KNOWLEDGE, AWARENESS & COMPLIANCE OF RADIOLOGIC TECHNOLOGISTS WITH RADIATION SAFETY PRINCIPLES IN MOBILE RADIOGRAPHY IN SELECTED HOSPITALS IN METRO MANILA

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ABSTRACT

Mobile radiography relies on the expertise of radiologic technologists, who possess a high level of knowledge, awareness, and compliance with radiation safety principles. Their skills are essential for implementing safety measures that reduce occupational radiation exposure, enhance workplace safety, and improve patient care and overall outcomes. Increased knowledge leads to greater awareness, which in turn fosters improved compliance with radiation safety standards. To maintain these high levels of adherence, it is crucial for hospitals in Metro Manila to implement the proposed action plan aimed at achieving optimal radiation safety practices.

The growing use of mobile radiography requires strict adherence to radiation safety regulations. However, maintaining controlled environmental conditions can be challenging. Therefore, it is essential to evaluate the knowledge and compliance of radiologic technologists and their relationship to radiation safety principles in mobile radiography across selected hospitals in Metro Manila. A descriptive-correlational study design will involve 74 radiologic technologists chosen through stratified random sampling.

To enhance radiation safety in mobile radiography, researchers should receive additional training on the As Low as Reasonably Achievable (ALARA) principle. This training will help ensure that their knowledge, skills, and professional competence remain optimal. Ongoing education through hospital-based seminars and workshops is also essential, covering topics such as proper dosimeter use, effective dose reduction, and crucial radiation protection measures. Regular workshops, refresher courses, and a strong safety culture are vital for maintaining radiation safety as a priority in daily practice. Finally, future researchers are encouraged to broaden the scope of radiation safety studies to include a more diverse sample population, thereby validating and strengthening these findings.

Keywords: Knowledge, Awareness, Compliance, Radiation safety, mobile radiography.

1. INTRODUCTION

The increasing use of mobile radiography in healthcare has created a pressing need for radiologic technologists to prioritize adherence to radiation safety standards and practices. As medical imaging becomes more essential as a diagnostic tool, it is critical to understand and evaluate radiologic technologists' knowledge, awareness, and compliance levels regarding radiation safety measures, particularly in complex mobile radiography settings where controlled environments may be challenging to maintain.

However, existing studies reveal significant gaps in the available literature, especially concerning hospitals in Metro Manila. Within the Philippine healthcare system context, the relationships between knowledge, awareness, and compliance related to radiation safety in mobile

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radiography remain largely unexplored. Furthermore, limited research investigates specific action plans to address compliance and knowledge deficiencies. This study aims to evaluate radiologic technologists' knowledge, awareness, and compliance regarding radiation safety in mobile radiography within selected public hospitals in the Metro Manila area. By examining these factors and their interrelationships, the goal is to develop an informed action plan to enhance the radiation safety practices of radiologic technologists, ultimately providing better protection for both healthcare workers and patients requiring mobile radiography services.

2. METHODOLOGY

The researcher used a descriptive correlational research design to explore relationships between various variables and analyze knowledge, awareness, and compliance with radiation safety principles. The primary data were collected via a questionnaire completed by radiologic technologists at Jose Reyes Memorial Medical Center (JRMMC), East Avenue Medical Center (EAMC) and Philippine Orthopedic Center (POC). The study involved 90 radiologic technologists from these three hospitals, chosen through stratified random sampling, based on a target population of 74.

A researcher developed a questionnaire comprising three sections designed to evaluate knowledge, awareness, and compliance with radiation safety principles. Experts validated the questionnaire, which demonstrated strong reliability with Cronbach's Alpha values indicating good internal consistency. After securing the necessary approvals, printed questionnaires were distributed to respondents and collected while maintaining confidentiality. The researcher then compiled the data for statistical analysis.

