EXPERIENCES OF RADIOLOGIC TECHNOLOGISTS ON RADIATION PROTECTION DURING RADIATION THERAPY

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Abstract

This study focused on the lived experiences of the radiologic technologists concerning radiation protection when administering radiation therapy. Qualitative descriptive research was employed in this study and the primary sources of data included semi-structured interviews conducted among radiologic technologists registered in San Fernando City, La Union who work in radiation therapy units. According to the findings, patient verification, accurate radiation therapy administration and patient positioning in terms of proper angle were considered first by the technologists in order to promote safety and reduce risks of radiation exposure. In terms of radiation protection measures, working inside the controlled area, using lead shields and other protective gadgets, heeding warning signals, and using OSLD film badge were observed among the radiologic technologists. Training, seminar, experience, teamwork and communication were also found to play important roles in making the safety measure effective. Patient cooperation, unfamiliarity about the procedure and non-standardization of process were among the difficulties encountered by the participants.

Keywords: Radiation Protection, Radiation Therapy, Radiologic Technologists, Occupational Safety.

1. Introduction

Radiation turns the impossible into reality — letting us see the unseen and heal the untreatable. Over the years, radiation was the initial focus which then expanded into the developing fields of radiologic technology. As this profession developed, various innovations within different branches of medicine were also introduced.

Because of these advances, the uses of radiation technology have evolved, developed new imaging technologies and treatment methodologies, and formed the safety procedures that are essential to contemporary healthcare.

Despite the financial costs, the worth of diagnostic imaging, as well as therapeutic radiology, continues to grow. Radiation therapy remains indispensable not only because of its availability but also because of its proven therapeutic benefits. According to the World Health Organization (2022), radiotherapy plays a vital role in cancer control by shrinking tumor burden, preventing progression, and thus improving overall survival rates.

The efficacy of radiotherapy is based on the process through which it acts: ionizing radiation causes DNA damage—notably double-strand breaks—to cancer cells, thereby disrupting their replication and initiating apoptosis or what we call cell death. Through this mechanism, radiation therapy becomes effective in reducing tumor burden and controlling the progression of cancer. Because of this therapeutic effect, radiotherapy continues to be one of the most essential modalities in cancer management worldwide. At the same time, the use of ionizing radiation highlights the importance of proper radiation protection practices for both patients and healthcare professionals.

The International Atomic Energy Agency (2022) expounds that the reason behind the increased sensitivity of cancerous cells rests on their rapid proliferation and lack of sufficient DNA repair mechanisms. This preferential vulnerability enables radiotherapy to maximize the control of tumors while doses to normal tissues surrounding the tumor are minimized by contemporary techniques. These therapeutic effects together form the worldwide basis for using radiation therapy and reinforce the demand for strict radiation protection practices in order to protect patients and healthcare workers.

The integration of radiation into the practice of medicine remains diverse, providing safe diagnostic tools and treatment options for myriad medical conditions. Its applications continue to improve healthcare services through advanced imaging technologies and therapeutic procedures. However, while most of the risks are manageable, ethical issues, risks, and consequences for the future also must be taken into consideration, which means more work and innovation are necessary for this field. This emphasizes the importance of continuously improving radiation safety practices and healthcare standards.

According to the World Health Organization (2022), more than half of all cancer patients will require radiotherapy at some point in their care. While this method plays a crucial role in prolonging the life and survival of the patient, it also poses a risk towards healthcare workers, specifically radiologic technologists, who deliver these treatments daily. This is alarming since prolonged and continuous exposure to ionizing radiation, even at low doses, has been linked to long-term health consequences and increased risk of malignancy. Therefore, radiation protection is not simply recommended but a matter of global urgency.

Furthermore, Radiation therapy is one of the top modalities in cancer management worldwide, with nearly half of cancer patients requiring it at some point during treatment. In response to this growing demand, technological innovations such as intensity-modulated radiotherapy and particle therapy have drastically improved treatment accuracy. Yet, despite these advancements they also raise concerns about occupational radiation exposure for healthcare workers, particularly radiologic technologists (Liu et al., 2025).

