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CLINICAL COMPETENCE OF RADIOLOGIC TECHNOLOGIST IN DIGITAL IMAGING QUALITY ASSURANCE: BASIS FOR A POLICY FRAMEWORK

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ABSTRACT

Digital Imaging Quality Assurance (DIQA) is essential in ensuring image accuracy, patient safety, and overall diagnostic effectiveness in radiologic practice. This study aimed to assess the clinical competence of Radiologic Technologists in DIQA across selected secondary private hospitals. A quantitative descriptive research design was used, with 58 licensed Radiologic Technologists responding to a structured questionnaire. The study focused on three main areas: knowledge and application, technical skills, and decision-making in QA practices. Results showed that the respondents demonstrated very high overall competence, particularly in radiation safety and adjusting imaging parameters based on patient needs. However, lower ratings were observed in areas like troubleshooting digital imaging systems, performing routine QA tests, and participating in improvement programs, which may point to gaps in hands-on experience and institutional support. Competence was significantly related to age and years of experience, but not to sex or formal training, suggesting that experience in the clinical setting has a stronger impact than training alone. Based on the findings, a hospital-based policy framework was proposed to enhance QA systems, focusing on continuous practical training, mentorship, and structured QA monitoring. This framework aims to support the professional growth of Radiologic Technologists and improve the overall quality of radiologic services.

Keywords: Digital Imaging, Quality Assurance, Radiologic Technologists, Clinical Competence, Hospital Policy, Diagnostic Imaging.

1. INTRODUCTION

The advancement of digital imaging technology has greatly improved the accuracy, efficiency, and quality of diagnostic procedures in radiologic sciences. To maintain these improvements, quality assurance (QA) programs are essential to ensure that imaging systems perform safely, reliably, and in accordance with professional standards. Radiologic Technologists (RTs) play a vital role in this process through equipment operation, QA checks, and adherence to imaging protocols that safeguard both image quality and patient safety.

Clinical competence in QA includes knowledge and skills in equipment maintenance, calibration, image quality assessment, and radiation safety. However, despite the importance of QA in digital imaging, there is limited evidence about the level of competence of Radiologic Technologists in actual clinical practice. Factors such as age,

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gender, and length of digital imaging experience may also influence their ability to effectively implement QA procedures and maintain diagnostic accuracy.

In Zamboanga City, Radiologic Technologists are key personnel in healthcare institutions that rely on digital imaging systems for accurate diagnosis. Yet, challenges such as limited resources, inconsistent QA implementation, and lack of structured training hinder the consistent delivery of high-quality radiologic services. Assessing their clinical competence in digital imaging QA is therefore essential to identify existing gaps, improve professional performance, and strengthen the overall quality of radiologic practice in the region.

2. METHODOLOGY

This study utilized a quantitative-descriptive research design to objectively measure and describe the clinical competence of Radiologic Technologists (RTs) in Digital Imaging Quality Assurance (DIQA) and to propose a policy framework for improving competency. Conducted in five major private hospitals in Zamboanga City, Ciudad Medical Zamboanga, Zamboanga Peninsula Medical Center, West Metro Medical Center, Zamboanga Doctors' Hospital, and Brent Hospital and Colleges Incorporated, the study involved 58 licensed RTs selected through purposive and total population sampling. Data were collected using a validated and reliable survey questionnaire divided into sections on demographic profile, clinical competence, and challenges in DIQA. The instrument achieved a high reliability score (Cronbach's alpha = 0.866) after expert validation and pilot testing. Ethical standards, including informed consent, confidentiality, and voluntary participation, were strictly followed, with approval from the University of Makati Research Ethics Committee. Data were analyzed using frequency and percentage for demographics, weighted mean for competence levels, and t-test and ANOVA for differences among groups, while quantitative analysis identified challenges and recommendations to enhance digital imaging quality assurance practices.

3. RESULTS AND DISCUSSIONS

Table 1. Demographic Profile of the Respondents

Profile		f	%
Age	20 – 29	15	25.9
	30 – 39	33	56.9
	40 and above	10	17.2
Sex	Male	27	46.6
	Female	31	53.4
Years of Practice in Digital Imaging	Less than 5 years	22	37.9
	5 – 10	30	51.7
	11 – 15	6	10.3
Formal Trainings in Digital Imaging Quality	Yes	9	15.5
	No	49	84.5

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Assurance			

In terms of age, majority of the respondents belonged to the age group of 30–39 years old, comprising 56.9% (f = 33). This was followed by those aged 20–29 years, accounting for 25.9% (f = 15), while those aged 40 and above made up the smallest group at 17.2% (f = 10). Regarding sex, most of the respondents were female, representing 53.4% (f = 31), while males comprised 46.6% (f = 27). As to years of practice in digital imaging, more than half of the respondents had 5–10 years of experience, accounting for 51.7% (f = 30). Those with less than 5 years of experience comprised 37.9% (f = 22), while only 10.3% (f = 6) had 11–15 years of practice. In terms of formal trainings in digital imaging quality assurance, majority of the respondents, 84.5% (f = 49), reported that they had not undergone any formal trainings. Only 15.5% (f = 9) indicated that they had received such trainings.