3. RESULTS AND DISCUSSIONS

Discussion on the knowledge, awareness, & compliance with radiation safety principles in mobile radiography was presented in the succeeding tables and textual presentations:

Table 1. Respondents level of Knowledge of Radiation Safety Principles in MobileRadiography

Indicators	Weighted	Verbal	Rank
Level Of Knowledge with Radiation Safety			
Ensure patient protection	3.91	Very high	1
Minimize radiation exposure	3.78	Very high	5.5
Consistently applies ALARA to minimize radiation dose to patients and staff	3.73	Very high	10
Ensures staff and self-protection by using lead barriers or stepping out of the exposure room.	3.83	Very high	3.5

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Utilizes lead shielding and protective barriers when distance is not an option.	3.74	Very high	8
Identifies sources of background radiation and how medical imaging contributes to overall exposure	3.74	Very high	8
Follows protocols if the dose limit is exceeded and reports any overexposure	3.74	Very high	8
Ensures exposure remains within safe levels	3.78	Very high	5.5
Involves an appreciation for the benefits and risks of using radiation for procedures or treatments	3.83	Very high	3.5
Maximize image quality while minimizing radiation exposure for patients, healthcare workers, and the public	3.84	Very high	2
Overall weighted Mean	3.42	Very high	

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Legend: Strongly Agree/Very high -4, agree/high-3, disagree/low-2, strongly disagree/very low-1

Table 1 shows that indicator 1states that "Ensure patient protection," was expressed verbally as very high and ranked as #1 with a weighted mean of 3.91. The second rank was indicator 10, which states, "Maximize image quality while minimizing radiation exposure of patients, health workers, and the public," with a weighted mean of 3.84 and was interpreted verbally as very high. Both Indicator 4, "Uses lead barriers or steps out of the exposure room to ensure staff and self-protection," and Indicator 9, "Shows an appreciation of benefits and risks of using radiation for procedure or treatment" was verbally inferred as very high and tied for rank 3.5, with a weighted mean of 3.83.

The indicator 2, "Minimize radiation exposure," and Indicator 8, "Ensures exposure remains within safe limits," were verbally interpreted as very high and ranked 5.5 with a weighted mean of 3.78. Indicator 5, "Utilizes lead shielding and protective barriers when distance is not an option", Indicator 6, "Identifies sources of background radiation and how medical imaging contributes to overall exposure" and indicator 7 "Follows protocols if the dose limit is exceeded and reports any overexposure" all were ranked 8th and verbally interpreted by very high with a weighted mean of 3.74. The indicator 3, "Consistently applies ALARA to minimize radiation dose to patients and staff." which we interpreted narratively as very high ranked at #10 with weighted mean 3.73.

To sum up, the general weighted mean was 3.79, which means it was verbally interpreted as very high. This shows that radiologic technologists have very high knowledge-of radiation safety principles and apply them in mobile radiography. Their commitment to the safety of patients and employees, the minimization of radiation dose, and the maintenance of high-quality images reflect their awareness of radiation risk and their responsibility to implement safety measures effectively.

The findings of the study are supported by Ghasemi (2023) Knowledge and Awareness Regarding Radiation Safety among Radiology Study Program Students conducted in Indonesia; the authors found that while a significant proportion of radiology students have good knowledge about radiation safety, there remains a good proportion of students who have not yet reached competent levels. The same can be observed in Table 1: Respondents' Knowledge about Radiation Safety Principles in Mobile Radiography, which concluded that practitioners were highly knowledgeable in vital radiation safety principles. Education and experience are paramount in ameliorating knowledge gaps in radiation safety, as suggested by both studies. Conclusions suggest that notwithstanding hands-on training still significantly increases knowledge and awareness, continuous education among both the students and practicing technologists should be emphasized to ascertain radiation protection in mobile radiography circumstances.

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Table 2. Radiologic Technologists' Level of Awareness in Radiation Safety Principles

Indicators	Weighted	Verbal	Rank
Level of Awareness in Radiation Safety	Mean	Interpretation	
Aware on the ALARA principles	3.93	Very High	1
Know different radiation protection method	3.84	Very High	2.5
Well-informed of how to correctly utilize personal protective equipment	3.84	Very High	2.5
Concerned about the safe handling of radiation dosimeters	3.54	Very High	10
Understand the radiation dose and its effect	3.80	Very High	6.5
Aware on special considerations for high risk groups	3.81	Very High	4.5
Informed about compliance with radiation protection standards	3.75	Very High	8.5
learnt safe use of mobile & other imaging modalities.	3.80	Very High	6.5
Have insight on properly position the patient and equipment to avoid repeat exposures.	3.75	Very High	8.5
Well-versed in performing routine quality control checks on mobile x-ray units to ensure proper functioning	3.8	Very High	8.5
Overall weighted Mean	3.80	Very High	

Legend: Strongly Agree/Very high -4, agree/high-3, disagree/low-2, strongly disagree/very low-1 As shown in Table 2, indicator 1 Radiologic Technologist was familiar with the principles of ALARA," has a weighted mean of 3.93 and ranked #1and was verbally interpreted as very high. Indicator 2, know different radiation protection method", and 3, well-informed of how to utilize personal protective equipment", both ranked 2.5 with weighted mean of 3.84, interpreted as very high. The indicator 6 aware on special considerations for high -risk groups" ranked 4.5 with a weighted mean of 3.81 and verbally interpreted as very high.

