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Letter to the Editor

# Why continuing education matters for X-ray technicians

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In today's rapidly evolving healthcare environment, continuous professional development is essential for all medical professionals to keep pace with technological advancements and increasing standards of patient care. Among these professionals, x-ray technicians play a critical role in diagnostic imaging and therapy, working with complex technologies such as digital imaging systems, computed tomography, magnetic resonance imaging, and artificial intelligence (AI). These rapid changes require both a solid foundation and continuous engagement in education to maintain and grow professional competence. As imaging modalities become more integrated with computational tools and data-intensive workflows, technicians are expected not only to operate machines but also to understand how algorithms influence image reconstruction, interpretation, and patient outcomes. Thus, their role is becoming increasingly knowledge-based and interdisciplinary.

The importance of ongoing education has long been recognized. As early as 1966, participants at the National Conference on X-ray Technician Training in Maryland emphasized that traditional training curricula must evolve to prepare professionals for future challenges rather than past practices[1]. This early insight remains more relevant than ever, as innovations like AI-driven image processing, mobile imaging platforms, and real-time data analysis reshape radiologic diagnostics. The healthcare environment has shifted from relatively static technology to an adaptive ecosystem that requires professionals to update their skills continuously[2].

In response to these shifts, the European Federation of Radiographer Societies (EFRS) has proposed a five-year education pathway, encompassing both bachelor's and master's degree programs, to better align professional preparation with modern demands. This structure reflects a broader understanding that basic training is insufficient in an environment where imaging techniques evolve within months, not decades. However, in many countries, including Bulgaria, formal education for x-ray technicians typically concludes at the bachelor level. As a result, continuing education becomes vital in bridging the gap between foundational training and advanced clinical competencies. Without ongoing skill development, professionals risk falling behind and becoming ineffective or even obsolete in clinical practice. Recent studies affirm a growing demand for specialized training. More than 60% of x-ray technicians report a need for further education, particularly in areas such as the safe application of ionizing radiation[3]. This is not merely a matter of professional growth, but one that directly affects patient safety, diagnostic accuracy, and care quality. Moreover, flexible learning formats such as workplace-based courses and distance education are increasingly preferred, as they allow professionals to combine learning with clinical practice. This mirrors international trends: in West Africa, 96% of radiologic technologists recognize the importance of continuing education for maintaining quality care, although many face significant barriers, including cost and limited access[4]. These examples highlight a universal challenge: aligning professional motivation with accessible, well-structured educational systems.

In addition to technical upskilling, the integration of digital technologies and AI necessitates targeted training to ensure safe and effective clinical use. Recent research highlights the need for structured learning in deep learning algorithms and AI-assisted diagnostics[5,6]. Such training goes beyond learning how to use new software – it involves understanding how AI systems are trained, how they can introduce bias, and how their outputs must be interpreted critically in context. For instance, AI models may produce highly plausible yet clinically inaccurate results if applied without understanding their limitations. This creates both opportunity and risk: well-trained technicians can leverage AI to improve image quality and accelerate workflows, while insufficiently trained personnel may unknowingly propagate errors. Hence, continuing education in this area becomes not just beneficial but essential for maintaining diagnostic integrity.

Radiation protection is another critical area where updated training is indispensable. X-ray technicians are often the first line of defence when it comes to limiting patient and staff exposure to ionizing radiation. International standards and na-



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tional regulations on radiation safety are frequently updated in light of new research, and professionals must be familiar with these changes to ensure safe practice. For example, AI-assisted fluoroscopy systems have demonstrated a capacity to significantly reduce radiation doses for both patients and staff – but these benefits are conditional on adequate operator training[7,8]. Without proper understanding of dose optimization strategies and the functioning of automated systems, x-ray technicians may underutilize protective features or inadvertently increase risk. Thus, radiation protection training is not a one-time competency but a continuously evolving responsibility.

Beyond maintaining technical proficiency, continuing education plays a crucial role in supporting professional confidence, mental well-being, and job satisfaction. Only 30% of healthcare workers report full confidence in their skills, a gap that correlates strongly with elevated stress levels and reduced job performance[9]. This is particularly true for x-ray technicians, who often operate under time pressure, with limited feedback, and in roles that are sometimes undervalued within interdisciplinary teams. Continued access to relevant and updated training helps restore professional identity, fosters a sense of competence, and builds resilience against burnout[10]. When practitioners feel that their knowledge is current and their skills are valued, they are more likely to stay engaged, motivated, and committed to patient care.

New formats of training are also reshaping the landscape of continuing education. A 2024 pilot study in Western Australia demonstrated that x-ray technicians using smart glasses for real-time supervisory feedback achieved measurable improvements in image quality and diagnostic accuracy, underscoring the promise of simulation-based and remote learning approaches[11]. Technologies such as augmented reality (AR) and virtual reality (VR) can simulate high-risk procedures in low-risk environments, allowing learners to practice repeatedly without consequences. These innovations are particularly relevant for small or rural healthcare facilities, where access to specialized trainers may be limited. Moreover, e-learning platforms and asynchronous modules offer the possibility for lifelong learning on demand, empowering professionals to learn at their own pace.

To meet the diverse learning needs of x-ray technicians, continuing education must remain adaptable, inclusive, and sensitive to practical constraints. Programs must be tailored not only to emerging technologies but also to the realities of shift work, staff shortages, and institutional limitations. The flexibility of content delivery, coupled with clearly defined outcomes and credentialing systems, can support widespread engagement. However, failing to keep pace with technological innovation poses serious risks. Professionals who neglect to update their competencies may find themselves unprepared for increasingly complex clinical decision-making, less autonomous in practice, and marginalized within interdisciplinary teams. Ultimately, this could compromise patient safety, degrade diagnostic quality, and reduce the standing of the profession within modern healthcare systems.

Therefore, both educational institutions and professional organizations must adopt forward-looking strategies to ensure that training programs evolve in step with technological progress. A proactive approach to continuing education – rooted in accessibility, relevance, and innovation – is essential for empowering x-ray technicians to contribute meaningfully to high-quality, future-ready radiologic practice. Ensuring ongoing professional development is not a luxury, but a necessity – one that underpins the resilience, adaptability, and excellence of healthcare systems in the 21st century.

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