Although radiation therapy is intended to act selectively on malignant cells, in reality, it inevitably influences cancerous and normal tissues alike. Ionizing radiation works by causing DNA damage, cell cycle arrest, and induction of apoptosis in cancer cells. Normal tissues, particularly the rapidly proliferating ones such as bone marrow, skin, and the mucosa of the gastrointestinal tract, can also absorb the radiation and may be subjected to temporary or long-term reactions, which may manifest as inflammation, fatigue, early reactions of the tissues, or late tissue changes. This is supported by Liu et al. (2025) and IAEA (2022). The dual effect of the ionizing radiation points out the narrow window between destruction of cancerous cells and preservation of the integrity of healthy tissues.

Along with the rapid increase in cancer cases globally, reports estimate nearly 20 million new cancer cases in 2022 (Bray et al., 2022). In which entails a very small scope of allowance regarding the treatment plan and stringent adherence to radiation protection measures in the clinical setting. The usage of radiation therapy is needed for the majority of these patients. In this context, radiation therapy is necessary because ionizing radiation selectively damages the DNA of rapidly dividing cancer cells, leading to cell death. Through this mechanism, it effectively reduces tumor burden and limits disease progression, reinforcing its indispensable role in cancer treatment.

The need for trained healthcare professionals and radiologic technologist staff for the implementation of proper radiation protection measures is the top-most priority globally. Proper education and training help ensure that radiation safety principles are consistently followed in healthcare settings. Unfortunately, in some countries worldwide, insufficient radiation equipment, staff, and shielding mean that both patient and healthcare provider protection will be inadequate without policy and system-based support. These challenges further highlight the importance of institutional support and effective radiation safety programs.

Global studies have highlighted similar concerns when it comes to radiation protection and guidelines. Park et al. (2023) observed in South Korea that continuing education is often inadequate, leaving technologists ill-prepared. In Brazil, de Andrade et al. (2023) identified a lack of standardized guidelines and training, causing confusion around dose limits and protective measures.

Likewise, Vano et al. (2022) conducted a global survey that found clinicians working outside radiology departments, such as in interventional cardiology and surgery, often have minimal formal training in radiation protection. This highlights the global concern regarding the lack or limited radiation protection and implementation of guidelines. Limited training may affect compliance with safety standards and proper radiation practices in clinical settings. Therefore, continuous education and reinforcement of radiation protection protocols remain necessary for healthcare professionals.

Some international studies highlight the importance of robust radiation protection measures to minimize occupational hazards and ensure long-term safety for medical personnel (Alomairy, 2022). Moreover, attention to radiation safety culture and the attitudes of healthcare professionals toward protective practices has become increasingly important, as these factors strongly influence compliance with safety standards (Moore, 2023; Shubayr et al., 2024). In the Philippine context, the rising record of cancer incidences demands an increase in radiation therapy services and the workload of radiologic technologists (Piansay et al., 2024).

In lieu of this situation, it underlines the importance of aligning local practices with global safety standards (International Atomic Energy Agency, 2022). Furthermore, efforts are being made to further enhance occupational radiation protection; this includes the testing of neutron exposure monitoring and the development of national standards for radiation safety in healthcare areas and facilities (Betos et al., 2022).

However, despite these actions, Romallosa et al. (2022) suggest that radiologic technologists may continue to face challenges when it comes to abiding by protective measures, especially in healthcare areas where limited equipment, workload, and attitudes influence compliance. These barriers may affect the consistent implementation of radiation safety practices in clinical settings. Inadequate resources and demanding workloads may also increase occupational risks

among healthcare workers. Because of this, strengthening institutional support and monitoring systems remains important in improving radiation protection practices.

At a local level, radiologic technologists working in cancer treatment institutes are directly exposed to occupational hazards and safety culture challenges. Some research has reported that they encounter issues such as limited access to personal protective equipment (PPE), inconsistent monitoring of radiation exposure, and varying levels of commitment to radiation safety protocols (Piansay et al., 2024; Shubayr, 2024).

Despite this, Radiologic technologists already carry strong attitudes toward radiation safety. They see it as part of their role and part of their training. One technologist said that radiation safety "was already taught to us." (Abis & Felizarte, 2025). Another mentioned that radiation is serious and has "delayed effects." These reflections clearly show that safety is not merely a requirement but a responsibility (Abis & Felizarte, 2025). Nevertheless, they also identified practical challenges that hinder compliance. Protective equipment is heavy and uncomfortable after long use. Some said tools are broken or missing.