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Subsequently, Indicator 10, which states well-versed in performing routine quality control checks on mobile x-ray units to ensure proper functioning," received a weighted mean of 3.81 and was ranked #4.5. Indicator 5 "understand the radiation dose and its effect," and indicator 8 learned safe use of mobile & other imaging modalities," were both ranked of 6.5, with a weighted mean of 3.80, and were verbally interpreted as very high. Indicator 7, informed about compliance with radiation protection standards," and indicator 9, "Have insight on properly positioning the patient and equipment to avoid repeat exposures," received a ranking of 8.5, with a weighted mean of 3.75, indicating a verbal interpretation of very high. Finally, Indicator 4, concerned about the safe handling of radiation dosimeters, was ranked #10, with a weighted mean of 3.69 and a verbal interpretation of very high.

The overall weighted mean was 3.80, which means. This verbally indicated as very high indicates that radiologic technologists have a very high awareness of radiation safety principles. They possess extensive knowledge of ALARA, the implications of radiation dosage, and suitable protective protocols. This awareness enables adherence to safety protocols, such as donning personal protective equipment, correctly positioning the patient, and conforming to radiation protection standards.

The findings of the study were supported by Yashima (2022). Awareness of Medical Radiologic Technologists of Ionizing Radiation and Radiation Protection Five years post-Fukushima Daiichi nuclear disaster, a study evaluating perceptions of medical radiologic technologists about radiation safety revealed heterogeneous awareness/understanding of radiation risk among professionals working in different imaging modalities and specialties. In the same vein, table 2 about the level of awareness of radiologic technologists of radiation safety in mobile radiography, helps in assessing technologists' awareness of safety measures, reflecting their knowledge and practice of radiation safety. These findings indicate that despite formal training in radiation safety among radiologic technologists, awareness and perceptions around radiation safety and quality can vary depending on workplace exposure, specialty, and type of radiological practice. It emphasizes the importance of ongoing education and specialized training to improve awareness and preparedness as well as responding to pertinent radiation-related emergencies and public issues.

Table 3. Radiologic Technologists level of compliance with Radiation Safety PrinciplesinMobile RadiographyImage: Safety PrinciplesImage: Safety Principles

Indicators Compliance with radiation safety principles	Weight ed Mean	Verbal Interpretation	Rank
Perform equipment quality checks before mobile procedures.	3.74	Very high	5.5
Optimize exposure techniques for each patient	3.79	Very high	3
Maintain safe distances during exposures	3.76	Very high	4

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		v 01. 0,	110.02,202
Follow proper equipment positioning guidelines	3.74	Very high	5.5
Wear my radiation monitoring badge during procedures	3.56	Very high	9
Use lead aprons during mobile radiography	3.86	Very high	1
Utilize thyroid shields when appropriate	3.73	Very high	7
Wear protective gloves when necessary	3.50	Very high	10
Use mobile protective barriers when available	3.71	Very high	8
Report equipment malfunctions promptly	3.83	Very high	2
Overall weighted Mean	3.72	Very high	

As shown in Table 3, the indicator 6, Radiologic Technologist used lead aprons during mobile radiography," ranked first with a weighted mean of 3.86 and was verbally interpreted as very high. Indicator 10, which states report equipment malfunctioning promptly, placed second with a weighted mean of 3.83, and the verbal interpretation of very high. The indicator 2 "optimize exposure techniques for each patient," was ranked #3 with a weighted mean of 3.79 and verbally interpreted as very high. Indicator 3 – maintain safe distances during exposures." ranked as #4, with a weighted mean 3.76, and the verbal interpretation was very high. Indicators 1 perform equipment quality checks before mobile procedures" and indicator 4 adhere to proper equipment positioning guidelines", ranked #5.5 with weighted mean of 3.74, both interpreted verbally as very high. Indicator 7 utilize thyroid shields when appropriate" received a rank of #7, and a weighted mean of 3.73, and was verbally interpreted as very high. Similarly, the eighth ranked for Indicator 9 use mobile protective barriers when available", has a weighted mean of 3.71 and verbally interpreted as very high. The indicator #5 wears my radiation monitoring badge during procedures," ranked #9, has a weighted mean of 3.56, which was verbally interpreted as very high. Lastly, Indicator 8 wear protective gloves when necessary" was ranked #10, yielded a weighted mean of 3.50, and verbally interpreted as very high.