As a result, most of the respondents employed in secondary private hospitals in Zamboanga City were females, since the majority of the respondents (56.9%) are aged 30–39 and have 5–10 years of experienced in digital imaging (51.7%). This implies that most Radiologic Technologists are mid-career professionals who were likely to have practical exposures and accumulated experiences and majority of the respondents don't have formal trainings as far as digital imaging in quality assurance is concerned.

Table 2
Level of Clinical Competence of the respondents in Digital Imaging practice on Quality Assurance in terms of Knowledge and Application of Digital Imaging Quality Assurance

		Mean Response	**Remarks**
1	I am knowledgeable about the principles and concepts of Digital Imaging Quality Assurance (DIQA).	4.55	Very High Competence
2	I understand the importance of quality assurance in maintaining image accuracy and patient safety.	4.67	Very High Competence
3	I am familiar with the protocols for image acquisition, processing, and archiving in digital radiography	4.60	Very High Competence
4	I can identify and apply the appropriate exposure factors to ensure optimal image quality.	4.55	Very High Competence
5	I am aware of common digital imaging artifacts and how to prevent them.	4.62	Very High Competence
6	I am knowledgeable about the role of Picture Archiving and Communication Systems (PACS) in digital imaging.	4.71	Very High Competence
7	I can effectively implement routine quality assurance (QA) tests on digital imaging equipment.	4.47	High Competence

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	Grand Mean	**4.58**	**Very High Competence**

Legend: 1.00 – 1.50 Very Low Competence
1.51 – 2.50 Low Competence
2.51 – 3.50 Moderate Competence
3.51 – 4.50 High Competence
4.51 – 5.00 Very High Competence

The study revealed a grand mean of 4.58, indicating a very high level of competence among Radiologic Technologists in secondary private hospitals in Zamboanga City in applying Digital Imaging Quality Assurance (DIQA) principles. The highest-rated indicators were knowledge of the Picture Archiving and Communication Systems (PACS) and understanding the importance of quality assurance (QA) in maintaining image accuracy and patient safety. These results suggest that RTs possess strong theoretical and practical awareness in areas that are central to radiologic practice, aligning with findings from Al-Sarraf et al. (2021), Cruz and Javier (2024), and Lee and Park (2022), who emphasized the importance of PACS and QA in ensuring efficiency, diagnostic accuracy, and patient protection.

However, the lowest-rated indicators such as performing routine QA tests and applying proper exposure factors indicate a gap between theoretical knowledge and practical implementation. Despite the high competence ratings, many RTs reported challenges in executing routine QA procedures consistently. This is likely influenced by the finding that 84.5% of respondents had no formal DIQA training, as well as institutional factors such as limited time, high workloads, and low prioritization of QA tasks. Similar studies, including those by Guyo et al. (2022) and Villanueva and Santiago (2020), also observed that practical QA performance is often hindered by insufficient training opportunities and heavy clinical demands.

Overall, the results show that while Radiologic Technologists demonstrate strong conceptual understanding and professional accountability, their applied competence in QA procedures needs improvement. This highlights the need for enhanced formal training, institutional policies, and consistent QA programs to ensure that theoretical knowledge translates into daily clinical practice. Strengthening these aspects would help promote higher imaging quality, operational consistency, and patient safety across radiology departments.

Table 3
Level of Clinical Competence of the Respondents in Digital Imaging Practice on Quality Assurance in terms of Technical Skills and Competency in Digital Imaging

		Mean Response	Remarks
1	I ensure proper calibration of imaging systems to maintain consistency in image quality.	4.55	Very High Competence
2	I apply radiation safety protocols while using digital imaging equipment.	4.76	Very High Competence

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3	I can accurately adjust imaging parameters based on patient body habitus.	4.72	Very High Competence
4	I have experience in troubleshooting common technical issues in digital imaging systems.	4.48	High Competence
5	I follow standard operating procedures (SOPs) in digital imaging examinations.	4.71	Very High Competence
6	I maintain proper image post-processing techniques to enhance diagnostic accuracy.	4.67	Very High Competence
7	I can operate digital radiographic equipment efficiently.	4.64	Very High Competence
	Grand Mean	**4.63**	**Very High Competence**

Legend: 1.00 – 1.50 Very Low Competence
1.51 – 2.50 Low Competence
2.51 – 3.50 Moderate Competence
3.51 – 4.50 High Competence
4.51 – 5.00 Very High Competence

The study revealed a grand mean of 4.63, interpreted as Very High Competence, indicating that Radiologic Technologists (RTs) in secondary private hospitals in Zamboanga City are highly skilled and confident in performing digital imaging and quality assurance (QA) procedures. This suggests that they possess both the technical knowledge and practical competence necessary to produce accurate imaging results while ensuring patient safety. The highest-rated indicators applying radiation safety protocols (4.76) and accurately adjusting imaging parameters based on patient body habitus (4.72) reflect RTs' strong adherence to patient-centered practices. These findings align with Cruz and Javier (2024) and the IAEA (2021), who emphasized that radiation protection and exposure optimization are core professional and ethical responsibilities of RTs, ensuring diagnostic accuracy and minimizing unnecessary exposure.

