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Is there a role for simulation based education within conventional diagnostic radiography? A literature review

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ABSTRACT

Introduction: Simulation based education is advancing, but is there a role for it in Diagnostic Radiography? The aim of this literature review was to understand the use of simulation within conventional diagnostic radiography education to raise awareness of this pedagogical approach. Objectives were to identify the prevalence and stage of delivery in education; understand the variation of simulation and learning objectives informing its use; and review the perceptions of those using simulation in education and practice.

Methods: The literature review used a systematic search strategy. Library Plus, CINAHL, ScienceDirect, Medline and Google Scholar were reviewed resulting in 703 articles. Inclusion and exclusion criteria were applied with initial review of title and abstract resulting in 22 articles. Fifteen articles were selected following full text review.

Results: Simulation was used for both pre-and post-registration education. Themes included interprofessional education, use of computer software and improving patient/practitioner interactions. Increased confidence and understanding of professional roles were common outcomes.

Conclusion: Simulation is a valuable pedagogical approach for diagnostic radiography education. Staff training and careful implementation of each stage is required to achieve desired learning outcomes.

Introduction

Simulation Based Education (SBE) is gaining momentum as a pedagogical approach in healthcare.[1,2] Many definitions of 'simulation' exist[3,4]; giving rise to the divergence in educators' perceptions as to what constitutes simulation and its use in education.[5] Bradley[6] and Alinier et al.[5] refer to a simpler definition for healthcare "*The technique of imitating the behaviour of some situation or process (whether economic, military, mechanical, etc.) by means of a suitably analogous situation or apparatus, especially for the purpose of study or personnel training*".[7]

Traditionally simulation in medicine was divided into low-and high-fidelity based on the level of realism, dynamic and interactive nature of the models or scenarios used.[2] Healthcare literature suggests the term simulation is linked to a wider use of methods, for example role play, part task trainers, integrated simulators, computer based systems, virtual reality, simulated patients and simulated environments[8–11]; advances in technology and innovative design are blurring the categories low-and high-fidelity.[2]

There are three main components to a simulation; 'briefing' whereby the participant is introduced to others, the environment and learning objective; 'intervention' taking form of a scenario, activity or task and finally the 'debrief', arguably the most important stage, offering feedback and time to reflect.[12–15] The interactive and immersive nature of simulation aligns with a number of adult learning theories,[16–18] offering all four distinct learning opportunities identified in Kolb's experiential learning theory.[16] It is arguably a valuable pedagogical approach in radiography where there is a lack of cohesiveness in the literature establishing undergraduate and graduate radiographer learning styles.[19–21]

Nehring and Lashley[14] (p3) identify six primary influences for the use of simulation in nursing education: 1) societal demands for safety and quality, 2) need to recreate health education, 3) ethical considerations, 4) technological advances, 5) professional shortages and 6) changing landscape for the delivery of patient care. These are not individualistic to nursing and are considered equally influential in Diagnostic Radiography.

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Transition from academia to clinical practice is challenging for students.[22–24] In addition changes to funding of courses to increase student numbers place additional pressure on short staffed departments to increase placements and supervisory capacity.[25–27] Sloane[28] recognises a change in curricular design is required to meet the limited clinical placement provision. A summary report following a National Simulation Development Project based in the United Kingdom (UK) found a growing body of evidence to support the use of SBE.[1] Within the UK the Health and Care Professions Council (HCPC)[29] advocate the use of simulated practice in the curricula; however the Nursing and Midwifery Council (NMC) extend this, stating that 300 of the 2300 h can be made up of simulated practice.[30] Of note is that the evidence of simulations impacting on improved patient outcomes requires further research.[1,5]

To establish if there is a role for SBE within diagnostic radiography an understanding of its current use is required. The aim of this review is to specifically identify the prevalence and stage of delivery in education; understand the variation of simulation and learning objectives informing its use; and review the perceptions of those using simulation in education and practice.

Methodology

A systematic search strategy was used to identify studies using SBE within diagnostic radiography. This approach has previously been used to explore the use of simulation in health sciences; however, it yielded no results for the radiography profession.[31,32] Marshall and Sykes[33] outline the importance of reviews to the radiography profession, providing a unique body of knowledge drawn from a range of published literature.

