also highlighted in terms of provision of QC test tools in their

budgets. A study in Tanzania identified similar challenges when it came to effectively implementing a QC program. Barriers included lack of time, lack of test tools and lack of managerial support amongst others,[17] similar to what has been seen in this study.

b) Radiation protection and safety in the radiography departments

Radiographers demonstrated an awareness of the importance of applying radiation protection principles during practice. This confirms that radiographers are trained and knowledgeable of radiation protection practices.

Some of the actions undertaken were;

"*We use lead aprons, making sure the doors are closed when exposing for the public" [RF5]*

"*I always use the high KV technique and then collimation, and ALARA principle … [MG5]*

The importance of shielding areas outside of the radiation field particularly those sensitive to ionizing radiation was reiterated by international organizations.[16] This is further emphasized for paediatric patients where there is greater probability of radiation risks manifesting. However, recent studies have questioned the efficacy of using these shielding devices.18, 19, 20 Inconsistencies in the application of these shielding devices as a protective measure have also been widely reported.[6,21]

This was evident in this study as demonstrated by these statements from participants.

"*… it's not every patient that we shield," [GS 1]*

"we do have enough lead aprons but for me some of them,.. I personally do not trust [MG 5]"

Recent evidence suggests that using radiation protection techniques such as collimation and optimised radiation exposures (e.g using the high kV technique) may be more effective in reducing radiation doses to patients. Patient shielding can rather adversely interfere with imaging leading to repeat examinations if misplaced or if the patient moves.[22] Shielding should be considered to be the last element in radiation protection strategies.[22] This further highlights the need for standardised guidelines. Protocols need to be in place guiding radiographers when to use shielding. Continuous education and training programmes in line with recent evidence should also be in place.

Participants mentioned that they do attempt to reduce unnecessary examinations in a bid to reduce unnecessary radiation doses to patients. The following statement supports this;

Some doctors request too many studies, and when you get to ask the patient, you get to know which part of the body to focus on, [MG 1].

WHO mentioned that referral guidelines are useful tools for justification of medical exposures as they provide guidance to physicians so that they can better request radiographic examinations.[23] Del Rosario Perez emphasized the use of referring guidelines and explained that they are meant to provide referring doctors with information regarding which procedure

is most likely to yield the most informative results, and whether another imaging modality could possibly be equally or more effective, and therefore more appropriate.[24]

Several studies have revealed that there is lack of awareness in radiation risks by referring physicians therefore hindering the justification of examinations.25, 26, 27 Due to this fact and in a bid to improve patient care and further justify examinations, radiography departments need to have their own guidelines aimed at justifying examinations.[28]

c) Radiographers' responsibility towards radiation protection

The results acknowledge that some QC tests are being performed and that some radiation protection measures are being applied. This indicates that some radiographers are genuinely concerned for their safety and that of the patients as well as the public. However, there is still concern over the lack of record keeping and the inconsistent responsibility to maintain documentation of QC tests conducted. There is further concern regarding the absence of justification and dose optimization protocols. National diagnostic reference levels (DRLs) have not been developed. Meyer et al., conducted a study to review published work on DRLs in low and middle income countries after identifying that most of the published work on the availability of DRLs was from high income countries. These authors identified that there is lack of published data on DRLs from the low and middle income countries with 6% and 25% retrieved respectively.[29] These findings imply that most low and middle income countries probably have not implemented DRLs. This is the case even in Eswatini.

d) Education and training in radiation safety for radiographers and other stakeholders

Education and training in radiation safety is necessary for all individuals concerned with ensuring patient safety in the radiography department. This includes radiographers, hospital management as well as the Ministry of Health. Ensuring continuous education creates awareness amongst all these stakeholders of the importance to maintain a radiation safe environment for the patients, the public and staff members.

Participants in the study seemed aware of the need for continuous education when it comes to radiation safety.