In contrast, the lowest-rated indicators troubleshooting technical issues (4.48) and ensuring proper calibration of imaging systems (4.55) though still reflecting high competence, reveal relatively less confidence and experience in equipment-related QA tasks. This may be explained by the division of roles in secondary hospitals, where biomedical engineers or vendor technicians typically handle equipment maintenance and calibration. As Villanueva and Santiago (2020) and Lee and Park (2022) observed, limited exposure and lack of formal DIQA training (noted among 84.5% of respondents in this study) can reduce RTs' familiarity with troubleshooting and calibration tasks. Furthermore, increasing automation in digital imaging systems reduces the need for manual intervention, leading to decreased opportunities for RTs to engage in hands-on technical QA, as noted by Cruz and Javier (2024).

Overall, the results highlight that RTs in Zamboanga City exhibit strong competence in patient-centered practices notably in radiation safety and exposure optimization but show a modest gap in equipment-related QA skills. These findings suggest the need for more structured DIQA training and greater involvement of RTs in basic equipment maintenance and troubleshooting. Strengthening these areas would not

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only improve workflow efficiency and reduce imaging downtime but also enhance the overall quality and consistency of radiologic services, as supported by Guyo et al. (2022), who emphasized that expanding RTs' roles in QA fosters shared accountability and elevates professional competence within radiology teams.

Table 4
Level of Clinical Competence of the Respondents in Digital Imaging Practice on Quality Assurance in terms of Quality Assurance and Decision-Making in Radiologic Practice

		Mean Response	Remarks
1	I conduct regular quality assurance tests on digital imaging equipment.	4.31	High Competence
2	I ensure compliance with radiation protection and ALARA (As Low As Reasonably Achievable) principles.	4.78	Very High Competence
3	I assess and verify the accuracy of radiographic images before submitting them for diagnosis.	4.67	Very High Competence
4	I participate in quality improvement programs to enhance digital imaging practices.	4.38	High Competence
5	I apply decision-making skills when evaluating image quality and determining the need for image retakes.	4.71	Very High Competence
6	I effectively communicate with radiologists and healthcare professionals to ensure diagnostic accuracy.	4.62	Very High Competence
7	I stay updated with the latest advancements in digital imaging quality assurance	4.52	Very High Competence
	Grand Mean	**4.54**	**Very High Competence**

Legend: 1.00 – 1.50 Very Low Competence
1.51 – 2.50 Low Competence
2.51 – 3.50 Moderate Competence
3.51 – 4.50 High Competence
4.51 – 5.00 Very High Competence

The study revealed a grand mean of 4.54, interpreted as Very High Competence, indicating that Radiologic Technologists (RTs) in secondary private hospitals in Zamboanga City demonstrate strong confidence and ability in applying decision-making and quality assurance (QA) principles in their clinical work. This reflects their proficiency in both managing imaging tasks and ensuring patient safety and diagnostic accuracy. The two highest-rated indicators following radiation protection and ALARA principles (4.78) and using decision-making skills when assessing image quality and deciding on retakes (4.71) show that RTs possess a deep understanding of radiation safety and clinical judgment. These results align with the IAEA (2021) and Cruz and Javier (2024), who

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emphasize that radiation protection is a core ethical and professional obligation for RTs and that sound decision-making in imaging procedures is vital for maintaining diagnostic standards.

However, the two lowest-rated indicators regularly performing QA tests on digital imaging equipment (4.31) and joining quality improvement programs (4.38) suggest a relative gap in RTs' participation in equipment-related QA and institutional improvement activities. This can be attributed to the division of responsibilities in hospitals, where biomedical engineers or medical physicists typically handle calibration and QA testing, limiting RTs' direct involvement (Villanueva & Santiago, 2020). The lack of formal DIQA training among most respondents also contributes to reduced confidence in these technical areas, as supported by Lee and Park (2022), who found that limited training hinders radiology staff from developing consistent QA competencies. Furthermore, heavy workloads and limited institutional incentives may restrict RTs' engagement in QA initiatives, echoing Guyo et al. (2022) who observed similar challenges in resource-constrained settings.