Multiple databases were searched using Library Plus including CINAHL, ScienceDirect, Medline and Google Scholar. Key words (see Table 1) were used in combination using the Boolean terms OR and AND to refine the search. Asterisks were used to broaden the search to find words that start with the same letters. No date restriction was applied in order to understand the historical context of simulation within radiography. Filters applied included English language and peer reviewed journals. Impact factors and Scopus scores broadly indicate value and the prestigious nature of a journal but make no judgement on the individual article. Further to this, citation counts may be low on newly published literature; they do not help to understand the use of simulation within diagnostic radiography and as such were not relevant to the aim of this review.

Any form of simulation was considered for inclusion. Articles reporting perspective or opinion from the participants or facilitators were considered to add value in understanding the use of simulation in this context. The initial inclusion criteria focussed on pre-registration studies. Simulation in other professions post-registration is prevalent[34]; radiographers are required to continue their professional development to maintain registration; it is reasonable to consider that simulation may be used as an educational tool, and for this reason post-registration was also included. This resulted in an unmanageable number of studies so was restricted to conventional radiographers; excluding studies in dentistry, radiotherapy, mammography, sonography, computed tomography, magnetic resonance imaging, nuclear medicine and specialised roles. Results revealed promotional articles, these had no evaluation of impact and were excluded. Studies with ambiguous participants were excluded.

Reviews of the title and abstract were used to check relevance against the inclusion and exclusion criteria. The criteria were applied during a full text screen resulting in the final 15 articles (see Fig. 1). Articles were reviewed using an adapted tool from the Critical Appraisal Skills Programme and tabularised using excel (see Table 2).

Table 1
Key words.

Simulation	Radiography	Education
Scenario	Radiographer	Learn*
Reality	'Diagnostic imaging'	Teach*
Virtual	Student radiographer	Prepare*
Role play	Radiography student	Student
Immersive		Undergraduate
High-fidelity		

* Broadens the search to find words that start with the same letters.

Results

Fig. 1 Outlines the results retrieved from the search and the mechanism to select the final 15 articles.

Discussion

The literature search resulted in a large heterogeneity between the studies (link to Table 2). A qualitative narrative is appropriate to explore the data.[32] Themes were predetermined based on the aim and objectives of the review.

Prevalence

Prevalence of simulation research from specific countries was reviewed and may be considered an indicator of emerging expertise. The majority (n = 6) were conducted in the United Kingdom[5,37,40–42,44]; four in Australia[43,45,46,48]; three in Scandinavian countries[35,36,38]; one in Germany[39] and one in the USA.[47] Thoirs et al.[46] report on the use of simulation across several academic institutes and clinical sites, providing evidence of the wide spread use of simulation in Australia. A similar report to that undertaken by Thoirs et al.[46] would establish the true inclusion of simulation within academic institutes in the UK. It is clear from the scarcity of research returned that simulation research within this context is in its infancy compared to nursing and medicine.[32,34] This review is therefore important to increase awareness of this pedagogical approach and encourage further research in this field.

Stage of delivery

Simulations were used across varying populations; spanning all years of a diagnostic radiography course: first year[35,37,38]; second year[40,41,45]; and third year.[5,43,47] Two studies were unclear regarding the stage of the participants.[42,44]

Aura et al.[36] and Bott et al.[39] are the only two studies undertaken with post-registration radiographers. Both studies focus on competency based simulations, with the end goal being improved service and safety for the patient. Using a qualitative approach Aura et al.[36] participants reported increased confidence using pharmacotherapy and working as a team; directly attributing this change to the simulation and acknowledging a change in their clinical practice six to seven months after the simulation. This longevity of change is likely attributed to improved accessibility of memory as simulation increases metacognitive skills and offers a period of reflection as to the relevance of the subject to their role.[49] It is unclear why there is a paucity of studies at this stage. Thoirs et al.[46] acknowledge that clinical partners are using simulation; it may be that short staffing inherent within this profession prevents the work being formally evaluated and published.

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