



Radiographers' perceptions of first year diagnostic radiography students' performance following implementation of a simulation-based education model

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ABSTRACT

Introduction: Simulation-based education (SBE) partially replaced the clinical placement learning for a cohort of first year students on a BSc (Hons) Diagnostic Radiography programme. This was in response to the pressures on hospital-based training caused by increasing student numbers and following increased capability and positive outcomes for student learning in delivering SBE as a result of the COVID-19 pandemic.

Methods: A survey was distributed to diagnostic radiographers, across five NHS Trusts, involved in the clinical education of first year diagnostic radiography students at one UK university. The survey sought radiographers' perception of student performance in undertaking radiographic examinations, safety procedures, knowledge of anatomy, professionalism, and the impact of embedding simulation-based education through multichoice and free text questions. Descriptive and thematic analysis of the survey data was undertaken.

Results: Twelve survey responses from radiographers across four Trusts were collated. Responses indicated the majority of radiographers perceived students to require the expected level of assistance in undertaking appendicular examinations, applying infection control and radiation safety measures, and had the expected level of radiographic anatomy knowledge. Students also interacted appropriately with service users, demonstrated increased confidence in coming into the clinical environment and were receptive to feedback. Some variation was noted, particularly in professionalism and engagement, though not always attributed to SBE.

Conclusion: Replacement of clinical placement with SBE was perceived to have provided appropriate learning opportunities and some additional benefits, however it was felt by some radiographers that SBE could not replace the experience of the real imaging environment.

Implications for practice: Embedding simulated-based education requires a holistic approach and close collaboration with placement partners to ensure complimentary learning experiences in the clinical placement setting, and support achievement of the learning outcomes.

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Introduction

Simulationbased education (SBE) has been widely documented in the medical and nursing research, but its scarcity in the diagnostic radiography literature until fairly recently indicates its relative infancy.¹ The advent of virtual radiography software, imaging simulators and immersive technologies is transforming traditional models of clinical skills education.^{2–6} The COVID-19

pandemic was a particular driver for the increased use of simulation-based education due to the disruption of clinical services and placements^{7–11} and sparked other innovations such as virtual or peer enhanced e-placements (PEEP).¹² As the access to clinical placement learning resumes, SBE continues to be further embedded in diagnostic radiography programmes. UK and International surveys demonstrate its use is prevalent, with SBE accounting for a fairly substantial number of programme hours.^{7,11,12} Moving on from the pandemic, the use of SBE is set to continue and increase¹¹ with the view that 11–30% of clinical training time could be replaced with simulated placements.¹³ This is due to the

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demonstration of SBE as an effective learning and teaching strategy in controlling the range of clinical skills and knowledge developed¹⁴ and in addressing the impact of traditional radiography placement capacity issues.^{12,15} The use of SBE is recognised by the UK Health and Care Professions Council¹⁶ to deliver quality practice-based learning experiences and features in the national vision of supporting UK healthcare education.¹⁷ Much of the existing literature evaluating SBE in diagnostic radiography education is from the student's perspective,^{2,13,15,18} or through the academic institutions' measurement of student attainment.^{19,20} Whilst students have reported the positive impact of SBE on their learning and confidence,^{2,13,15,21} there is a paucity in the literature around the clinical placement providers perspective of the impact of SBE in developing student capability. Gaining this perspective will provide an alternative insight to the impact that students and academic institutions report. It may also provide further understanding into the acceptability of SBE, as it has previously been reported that some clinical staff believe SBE cannot replicate the complexities of the clinical environment and therefore should be an enhancement of, rather than a replacement for, clinical radiography training.²² It is however recognised that radiographers' views around student performance may not be consistent with other measures as it has been identified that clinical assessors lack subjectivity, can display variable understanding of the professional behaviour criteria, and often find it difficult to give negative feedback.²³

In our higher education institution (HEI) in the north of England, the clinical education of the BSc (Hons) Diagnostic Radiography programme was changed in response to some of the positive lessons learned by replacing clinical placement with simulation during the disruption of the COVID-19 pandemic, and the continuing issues around placement capacity. The new clinical education model moved away from block weeks of clinical placement throughout the academic year, and instead first year students underwent 46 ninety-minute simulation-based activities in amongst each academic week throughout semester one and two. It was hoped that extensive pre-placement simulation and a delayed start to the first clinical placement would equip students with a greater degree of clinical and professional skills, familiarity with the imaging environment, and reduce anxiety to applying their skills in practice. Where simulated practice is to be offered as a valid alternative, assurances are needed that equivalent standards of competence and capability can be demonstrated for learners.¹⁷ With clinical radiographers supporting the learning and assessment of diagnostic radiography students it is appropriate to garner their perspectives to evaluate the impact of replacing clinical practice placement with SBE on student performance. This study therefore aims to determine if replacing clinical placement with SBE could support the students to perform as expected in a clinical practice placement by the end of the first stage of the BSc diagnostic radiography programme.

Method

Structure of the SBE activities

A cohort of 63 first year BSc Diagnostic Radiography students undertook 46 ninety-minute simulation-based activities in amongst each academic week during the 2021/22 academic year. The clinical simulation activity was supported by a carefully structured 234-page workbook which clearly outlined the learning outcomes related to each activity (on campus, virtual, and directed), directed work to undertake, reflection, expectations, feedback, and peer/formative/summative assessments. The order of curriculum content delivery across and within modules was overhauled to ensure a coherent

alignment with the lectures, and the range of simulated activity, to create a logical and progressive development of student knowledge and skills across the learning outcomes.