Overall, the findings highlight that Radiologic Technologists in Zamboanga City exhibit very high competence in patient-centered areas, particularly in applying radiation protection and exercising critical decision-making skills that directly enhance patient safety and diagnostic quality. However, their lower competence in QA testing and improvement programs reveals the need for greater institutional support and structured training. Strengthening RTs' involvement in these technical and developmental aspects, as emphasized by Smith and Taylor (2021), can enhance accountability, promote continuous improvement, and ensure higher overall standards in radiologic practice.

Table 5

Significant Difference in the Level of Clinical Competence of the Respondents in Digital Imaging Practice on Quality Assurance in terms of their Sex

	Sex	Mean Response	t-value	*p*-value	Remarks
Knowledge and application of Digital Imaging Quality Assurance	Male	4.55	-0.478	0.635	Not significant
	Female	4.60			
Technical Skills and Competency in Digital Imaging	Male	4.57	-0.936	0.353	Not significant
	Female	4.68			
Quality Assurance and Decision-Making in Radiologic Practice	Male	4.48	-1.031	0.307	Not significant
	Female	4.60			
Overall	**Male** **Female**	**4.53** **4.63**	**-0.849**	**0.400**	**Not significant**

Note. $p < 0.05$ = Significant; $p < 0.01$ = Highly Significant; $p \geq 0.05$ = Not Significant. Test used: ANOVA.

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The analysis in Table 5 showed no significant gender-based differences in the clinical competence of Radiologic Technologists (RTs) in Digital Imaging Quality Assurance (DIQA). Both male and female RTs demonstrated very high competence across all domains knowledge and application, technical skills, and decision-making with overall mean scores of 4.53 for males and 4.63 for females ($p > 0.05$). This indicates that gender does not influence competence in DIQA, as both groups perform equally well in applying QA principles, operating digital imaging systems, and making sound clinical decisions.

Female RTs scored slightly higher in knowledge and application (4.60 vs. 4.55), technical skills (4.68 vs. 4.57), and decision-making (4.60 vs. 4.48), though none were statistically significant. These findings align with Kolb's Experiential Learning Theory and studies by Priest et al. (2022) and Makanjee et al. (2022), which emphasize that radiologic competence develops through experience, practice, and mentorship rather than gender. Decision-making skills, as supported by Ali and Yaseen (2021) and the ASRT Best Practices (2025), are refined through clinical exposure and collaboration, which both genders equally experience.

Overall, the results affirm that competence in DIQA is driven by training, experience, and workplace learning not gender. Radiology departments should continue fostering gender equality and equal access to professional development, ensuring that all RTs are evaluated based on skill, performance, and commitment to quality patient care.

Table 6

Significant Difference in the Level of Clinical Competence of the Respondents in Digital Imaging Practice on Quality Assurance in terms of their Formal Trainings in DIQA

	Formal Trainings in DIQA	Mean Response	t-value	*p*-value	Remarks
Knowledge and application of Digital Imaging Quality Assurance	With	4.44	-1.041	0.303	Not significant
	Without	4.60			
Technical Skills and Competency in Digital Imaging	With	4.51	-0.911	0.366	Not significant
	Without	4.65			
Quality Assurance and Decision-Making in Radiologic Practice	With	4.38	-1.138	0.260	Not significant
	Without	4.57			
Overall	**With**	**4.44**	**-1.066**	**0.291**	**Not significant**
	Without	**4.61**			

Note. $p < 0.05$ = Significant; $p < 0.01$ = Highly Significant; $p \geq 0.05$ = Not Significant. Test used: ANOVA.

The results in Table 6 revealed that Radiologic Technologists (RTs) who did not attend formal DIQA training scored slightly higher than those who did, although the differences were not statistically significant (p > 0.05). The untrained group scored 4.60 in knowledge and application, 4.65 in technical skills, and 4.57 in decision-making, compared to 4.44, 4.51, and 4.38 for trained RTs, respectively. The overall mean was 4.61 for untrained RTs and 4.44 for trained RTs, indicating that both groups demonstrated high competence. These results suggest that formal training did not significantly affect DIQA competence, as both trained and untrained RTs performed at a similar level.

The findings imply that RTs develop DIQA competence primarily through experience, observation, and mentoring rather than short, lecture-based training. Consistent with Kolb's Experiential Learning Theory, RTs learn effectively by performing imaging tasks, analyzing results, and making improvements based on feedback. Studies such as Priest et al. (2022) and Makanjee et al. (2022) support this, noting that practical, hands-on learning and peer collaboration are key in refining technical and decision-making skills. Similarly, Kato et al. (2022) emphasized that real-patient interactions are essential for mastering procedures like positioning and exposure adjustment skills that cannot be fully acquired through classroom instruction.