Training is not always regular. Many rely on what they learned in school, even as machines and protocols change in hospitals (Romallosa et al., 2022). This may affect the ability of healthcare professionals to adapt to new technologies and updated radiation safety standards. One technologist described protective equipment as a "bug-a-bug hassle," showing how simple discomfort can affect safety (Shubayr, 2024). These findings highlight the importance of continuous education, updated training programs, and improvements in protective equipment to encourage better compliance with radiation protection practices.

The dual nature of radiation-the potential for therapeutic benefits in the treatment of cancer and actual harm where its use is not controlled-emphasizes that, with increased dependence on radiotherapy treatments, radiographers need to work in conditions that are both safe and regulated. The very biological response that destroys malignant cells will have the same deleterious effect on normal tissues and health professionals if protection is inadequate. Current literature highlights the fact that an increase in the incidence of cancer is also increasing occupational risks and thus the importance of understanding the practical experiences of radiologic technologists (Romallosa et al., 2022; Moore, 2023).

In regions like San Fernando City, La Union, where radiation therapy services are essential and resources may be finite, understanding the lived experiences of radiologic technologists is crucial. Their narratives and perspectives can provide essential information and insights into the effectiveness of current safety policies, the adequacy of protective measures, and the realities of balancing patient care with occupational protection. These experiences may also help identify gaps and challenges encountered in actual clinical practice. Through this understanding, healthcare institutions may further improve radiation safety culture and occupational protection measures.

Furthermore, a study conducted by Agopito et al. (2024) at Lorma Colleges examined the radiation protection practices of radiologic technologists. The results indicate that technologists consistently adhere to the three principal domains of radiation safety: justification, optimization, and dose limitation. The study also showed that healthcare professionals possess strong awareness regarding radiation hazards and proper safety practices. These findings support the importance of maintaining effective radiation protection measures in healthcare institutions.

The study further observes that radiologic technologists in the region possess a high level of awareness regarding radiation risks and proactively engage in safe procedural practices. However, the study did not find some correlation to demographic variables, and they highlighted that other factors other than those examined may play a crucial role in adherence to radiation protocols. These factors may include organizational culture, institutional support, access to resources, and continuous training. Such findings suggest the need for further studies focusing on additional influences affecting radiation protection compliance.

And thus, they specifically implied that further research will help explore other potential influences, such as organizational culture, individual attitude to safety or access to resources and training. In which these gaps form the basis for the present study.

This research aims to explore and understand the experiences of radiologic technologists on radiation protection during radiation therapy. By focusing on their stories and narratives, this research aims to highlight challenges, identify gaps in current practices, and contribute to the improvement and refinement of radiation safety culture in both local and national settings.

This study is important because it tackles the real problems faced by radiologic technologists who, in turn, are directly exposed to radiation therapy, one of the most sensitive and high-risk areas in healthcare. With the continuous rise in demand for cancer treatments around the world and in local communities, it follows that radiologic technologists' services are becoming increasingly indispensable for accurate therapy delivery and protection against unnecessary radiation exposure to both technologists and their patients. The findings of the present research will benefit several groups.

Radiologic Technologists. The study is a platform where technologists can share the problems they face, needs, and experiences related to radiation protection. Shared experiences which will strengthen safety practices and contribute to an improved awareness of how occupational radiation risks are managed in a healthcare setting.

Health Care Institutions. The results may be used by hospitals and cancer centers to reassess their present safety policies on the availability of protective equipment, training programs, and compliance systems. Identifying gaps can help ensure the practice remains safe, ethical, and sustainable.

2. Objectives

This study aims to explore and understand the lived experience of radiologic technologists regarding radiation protection

3. Materials and Methods

This study utilized a qualitative descriptive research design to explore the lived experiences of radiologic technologists on radiation protection during radiation

therapy. This design is appropriate for providing an in-depth understanding of participants' perspectives in their natural work settings, without the need for extensive theoretical interpretation. Qualitative descriptive studies are often applied in healthcare research to capture firsthand experiences and practical insights relevant to patient and occupational safety (Kim et al., 2022).