To sum up, the overall weighted mean was 3.72, which could be verbally interpreted as very high. This shows that radiologic technologists have very high compliance with radiation safety principles. In fact, radiologic technologists provided a higher level of compliance-with radiation safety principles in mobile radiography. So, add basics such as protective equipment (lead aprons, thyroid shields), distances, exposure techniques, and reporting. Their stringent adherence minimizes radiation risks to patients and healthcare personnel.

The findings of the study were supported by Shawki (2019) cited by Kamislioglu (2021), who states that assessing radiographers' compliance with-radiation protection practices aligns with the findings in Table 3, by emphasizing the importance of compliance with radiation safety measures. With 75.1% of radiographers demonstrating good adherence to environmental, patient, and self-protection practices, the study suggests that experience plays a key role in compliance levels. Similarly, the data in Table 3 shows that radiologic technologists have a very high

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compliance with following safety principles, such as using lead aprons, optimizing exposure techniques, and maintaining safe distances. These findings underscore the need for ongoing education, training, and stricter adherence to radiation safety protocols to enhance compliance among radiologic technologists in mobile radiography settings

Table 4. T	he Relationship	Between the Level of	of Knowledge a	and Level of	Awareness
on Radiati	on Safety Princ	iples in Mobile Radio	ography		

Variables	Statistical Treatment (Pearson's)	p-value	Decision	Interpretation
Knowledge & Awareness	r=563 (moderate correlation)	. 000**	H0 reject	Significant

*Significant @ .01

As shown in Table 4, For the relationship between the level of knowledge and level of awareness on radiation safety principles in mobile radiography, a Pearson's r value of .563 was obtained, indicating a moderate correlation. Meanwhile, a probability value of .000, which was lower than the test of significance at .01 showed that there is sufficient statistical evidence to reject the null hypothesis, suggesting a significant relationship between the variables. This means that the higher the level of knowledge of the radiologic technologist with radiation safety principles in mobile radiography, the higher the level of awareness.

To support this study by Shbeer (2024) stated that correlation between ICU personnel's understanding of radiation safety (knowledge) and their actual awareness of its importance in clinical practice (awareness). The relationship depicted in the table likely underscores the gaps in education and the need for a comprehensive radiation safety training program targeted at ICU staff. This training should increase knowledge and enhance awareness of the risks associated with radiation exposure and the importance of protective measures.

Table 5.Relationship Between Radiologic Technologists' Level of Adaptation To Digital Tools and Practice in Patient Management in a Digitalized Environment

Variables		Statistical	p-value	Decision	Interpretation
		Treatment	-		-
		(Pearson's)			
Knowledge	&	r=.614	.000*	H0 rejected	Significant
Compliance		(moderate correlation)			
*Significant @	.01	···· ,			

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For the relationship between the level of knowledge and level of compliance with radiation safety principles in mobile radiography, a Pearson's r value of .614 was obtained, indicating a moderate correlation. Meanwhile, a probability value of .00,0, which was lower than the test of significance at .01, showed that there is sufficient statistical evidence to reject the null hypothesis, suggesting a significant relationship between the variables. This means that the higher the respondents' level of knowledge of radiation safety principles in mobile radiography, the higher their level of compliance.

To support this study by Razooqi (2021) study in Nigeria, although workers (especially radiologists and radiographers) had good knowledge, the lower scores among nurses and Radiologic technologist (42%) reflect a broader gap in both knowledge and compliance. The results suggest that a higher level of knowledge should, in theory, lead to better compliance with radiation safety principles.