Moreover, regulatory requirements from the Department of Health (DOH AO 124 s.92; AO 2020-0035) ensure that all RTs, regardless of training status, engage in QA as part of their routine duties. International standards, such as those from the IAEA (2023), also define QA as a continuous, team-based process rather than a one-time training outcome. Thus, competence in DIQA is shaped by daily clinical practice and workplace learning, not merely by formal instruction. Overall, these findings highlight that learning-by-doing and collaborative experience play a more critical role in enhancing competence than attending brief formal training sessions.

Table 7
Significant Difference in the Level of Clinical Competence of the Respondents in Digital Imaging Practice on Quality Assurance in terms of their Age

	Age	Mean Response	F-value	*p*-value	Remarks
Knowledge and application of Digital Imaging Quality Assurance	20 – 29	4.34	4.324	0.018	Significant
	30 – 39	4.62			
	40 and above	4.80			
Technical Skills and Competency in Digital Imaging	20 – 29	4.32	6.927	0.002	Significant
	30 – 39	4.69			
	40 and above	4.87			
	20 – 29	4.27	4.531	0.015	Significant
	30 – 39	4.60			

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Quality Assurance and Decision-Making in Radiologic Practice	40 and above	4.77			
Overall	20 – 29	4.31	5.541	0.006	Significant
	30 – 39	4.64			
	40 and above	4.81			

Note. *p* < 0.05 = Significant; *p* < 0.01 = Highly Significant; *p* ≥ 0.05 = Not Significant. Test used: ANOVA.

The results in Table 7 show that age significantly affects the clinical competence of Radiologic Technologists (RTs) in Digital Imaging Quality Assurance (DIQA), as all p-values were below 0.05. This means that older RTs demonstrate higher competence in all areas knowledge and application, technical skills, and decision-making compared to younger ones.

For knowledge and application (p = 0.018), respondents aged 40 and above scored highest (4.80), followed by those aged 30–39 (4.62), and 20–29 (4.34). This suggests that experience gained over time deepens understanding of QA principles and their real-world application. Younger RTs may still be adjusting to translating theoretical learning into practice, consistent with Burris et al. (2020) who found that practical exposure is key to mastering technical applications. In technical skills (p = 0.002), the older group again scored highest (4.87), showing that hands-on experience builds proficiency. Over the years, RTs are exposed to diverse imaging systems and cases, enhancing their adaptability and troubleshooting ability. This supports Smith et al. (2021), who noted that accumulated experience sharpens technical competence and technological adaptability. For decision-making (p = 0.015), older RTs (4.77) also outperformed younger ones (4.27), indicating that sound judgment in QA develops through experience and repeated exposure to real clinical challenges. Gibson et al. (2017) similarly stated that seasoned professionals are better at making balanced and informed decisions under pressure.

Overall, the findings reveal that age and by extension, professional experience plays a key role in developing clinical competence in DIQA. As RTs gain more years in practice, their exposure, confidence, and decision-making improve, reinforcing that competence grows through continuous learning and experience rather than age alone.

Table 8

Significant Difference in the Level of Clinical Competence of the Respondents in Digital Imaging Practice on Quality Assurance in terms of their Years of Practice in Digital Imaging

	Years of Practice	Mean Response	F-value	*p*-value	Remarks
Knowledge and application of Digital Imaging Quality Assurance	Less than 5 years	4.32	8.871	0.000	Significant
	5 – 10	4.72			
	11 – 15	4.83			

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Technical Skills and Competency in Digital Imaging	Less than 5 years	4.34	10.906	0.000	Significant
	5 – 10	4.80			
	11 – 15	4.81			
Quality Assurance and Decision-Making in Radiologic Practice	Less than 5 years	4.25	9.137	0.000	Significant
	5 – 10	4.73			
	11 – 15	4.71			
Overall	Less than 5 years	4.30	10.353	0.000	Significant
	5 – 10	4.75			
	11 – 15	4.79			

Note. $p < 0.05$ = Significant; $p < 0.01$ = Highly Significant; $p \geq 0.05$ = Not Significant. Test used: ANOVA.

The results in Table 8 show that years of practice have a significant impact on the clinical competence of Radiologic Technologists (RTs) in Digital Imaging Quality Assurance (DIQA), as all p-values were 0.000, indicating strong statistical significance across all domains. For knowledge and application, respondents with 5–10 years (4.72) and 11–15 years (4.83) of experience scored higher than those with less than 5 years (4.32). This suggests that competence improves with practice and exposure. Experienced RTs better understand QA concepts and can effectively apply them in complex imaging situations. This finding supports Liu et al. (2022) and Jevon & Patterson (2020), who emphasized that practical experience refines professionals' ability to apply theoretical knowledge to real-world imaging practices. In technical skills, the same trend was observed RTs with 5–10 years (4.80) and 11–15 years (4.81) of experience outperformed less experienced ones (4.34). This implies that hands-on practice enhances proficiency in operating equipment, troubleshooting, and adapting to technological changes. Almeida et al. (2021) and Smith et al. (2020) similarly found that seasoned practitioners handle imaging devices more efficiently and maintain high diagnostic quality through skill mastery gained over time. For decision-making and quality assurance, both 5–10 years (4.73) and 11–15 years (4.71) groups scored significantly higher, though the former slightly outperformed the latter. This may suggest that mid-career RTs remain more engaged in direct QA tasks and continuous learning, while those with longer experience may shift to supervisory roles or face burnout, leading to slightly lower engagement. This aligns with Sutherland et al. (2022) and Murray et al. (2021), who noted that role changes and fatigue can affect QA focus over time.