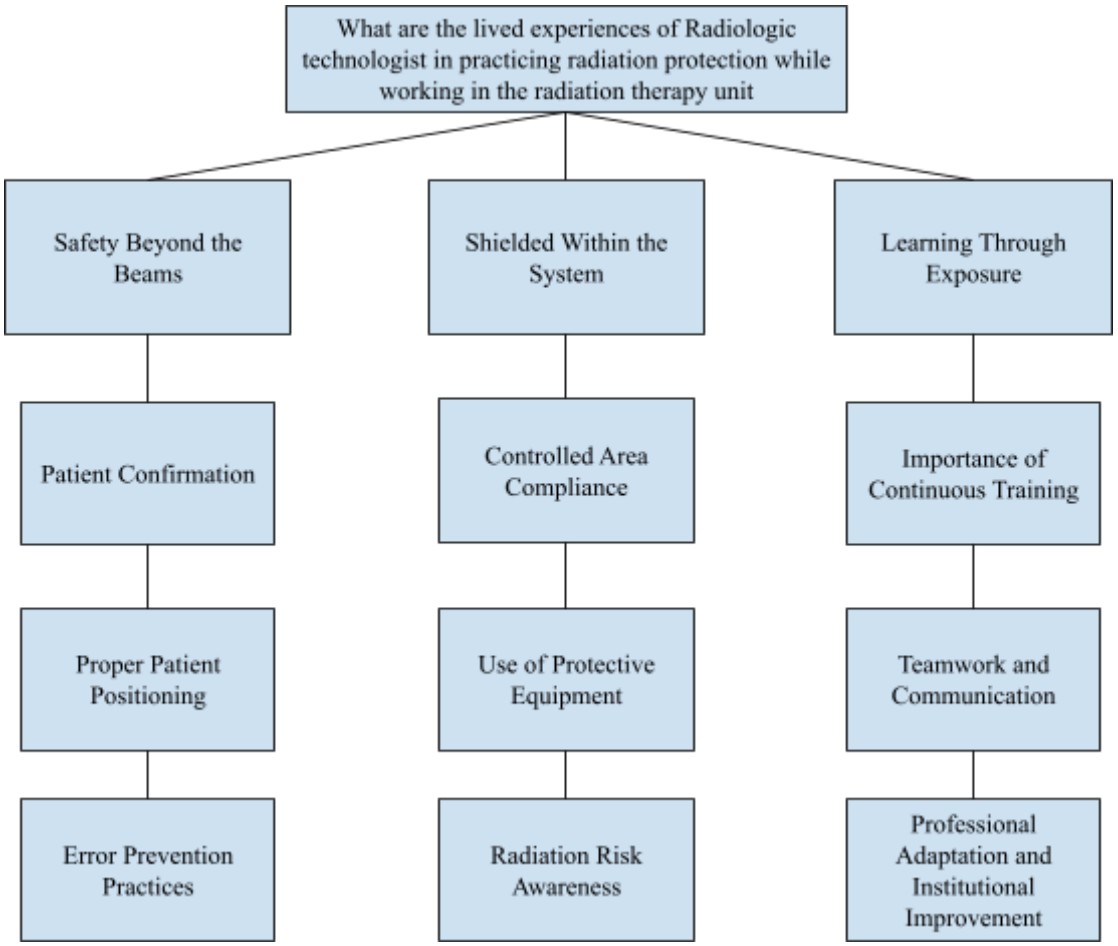
This study was conducted at LORMA Cancer Institute located in San Fernando City, La Union, from January-April 2026. As it is a private medical institution, LORMA Cancer institute has a radiation therapy unit that offers therapeutic procedures with ionizing radiation. The institution is a commendable venue for this study, particularly with the presence of licensed and well skilled Radiologic Technologists performing radiation therapy. The participants for this research will be Registered Radiologic technologists allocated to the radiation therapy unit. A purposive sampling technique will be used to select participants who possess the necessary experience and knowledge of radiation safety practices in Radiation Therapy

The data-gathering tool for this study consisted of researcher-made semi-structured interviews and open-ended questions designed to explore the experiences of radiologic technologists regarding radiation protection during radiation therapy. The use of a semi-structured interview format allowed for a balanced and in-depth understanding of participants' perspectives, Prior to the conduct of the study, the researchers secured the necessary approval from the healthcare institution and research ethics committee. Informed consent was obtained from the participants before the interviews were conducted. The participants were informed regarding the purpose of the study, confidentiality of information, and voluntary participation.