Table 6. The Relationship Between the Level of Awareness and Level of Compliance with Radiation Safety Principles in Mobile Radiography

Variables		Statistical Treatment (Pearson's)	p-value	Decision	Interpretation	Fo
Awareness compliance	&	r=.510 (moderate correlation)	.000**	reject H0	Significant	UII

*Significant @ .01

relationship between the level of awareness and level of compliance with radiation safety principles in mobile radiography, Pearson's r value of .510 was obtained indicating a moderate correlation. Meanwhile, a probability value of .000 which was lower than the test of significance at .01 showed that there is sufficient statistical evidence to reject the null hypothesis, suggesting a significant relationship between the variables. This means that the higher the level of awareness of radiologic technologist with radiation safety principles in mobile radiography, the higher their level of compliance.

To support this study Abuzaid (2019) cited by Bakri (2024) the relationship between radiographers' awareness and their compliance with radiation safety principles. Specifically, the study shows that more experienced and older radiographers tend to have better adherence, which could be linked to a higher level of awareness of safety protocols developed over years of experience.

4. CONCLUSION

Radiologic technologists in selected hospitals throughout Metro Manila demonstrate a high level of knowledge, awareness, and compliance with radiation safety principles in mobile radiography. This high level of knowledge and understanding leads to high levels of compliance, reducing occupational radiation exposure risks and improving patient safety. The results indicate that greater awareness fosters improved literacy and adherence to safety guidelines. Therefore, the proposed action plan focuses on sustaining knowledge, enforcing data practices, and ensuring

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compliance with radiation safety protocols in mobile radiography, emphasizing the importance of maintaining these high standards.

Action Plan to sustain the radiologic technologists' Knowledge, awareness & Compliance of Radiation Safety Principles in Mobile Radiography

Areas of	Program	Time	Persons	Expected	Success
Concern		frame	Involved	Outcome	Indicator
Radiologic technologis ts' knowledge of radiation safety principles in mobile radiograph y	 In-house lectures, Seminar on learning and development Develop online training modules for ongoing education Create a check-in system for technical quizzes post- training 	First,Fi rst/ the second quarter of the year	Departmen t head, Chief RT, RTs, Human Resource Manageme nt	Maintain and/or sustain exemplary radiation protection protocols.	98% turnaround rate for the engaged individuals
Radiologic technologis ts' awareness in radiation safety principles in mobile radiograph y	 Organize interactive workshops with case studies (3 sessions) Distribute informative pamphlets on recent radiation safety updates Implement a monthly safety newsletter highlighting best practices 	First/ the second quarter of the year	Departmen t head, Chief RT, RTs, Human Resource Manageme nt	Maintain and/or sustain exemplary radiation protection protocols	98% turnaround rate for the engaged individuals
Radiologic technologis ts'	1. Mandate attendance at national	Fourth quarter	Departmen t head, Chief RT,	Maintain robust adherence	98% turnaround rate for the

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compliance		conventions	of the	RTs,	to	engaged	
with		focusing on	year	Radiation	radiation	individuals	
radiation		radiation safety	-	Protection	protection		
safety	2.	Establish peer		officer	standards.		
principles		mentoring					
in mobile		programs for					
radiograph		compliance					
y		accountability					
•	3.	Conduct					
		compliance					
		audits					
		following					
		training					
		sessions					

Rationale:

Continuous training and reinforcement of best practices are essential for maintaining radiologic technologists' knowledge, awareness, and compliance with radiation safety principles. Regular education sessions, workshops, and refresher courses should be conducted to keep technologists updated on the latest safety protocols. Hospitals must enforce strict compliance through monitoring, audits, and the proper use of safety equipment. Fostering a strong safety culture will minimize radiation risks and enhance overall patient care. Collaboration among administrators, department heads, and technologists is crucial for upholding high standards. By consistently updating training programs, enforcing safety protocols, and providing necessary resources, hospitals can ensure a safe working environment for both technologists and patients. Future research should focus on strengthening radiation safety practices in mobile radiography.

5. RECOMMENDATION

To enhance radiation safety in mobile radiography, we should focus on comprehensive training centered around the ALARA (As Low as Reasonably Achievable) principle. Ongoing education through seminars and workshops can deepen our understanding of effective dosimeter use and radiation safety. By developing robust training protocols, updating processes, and ensuring access to protective equipment, we can improve our facility's radiation safety programs. Regular workshops and a strong safety culture will help us maintain high standards. Committing to continuing education and reinforcing best practices such as effective shielding and safe distances will reduce radiation risks while improving imaging quality. Together, these initiatives will create a safer radiography environment.

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