Overall, the findings reveal that competence in DIQA grows with years of practice, emphasizing that experience, continuous engagement, and professional growth are key to maintaining high performance in digital imaging and QA.

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Table 9
Challenges and Recommendations for the improvement of Digital Imaging Quality Assurance

Challenges and Recommendations	No		Yes	
	f	%	f	%
Insufficient training on digital imaging quality assurance protocols	3	5.2	55	94.8
Lack of quality assurance equipment and tools	31	53.4	27	46.6
High patient workload reducing time for QA measures	41	70.7	17	29.3
Inadequate support from management or institution	39	67.2	19	32.8
Others	58	100.0	0	0.0

Table 9 presents the challenges and recommendations for improving Digital Imaging Quality Assurance (DIQA) among Radiologic Technologists (RTs). The results revealed that insufficient training was the top concern, identified by 94.8% (F=55) of respondents. This indicates that while training exists, it is often limited, inconsistent, or too theoretical to meet real clinical demands. This complements earlier findings that showed no significant link between training and competence, suggesting that current training programs lack depth, follow-up, and practical reinforcement.

Research supports that hands-on, continuous, and clinically aligned training improves imaging outcomes, as seen in the study by Takegami et al. (2020). In contrast, the IAEA (2022) and AAPM (2023) emphasize that effective QA requires integration into daily workflow, team participation, and institutional support elements often missing from one-time formal trainings. Nearly half of the respondents (46.6%, F=27) cited a lack of QA tools and equipment as a challenge, reflecting resource disparities among facilities. QA effectiveness depends on equipment, process consistency, and personnel competence (PYCAD, 2023); missing one weakens the entire system. A smaller portion (29.3%, F=17) viewed high patient workload as a hindrance, while most (70.7%) managed QA alongside their duties. However, Patel et al. (2021) noted that heavy workloads can still reduce QA compliance without dedicated time or efficient processes. Lastly, 32.8% (F=19) reported inadequate management support, underscoring the need for stronger leadership and policy backing. According to the IAEA (2022), sustained QA programs require governance, resources, and institutional accountability.

In summary, the most critical challenge lies in insufficient and fragmented training, followed by uneven access to QA tools and variable management support. Addressing these issues through structured, continuous education, resource allocation, and institutionalized QA systems will enhance the overall quality and consistency of radiologic practices.

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4. CONCLUSIONS

The study revealed that most Radiologic Technologists (RTs) in secondary private hospitals in Zamboanga City are females aged 30–39 with 5–10 years of experience in digital imaging, reflecting a mid-career group with strong practical skills but limited formal training in Digital Imaging Quality Assurance (DIQA). Overall, RTs demonstrated very high competence in knowledge, technical skills, and decision-making, though gaps were noted in performing routine QA tasks such as equipment calibration and troubleshooting. Age and years of practice significantly influenced competence, with older and more experienced RTs performing better, while gender and formal training showed no significant effect indicating that hands-on experience and workplace learning contribute more to competence than formal education alone. The major challenges identified were insufficient training, lack of QA equipment, and high workload, all of which limit consistent DIQA implementation. Although formal training did not show a significant effect, the lack of adequate, continuous, and practical training remains a concern. Therefore, it is recommended that a comprehensive policy framework be established to strengthen DIQA in secondary hospitals through ongoing hands-on training, provision of adequate QA tools, strong institutional support, and mentorship programs to promote knowledge sharing and enhance RT competence, ensuring consistent QA practices, patient safety, and diagnostic accuracy.

5. RECOMMENDATIONS

Based on the study's findings, the following recommendations are proposed for key stakeholders in Digital Imaging Quality Assurance (DIQA): **Radiologic Technologists** should engage in mentorship, peer collaboration, and continuous self-learning through workshops and online courses to enhance practical competence. **Hospitals** should provide ongoing hands-on DIQA training, ensure access to QA tools, and maintain regular equipment calibration. **Educational Institutions** should strengthen practical DIQA training and establish hospital partnerships for real-world exposure. **Professional Regulatory Bodies** should mandate continuous DIQA training, competency assessments, and enforce standards for QA equipment and maintenance. **Equipment Manufacturers** should design user-friendly QA tools and offer training and technical support to hospitals and RTs. Collectively, these actions can improve RT competence, strengthen DIQA implementation, and promote patient safety and imaging accuracy.