The gathered data were transcribed, translated when necessary, and analyzed using thematic analysis following Braun and Clarke's framework (Thematic Analysis). Significant statements were extracted from the participants' narratives and organized into codes, categories, themes, and subthemes to identify patterns and meanings regarding the lived experiences of radiologic technologists on radiation protection during radiation therapy procedures.

4. Results

This chapter presents the findings and discussions gathered from the participants regarding their lived experiences on radiation protection during radiation therapy. From the narrative of the participants, the researchers generated the three major themes: (1) "Safety Beyond the Beams," (2) "Shielded Within the System," and (3) "Learning Through Exposure." The major themes are presented with their corresponding sub-themes and significant statements of participants.



5. Discussion

The major theme under the category **Safety Beyond the Beams** involved the positive experience of radiologic technologists in relation to radiation protection during the course of radiation therapy. Similarities between the participants were evident when they stated that verification of patient information, confirmation of treatment plan, and proper positioning of patients were some important aspects of radiation protection practices.

The sub-theme **"Patient Confirmation"** refers to the significance of the process of verifying a patient's identity, correct treatment and prescribed dose to prevent errors and minimize radiation exposure. According to the participants, the verification procedure acts as an essential layer which provides safety for both patient and procedure performed. It shows the high sense of responsibility among technologists for providing safe treatment and reducing treatment errors and adverse events that may take place.

"Proper Patient Positioning" highlights the importance of proper positioning of the patient when undergoing treatment. Participants agreed that accurate patient positioning ensures radiation targeted correctly to the affected area, thus, minimizing harm done to healthy tissues. As stated by the participants, any

error related to positioning will have a great impact on outcome and success of treatment. This indicates high awareness among the participants on the issue.

"Error Prevention Practices" explains the importance of communication, endorsement, and cooperation among healthcare workers in radiation therapy units. Radiologic technologists emphasized the significant role played by nurses, physicians and Radiation Protection Officers in maintaining a coordinated workflow. From participant responses, it was learned that effective communication helps to increase the efficiency of treatment and improve safety practices within the department.

The major theme of **Shielded within the system** refers to the problems associated with radiation protection practices among radiologic technologists working in radiation therapy departments. The authors have noted the existence of common issues with regards to occupational exposure to radiation, procedural requirements, and strict safety protocols compliance at all times in high-pressure situations.

The sub-theme of **"Controlled area compliance"** deals with the strict implementation of safety protocols and rules of conduct inside radiation therapy clinics. Participants admitted that protocols were necessary but sometimes generated a lot of pressure because of strict surveillance and time sensitivity of procedures. As can be seen from the narratives, radiation technologists were always reminded about adherence to safety protocols including entry into controlled areas, use of warning signs, and shielding.

The sub-theme of **"Use of protective equipment"** addresses the issues with occupational exposure of radiologists working with radiation in medical settings. Despite the presence of various protective gear including barriers made of lead and personal safety shields, participants mentioned their concerns about radiation exposure during work. It can be seen from the narratives that technologists are always trying to protect themselves using the ALARA principle.

The sub-theme of "**Radiation Risk Awareness"** highlights the participants' understanding and consciousness of the potential risks associated with radiation exposure during therapy procedures. Participants emphasized the importance of adhering to radiation protection protocols to ensure the safety of both patients and healthcare professionals. Based on their narratives, technologists demonstrated heightened awareness of the possible harmful effects of radiation, which motivated them to practice caution, maintain precision, and strictly follow safety measures throughout radiation therapy procedures.

The coping mechanisms and adaptive strategies of radiologic technologists are addressed under the major theme **Learning Through Exposure**. According to the researchers, similarities are observed in the aspects of continuous learning, institutional support, teamwork, and radiation safety training as important coping methods.

The subtheme **"Importance of continuous learning"** focuses on the necessity for continuing professional development in the form of seminars, training sessions, and workshops. It is stressed that continuous training is beneficial to

radiologic technologists because it increases the level of understanding of the principles of radiation safety and enables them to perform therapeutic procedures with greater confidence. It appears that continuous training is vital for developing competence and promoting safe practice.