I think we need to have frequent refresher trainings on the roles and responsibilities of a radiographer when it comes to radiation protection,[TB 2],

"I think we need proper training, reminders." [MK 1]

The need for continuous education and training is supported by Inkoom et al.,who stated that adequate training should be provided for persons with radiation protection responsibilities.[30] In some instances, even though radiographers are trained in radiation protection and safety, non-compliance in clinical practice is often observed.[7] This could be attributable to a possible lack of competence on the part of radiographers therefore necessitating regular education and training regarding proper practices.

Continuous professional development (CPD) programs for radiographers have been developed in various countries as a means to develop individual abilities, change practices and improve provided services.[31] However, lack of participation by radiographers in CPD activities has also been reported.[31,32] As a means to maintain standards in practice, these

studies have recommended that CPD should be mandatory and further be a requirement in maintaining registration with the relevant bodies.[31,32]

Participants further mentioned it would be a good strategy to promote radiation awareness for hospital management and the Ministry of Health as these would lead to appropriate support from these entities.

"*I think we need to have workshops for doctors to learn about radiation … management itself as well as Ministry of Health. They need to understand what ionizing radiation is and its effects" [GS 1]*

The involvement of management was highlighted in the study by Ngoye et al., who stated that hospital management who are not aware of the benefits of a radiation safety program tend to disregard it at the cost of radiation risks.[4] These authors argue that most radiographers do not have the support of management, because they have no understanding of what the safety measures such as QC tests are and why they must be performed.[4]

e) Support from governmental and management structures

The Ministry of Health of Eswatini has an established National Health Policy document, which does not include the safe use of ionizing radiation in radiography departments.[33] This questions the awareness of the policy makers on the hazards of the uncontrolled use of ionizing radiation in the radiography departments. In a study conducted by Chinamale in Malawi, it was found that some radiation safety procedures such as the QC tests were not being performed in the radiography departments, because there were no regulatory structures. The recommendation was for the government to develop and implement radiation safety policies.[3] As noted during the data collection and analysis processes in this study, participants expressed the need for a collaborative effort between the Ministry of Health in Eswatini and the hospital managers. This was regarded as essential in maintaining safety standards in terms of ionizing radiation in the radiography departments. This is supported by these statements;

"..we expect government to come up with the relevant legislation, because everything is governed by law …. introduce proper management structures within radiology departments."[RF 4]

"I think if each and every hospital could come up with radiation protection officers" [MC 2]

"…. if we had a policy that will guide and protect me as a radiographer."[RF 2]

There was also a concern that even after equipment services were done, the hospital management tends to ignore the recommendations.

"Even now if we could just go do a test to the collimator it's very off, … the company that services … gave recommendations that we need a new collimator box but nothing has been done till now." [GS 1]

Ngoye et al., stated that, awareness of radiation risks and support in optimization of radiation exposure among hospital management is vital for the improvement of radiation protection and QA procedures.[4]

f) The need for a self-regulatory body in the radiography departments

Participants in the study acknowledged that there are valid reasons why radiation safety programs should be present in radiography departments and that there are implications if these are not in place. In addition to that, radiographers are aware of the need for support to carry out their responsibilities and also support for them to establish the self-regulatory body. The views expressed were that such a body would bring about change in the current situation within the radiography departments. The IAEA states that proper implementation of radiation protection standards requires that an independent regulatory authority be established by government through appropriate legislation.[34] In support of the self-regulatory body, participants mentioned;

"so that the frequency of checking radiation safety will be done on a regular basis." [RF 3]

The IAEA states that radiation safety assessments should be part of the duties of the regulatory body and should include assessing all relevant areas of radiation protection and safety for a medical radiation facility, including the siting, design and operation of the facility.[1] As part of radiation safety, radiation surveys and inspections of radiography departments should be compulsory.[35] These surveys, should involve inspecting for proper facility infrastructure, radiation protection and safety practices, imaging equipment QC processes, dose optimization in clinical practice and dosimetry.[36]

MC2 saw this as an opportunity to address other areas as well, monitoring of exposure to radiation workers while working,

"… it's going to be easy for all the hospitals to have the dosimeters read and be given on time to the radiographers."