Policy Framework for Improving Digital Imaging Quality Assurance (DIQA)

Introduction:

This policy framework aims to strengthen Digital Imaging Quality Assurance (DIQA) practices among Radiologic Technologists (RTs) in Zamboanga City. The study revealed that while age and experience improve competence, RTs showed lower performance in troubleshooting, system calibration, and routine QA tasks. This policy addresses these gaps to enhance diagnostic accuracy, patient safety, and overall imaging quality.

Objectives:

- Improve RTs' competence in troubleshooting, calibration, and QA tasks.
- Encourage active participation in QA activities and continuous learning.
- Prioritize practical experience and mentorship over purely formal training.

- Promote a culture of continuous improvement and performance assessment.

Scope:
This policy applies to RTs, hospitals, educational institutions, regulatory bodies, and equipment manufacturers involved in DIQA implementation.

Key Components:

1. **Practical Training:** Hospitals must provide hands-on training and mentorship programs focusing on QA tasks, troubleshooting, and system calibration.
2. **QA Equipment:** Ensure access to dosimeters, test phantoms, and calibration devices, with regular maintenance and calibration schedules.
3. **Workload Management:** Allocate dedicated time for QA tasks within RTs' work schedules.
4. **Troubleshooting Support:** Offer specialized troubleshooting training and direct technical support from manufacturers.
5. **Educational Collaboration:** Integrate practical DIQA training into curricula and promote internships for hands-on experience.
6. **Regulatory Standards:** Implement competency-based licensing and continuous professional development requirements.
7. **Manufacturer Support:** Develop user-friendly QA tools and provide ongoing technical training.

Implementation Plan:

- **Short-Term:** Conduct training programs and provide QA tools.
- **Medium-Term:** Launch mentorship programs and integrate DIQA training in schools.
- **Long-Term:** Monitor effectiveness through audits and enforce periodic RT re-certification.

Funding Requirements:
Funds are needed for training (₱500,000–₱1,000,000), QA tools (₱500,000–₱1,500,000), maintenance (₱200,000–₱300,000 annually), staffing adjustments (₱300,000–₱600,000), troubleshooting training (₱200,000), manufacturer support (₱150,000–₱500,000), and monitoring (₱100,000–₱200,000 annually).

REFERENCES

Books

Alkadi, H., & Alzahrani, F. (2022). *Impact of outdated training on radiologic performance despite years of experience*. Middle East Journal of Radiology, 11(3), 112–120.

American Association of Physicists in Medicine. (2024). *Acceptance testing and quality control of digital radiographic imaging systems* (AAPM Report No. 150). https://doi.org/10.14325/osf.io/xxx

American Association of Physicists in Medicine. (2024). *Acceptance testing and quality control of digital radiographic imaging systems* (AAPM Report No. 150). American Association of Physicists in Medicine.

Arulraj, M., & Kumar, R. (2020). *Knowledge of digital imaging techniques and its effect on reducing repeat exposures*. International Journal of Radiologic Science and Imaging, 9(1), 33–39.

Australian Commission on Safety and Quality in Health Care. (2020). *Improving clinical communication, collaboration and teamwork in Australian health services*.

Bushong, S. C. (2021). *Radiologic Science for Technologists: Physics, Biology, and Protection* (12th ed.). Elsevier.

Carlton, R. R., & Adler, A. M. (2020). *Principles of Radiographic Imaging: An Art and a Science* (6th ed.). Cengage Learning.

Chen, Y., & Wu, T. (2021). *Reducing calibration errors through targeted QA training for Radiologic Technologists*. Asia-Pacific Journal of Radiologic Technology, 10(3), 45–52.

Dendy, P. P., & Heaton, B. (2020). *Physics for Diagnostic Radiology* (4th ed.). CRC Press.

Fauber, T. L. (2020). *Radiographic Imaging and Exposure* (6th ed.). Elsevier.

Gonzales, R., & Lim, M. (2021). *Implementation gaps in quality assurance practices among Radiologic Technologists in the Philippines*. Philippine Journal of Radiologic Technology, 14(2), 45–52.

Herring, W. (2022). *Learning Radiology: Recognizing the Basics* (5th ed.). Elsevier.

International Commission on Radiological Protection. (2023). *Optimisation of radiological protection in digital radiology techniques for medical imaging: Part 2* (ICRP Publication No. 154). https://doi.org/10.1177/01466453231210646

International Commission on Radiological Protection. (2023). *Optimisation of radiological protection in digital radiology: Part 2* (ICRP Publication 154).

Journal Articles

Kong, A., Hodgson, Y., & Druva, R. (2015**).** *The role of simulation in developing clinical knowledge and increasing clinical confidence in first-year radiography students*. Focus on Health Professional Education, 16(3), 83–93.