The subtheme **"Teamwork and communication"** upon the significance of teamwork and effective communication at the workplace. According to the respondents, collaboration with other employees can be considered a method of coping with job-related challenges. From the information obtained in narratives, teamwork contributes to creating an organized and comfortable working environment for radiologic technologists.

The sub-theme **"Professional Adaptation and Institutional Improvement"** highlights how radiologic technologists gradually integrate radiation safety practices into their clinical routines through experience and continuous exposure to radiation therapy procedures. Participants indicated that frequent involvement in radiation therapy and regular interaction with patients contributed to the development of professional habits related to radiation protection, such as proper shielding, accurate patient positioning, and strict adherence to controlled area protocols. Furthermore, respondents emphasized the importance of institutional support, including established guidelines and safety measures, in strengthening compliance with radiation protection practices and improving the overall quality of patient care.

6. Conclusion

It is evident from the results of the study that all respondents always apply radiation protection measures to protect both patients and healthcare professionals from the dangers of exposure to radiation. The participants stated that radiation safety was an important part of the medical practice that requires constant attention and proper adherence to the existing guidelines. The important aspects that were mentioned by the respondents as the basis of radiation safety include patient identification, correct positioning, area control, and regular application of protective devices. Moreover, the participants noted the important role of cooperation and communication between professionals to ensure that treatment will be delivered safely and effectively. In addition, the value of professional development was also mentioned because continuous learning plays an important role in the process of updating knowledge about radiation safety.

It is evident from the participants' responses that they are flexible, accountable, and attentive to the existing radiation protection guidelines despite all the problems that arise within the context of their professional activity in therapeutic settings. Time-related issues, need to follow some specific procedures, and accuracy of actions were among the main concerns raised by respondents. However, due to their high awareness of the possible consequences of exposure to radiation, the participants were able to act responsibly at work. At the same time, it becomes clear from the results of the study that an important role is played by organizational commitment to safety when protecting patients and healthcare professionals from dangerous radiation.

Thus, radiation protection measures in therapeutic settings cannot be provided successfully without the involvement of both professionals and organizations. In addition to the use of protective devices and following certain procedures, there is also a need to ensure sufficient resources and appropriate workplace policies. This can be achieved through radiation safety education.

7. Acknowledgement

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9. Appendices

Appendix A

Approval Letter from the REC

LORMA COLLEGES

LC-REC Form #024
APPROVAL LETTER

REC Reference #: 2026-087

March 27, 2026

To: **Matt Joseph Agbayani, Louise Francis Zinah Cabico, Primo Ric Olais, Angel Abuan and Myriah Helaena Soriano**
LORMA Colleges, College of Radiologic Technology

Subject: Approval of the Research Study – "EXPERIENCES OF RADIOLOGIC TECHNOLOGISTS ON RADIATION PROTECTION DURING RADIATION THERAPY" – by the Research Ethics Committee (REC).

Dear Researcher/s,

The Research Ethics Committee (REC) has reviewed your application to conduct the above-mentioned research study in the Bethany Hospital, City of San Fernando, La Union with you as the Principal Investigators within a duration of March 27, 2026 to March 27, 2027.

The Following documents have been reviewed and approved:

1. Endorsement of the Research Coordinator
2. Title and Statement of the Problem/Objective
3. Literature Review
4. Methods and Procedures
5. Population and Locale
6. Exclusion/Inclusion Criteria
7. Data Analysis
8. Ethical Considerations

The institutional REC expects to be informed about the progress of the study, any revision in the protocol before implementation and participants'/respondents' information/informed consent. Likewise, you are required to provide the Board a copy of the final report.

Yours Sincerely,

JEROME P. VERA, LPT
Chairman, LC-REC

10. Author(s) biodata

Matt Joseph Agbayani[2], Angel G. Abuan[3], Louise Francis Zinah M. Cabico[4], Primo Ric N. Olais[5], and Myriah Healena[6] are students enrolled in the Bachelor of Science in Radiologic Technology at LORMA Colleges. Together with the guidance of their research adviser, Ms. Dana Michile Castro, they conducted a study entitled "Experiences of Radiologic Technologists on Radiation Protection During Radiation Therapy." The researchers demonstrated dedication, teamwork, and commitment throughout the completion of this study, aiming to contribute meaningful insights

into radiation protection practices in therapeutic settings and to support the advancement of radiologic technology education and patient safety.