Chapter 17
Interactive Simulation and E-Learning Platforms for Diagnostic Radiography Education:
Simulated Learning in Diagnostic Radiography

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ABSTRACT

This chapter provides an overview of simulation in diagnostic radiography education, simulated learning activities in physical and virtual radiography simulated learning environment, and presents easily accessible, efficient, equitable, and inclusive platform technologies and software for simulated learning. Physical and virtual simulation activities specific to the role of diagnostic radiographers are described. Platform technologies and software that support these simulated learning activities are also described. Users' ability to access some of these platforms offline and freely overcomes the context-specific factors (technology and educational resources) that affect diagnostic radiography teaching and learning. Incorporation of these tools into teaching and learning should allow diagnostic radiography training institutions across the world to learn and succeed from context-appropriate knowledge.

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INTRODUCTION

Medical imaging depends completely on technology for the diagnosis of diseases. The acquisition of skills and competencies is needed to independently operate medical imaging equipment and perform medical imaging tasks. Historically, these skills and competencies were acquired through classroom teaching and learning and clinical placements. However, restrictions on clinical placements due COVID-19, shortage of placement sites and opportunities, and changes in the dynamics of university education has reinforced the need for alternatives to the traditional approaches of developing skills and competencies. Simulated learning is increasingly being adopted in health and medical education. Medical imaging technology continues to evolve and requires continuous education and professional development by medical imaging professionals and trainees to operate these evolving technologies (Alexander et al., 2019; Mohamed Afif et al., 2021). Modern imaging tools requires significant expertise for operation, protocol selection, and imaging procedures. The high level of expertise needed to operate these machines has increased the need for diagnostic radiographers to undertake continuous professional development (CPD) activities and receive CPD points to attain proficiency and maintain certification for practice (Eddy et al., 2015; Stevens, 2016). Undergraduate students are also expected to acquire the skills and competencies required to operate these machines upon graduation. In response to the preregistration requirements of many diagnostic radiography licensing bodies and to better equip students for clinical placements, it has become mandatory for all diagnostic radiography students to show competency in independently operating imaging equipment for the purpose of positioning patients for the imaging procedure, acquiring images, and manipulating and evaluating these images, as well as simultaneously caring for the patient (Hewis et al., 2021(Shiner, 2018)). To ensure that students achieve these skills and competencies, universities and training institutions offering diagnostic radiography degrees are required to have an integrated clinical program of study, including on-campus theoretical academic training and off-campus clinical placements. This approach is to ensure that theoretical knowledge is translated to practice and that students are equipped clinically to perform independent imaging investigations upon graduation. However, there are significant gaps in the incorporation of clinical skills acquisition in diagnostic radiography training programs. First, the development of these skills is challenging due to a paucity of hospitals to support students seeking clinical placement training and lack of these equipment in many countries. Secondly, diagnostic radiography students have restricted access to imaging equipment at clinical sites to support their clinical skill acquisition (Mohamed Afif et al., 2021). Thus, some diagnostic radiography training institutions prerequires students to demonstrate competency in simulating different imaging investigations before undertaking clinical placements. These preclinical placement requirements have reinforced the need for simulated teaching and learning in diagnostic radiography.

Simulated learning has been successfully incorporated within teaching in medicine and health-related disciplines (Al-Elq, 2010; Wang & Ji, 2021). In diagnostic radiography, low fidelity irradiation and positioning techniques using anatomical models (phantoms), hardware technologies, and role play using live actors have been used prior to the Covid-19 pandemic (Hazell et al., 2020; Vestbøstad et al., 2020). Since the pandemic, many training institutions have transitioned to virtual learning and patient examination and care is simulated using both hardware and software technologies. However, there are universal gaps in the integration of these technologies into diagnostic radiography education. First, many training institutions lack the finances to purchase, install, and service these hardware components. Secondly, only a few leaners can use the equipment at a time. Third, breakdown of the hardware and slow simulation speed due to high simulation workload, and institutional access restrictions limit the utility of hardware