The responsibilities of the appointed regulatory body include acquiring a dosimetry service for workplace and individual monitoring.[1] Okaro et al., stated that radiographers' measurements of radiation doses are essential to ensure that dose limits are not exceeded.[37] Further, an effective personnel monitoring program becomes a measure of verifying that radiation protection practices are adequate and acceptable in that if radiographers' doses are within limits then it means safety practices are acceptable.[38]

Participants further recognized that there is a need for the body in terms of standards for proper authorization of new practices and ensuring proper qualifications of persons hired to work in the radiography departments.

"*..if we install a new machine, it must meet certain requirements.. right now since we don't have a regulatory body, if I have the capital I can open a private practice in town*," *[*MG 5*]*

The IAEA states that prospective owners of x-ray facilities should apply for a registration or a license from a recognized regulatory body.[15] This agency further states that license or registration should be granted on condition that a) safety can be ensured by the design of the facilities and equipment; b) the operating procedures are simple to follow; and c) the safety training requirements are minimal.[15] This necessitates the need for inspecting compliance of new practices and ensuring staff is properly qualified which was a concern by some participants as seen in the statements below;

..we have people that are doing radiography who are not trained radiographers. But if there is a body … and the people are properly trained to handle radiation then everything will be done properly. [GS 2]

"*we have many unqualified people in Swaziland who are dealing with radiation … it will help to regulate as to who is eligible to handle radiation." [RF 4]*

Authorization of new practices entails that the person applying for the license demonstrates that all staff operating the radiation producing equipment is properly qualified. The IAEA recommends that the following information be submitted to the regulatory body in this regard; a) the qualifications in radiation protection of the medical practitioners applying for the authorization; (b) a statement that only persons with qualifications in radiation protection will be permitted to administer medical radiation exposure using the sources to be authorized.[34]

A regulatory body must ensure that in the event there are reports of unsafe practices in the radiography departments, corrective actions must be taken in the form of enforcement actions. These include a) written warnings b) orders to curtail specific activities c) modification, suspension or revocation of authorization and d) impose penalties such as fines.[34] This is a very important measure to ensure compliance to radiation safety practices.

Participants expressed concern at the fact that there are no radiation safety policies to follow and no set standards to guide them as seen in the statements;

"*we need guidance, we need to follow necessary steps" [MK 1]*.

… if we had a policy that will guide and protect me as a radiographer [RF 2]

Policies well documented in a radiation safety manual for the radiography departments are important and need to be adhered to. The California Department of Public Health recommends that in the radiation safety program there should be included amongst others a) documented QA program which clearly outlines procedures to comply with the ALARA principle b) personnel monitoring program and c) provision for continuous education and training on radiation safety of employees.[39]

WHO emphasises that, "the government needs to collaborate with various stakeholders including international organizations and health facilities in developing, coordinating and motivating the implementation of policies, recommendations, regulations, guidelines, standards and requirements generated by regulatory authorities and international bodies such as IAEA and ICRP.[13]

Conclusion

This study demonstrated that radiographers in Eswatini are aware of their ethical responsibilities regarding radiation protection and safety. They are aware that they must perform QC tests which are already being performed by some radiographers. The radiographers are however concerned about the lack of support from hospital management and government, which culminates in lack of monitoring. The participants went further to identify measures that can be put in place to improve on the situation which included the need for continuous professional development for radiographers. In addition to this, the

participants indicated that there is need for the education on radiation protection and safety to include hospital management and responsible persons in government. Finally, the radiographers expressed optimism about the possibility of establishing the self-regulatory body in Eswatini. It is envisaged that such a self-regulatory body will not only assist in the monitoring of the radiation safety measures, but will also ensure that shortcomings in radiation worker monitoring is being addressed. It is acknowledged that with Eswatini classified as a low income country, it may be a challenge to set up the self-regulatory body even though radiographers are willing to establish it.

Conflict of interest statement

None.

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