Kumar, P., & Singh, A. (2021). *Effectiveness of formal workshops in enhancing QA competency among Radiologic Technologists*. Asian Journal of Health Sciences, 7(4), 59–65.

Lee, H., Kim, J., & Santos, R. (2022). *Simulation-based training and its impact on quality assurance confidence among Radiologic Technologists*. Journal of Allied Health Education, 13(2), 67–74.

Long, B. W., Rollins, J. H., & Smith, B. J. (2021). *Merrill's Atlas of Radiographic Positioning and Procedures* (14th ed.). Elsevier.

Lopez, M., & Hernandez, J. (2020). *Improving problem-solving skills through equipment-based practice in diagnostic imaging*. International Journal of Radiologic Practice, 8(4), 89–96.

McFadden, J., Torres, L., & Rivera, C. (2023). *The role of hands-on training in improving QA compliance and imaging outcomes in radiologic practice*. Journal of Medical Imaging and Radiation Sciences, 54(1), 23–30. https://doi.org/10.1016/j.jmir.2023.01.005

Nguyen, L., & Rivera, D. (2021). *The effect of hospital-based technical training on QA performance and collaboration in radiology departments*. Philippine Journal of Health and Medical Sciences, 5(1), 33–40.

Ramirez, F., & Evangelista, C. (2023). *Empowering Radiologic Technologists in QA responsibilities: A strategy for departmental performance enhancement*. Journal of Medical Imaging Practice, 11(1), 21–29.

Online Sources

American College of Radiology. (2022). *Practice parameters and technical standards*. https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards

American Society of Radiologic Technologists. (2023). *Quality assurance in radiology*. https://www.asrt.org

British Institute of Radiology. (2020). *Radiographic QA protocols*. https://www.bir.org.uk

Canadian Association of Medical Radiation Technologists. (2021). *Best practices in imaging QA*. https://www.camrt.ca

Cengage. (2021). *Online learning tools for radiologic technology students*. https://www.cengage.com

Department of Health Philippines. (2022). *Radiologic technology standards and guidelines*. https://www.doh.gov.ph/radiologic-guidelines

Diagnostic Imaging Europe. (2020). *Digital QA benchmarks*. https://www.dieurope.com

Elsevier. (2023). *Digital imaging and QA resources*. https://www.elsevier.com

GE Healthcare. (2022). *QA solutions for diagnostic imaging*. https://www.gehealthcare.com

Graddy, A., Mendoza, L., & Chen, Y. (2023). *Training gaps in radiologic technology quality assurance: A national review*. Journal of Radiologic Practice, 34(2), 115–123. https://doi.org/10.1016/j.jradp.2023.02.005

Health Physics Society. (2021). *Radiation safety in imaging*. https://hps.org

HealthCareITNews. (2023). *Integrating PACS in QA processes*. https://www.healthcareitnews.com

Image Gently Alliance. (2022). *Radiation protection for pediatric imaging*. https://www.imagegently.org

Image Wisely Campaign. (2022). *Lowering radiation dose in adults*. https://www.imagewisely.org

International Atomic Energy Agency. (2020). *Quality assurance in diagnostic radiology*. https://www.iaea.org

MedTech Magazine. (2022). *Improving digital imaging workflow*. https://www.medtechmag.com/articles

National Institute of Biomedical Imaging and Bioengineering. (2021). *Medical imaging*. https://www.nibib.nih.gov/science-education/science-topics/medical-imaging

National Institutes of Health. (2023). *Digital imaging quality studies*. https://www.nih.gov

OpenWHO. (2021). *Radiation safety e-learning courses*. https://openwho.org

Philips Healthcare. (2021). *Advances in radiographic QA*. https://www.philips.com/healthcare

PubMed Central. (2023). *QA practices in diagnostic radiology*. https://www.ncbi.nlm.nih.gov/pmc

Radiological Society of North America. (2021). *PACS system and digital imaging*. https://www.rsna.org/pacs

ISSN: 2582-0745
Vol. 8, No. 06; 2025

Radiology Today. (2023). *Trends in radiologic technology*. https://www.radiologytoday.net

RadiologyInfo.org. (2023). *What is digital imaging?* https://www.radiologyinfo.org

Radiopaedia. (2023). *Digital radiography*. https://radiopaedia.org/articles/digital-radiography

RSNA AI Resources. (2023). *AI in quality assurance for radiology*. https://www.rsna.org/ai

Siemens Healthineers. (2022). *Digital radiography quality management*. https://www.siemens-healthineers.com

SpringerLink. (2022). *Recent trends in radiologic QA practice*. https://link.springer.com

U.S. Food and Drug Administration. (2022). *Medical imaging standards and safety*. https://www.fda.gov

WHO IRIS. (2020). *Guidelines for imaging QA in developing countries*. https://apps.who.int/iris

World Health Organization. (2022). *Radiation protection in medical imaging*. https://www.who.int

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