The examples of the types of simulated activity that took place in the first year of the programme included a mix of role play, use of live equipment to undertake radiographs on anthropomorphic phantoms, the review of radiographs on reporting grade monitors and use of PACS, and virtual radiography and desktop simulation software by virtual medical coaching (Table 1).

After undertaking two summative assessments of clinical skills in the simulated setting, the students commenced their first clinical placement consisting of 30 days in an imaging department during the last 10 weeks of the year. The first year of the programme had previously been structured with four blocks of clinical placement totalling 18 weeks spread over the academic year, with the first placement commencing six weeks into the programme. A webinar session was delivered twice to radiographers across partnering clinical placement sites to outline the changes to the structure of the first year of the programme, indicating the stage outcomes remained unchanged. This included information regarding the type of simulation equipment new on campus, and example activities the students had undertaken supported by the clinical simulation workbook. The webinar recording was uploaded to the clinical educator training module which all radiographers can access.

Survey

An electronic survey was distributed by email to 26 key contacts (projectional radiography department managers and clinical student supervisors) working within five NHS trusts where students underwent the end of year placement. The intended participants were radiographers that had worked with this cohort of students during the placement, the number of which was unknown, and so the email requested the key contacts distribute the survey to projectional radiography staff. The survey comprised of multiple-choice questions describing levels of student performance in professionalism, interpersonal skills, ability to undertake radiographic examinations and safety procedures, and knowledge of anatomy. Multiple choice options were phrased to represent the academic institutions expectations at below, meeting and exceeding the expected level of performance. There were two free text questions allowing comments on any benefits or issues observed due to restructuring clinical education for first years in this way (Table 2). Institutional ethical approval was obtained prior to commencement of the evaluation and distribution of the survey (EC27057).

MS Forms© was used ensuring anonymity of response returns, though organisation and role were sought in order to identify any patterns among responses across these demographics. Data was extracted into MS excel© to support descriptive analysis of multi choice responses, and free text comments were thematically analysed using Braun and Clarke's six phases of analysis.²⁴ Each researcher independently reviewed and coded the data, drawing common concepts within and across participant responses into broader themes, and rechecking the text in the context of the wider survey responses. Themes were compared and reviewed collectively, and consensus themes were defined.

Results

Multiple choice survey responses

Twelve responses from four of the five Trusts providing clinical placements to the university were received, and respondents categorised themselves by one the following three options: radiographer (R) (n = 2); clinical supervisor (CS) (n = 9); and trained to

Table 1
Variety of simulation-based education used.

Simulation activity	Modules	Types of learning outcomes
All	<ul style="list-style-type: none"> • All Radiography of the appendicular skeleton • Radiography of the axial skeleton • Chest and abdominal imaging • Safe and Professional Radiographic Practice 	<ul style="list-style-type: none"> • Professionalism • Interaction with radiographic and healthcare colleagues • Punctuality • Record keeping • Receiving constructive feedback • Reflection and self- development
Virtual medical coaching virtual reality radiography simulation	<ul style="list-style-type: none"> • Radiography of the appendicular skeleton • Radiography of the axial skeleton • Chest and abdominal imaging 	<ul style="list-style-type: none"> • Patient positioning • Exposure factors • Radiation dose report • Image evaluation
Virtual medical coaching desktop radiography simulation	<ul style="list-style-type: none"> • Radiography of the appendicular skeleton • Radiography of the axial skeleton • Chest and abdominal imaging • Safe and Professional Radiographic Practice 	<ul style="list-style-type: none"> • Patient positioning • Exposure factors • Radiation dose report • Image evaluation
Clinical simulations in imaging suite	<ul style="list-style-type: none"> • Radiography of the appendicular skeleton • Radiography of the axial skeleton • Chest and abdominal imaging • Safe and Professional Radiographic Practice 	<ul style="list-style-type: none"> • Radiation protection and safety • Infection control • Patient positioning • Positioning corrections • Exposure factors • Optimisation • Professional behaviours and communication
Clinical simulation in PACS suite	<ul style="list-style-type: none"> • Radiography of the appendicular skeleton • Radiography of the axial skeleton • Chest and abdominal imaging 	<ul style="list-style-type: none"> • Radiographic image analysis • Recognising common pathologies
Clinical simulation in clinical skills room	<ul style="list-style-type: none"> • Safe and Professional Radiographic Practice 	<ul style="list-style-type: none"> • Infection control • Hand hygiene and personal protective equipment • Aseptic non touch technique and appropriate handling of sterile medical devices • Application and removal of bandages, dressings, and slings

complete student assessments (A) (n = 1). Two thirds (n = 8) of respondents rated their supervision of, and interaction with first year students during the end of year placement as frequent, and a third rated it occasional (n = 4).

For routine appendicular and axial radiographic examinations, 75% (n = 9/12) and 50% (n = 6/12) of responses respectively indicated that the first years needed the expected level of assistance (Fig. 1). Students' knowledge of radiographic anatomy was rated as the expected level by 75% of respondents and less than expected by 25%.

Most of the responses indicated students were able to apply radiation safety and infection control measures with (75% and 66.7%), or without prompts (8.3% and 33.3%), rather than needing assistance (16.6% and 0%) (Fig. 2).

With regards to staff perceptions around the students' professionalism: attendance was felt to be acceptable or good by 91.7% (n = 11) of respondents; 75% (n = 9) felt service user interaction was appropriate or exceeded expectation; 50% (n = 6) stated students consistently acted in a professional manner; and 50% (n = 6) felt students were appropriately or excellently engaged, involved and proactive in the workflow and their learning (Table 3). Respondents perceived the majority of students to be confident in their performance, with only 2 respondents (16.7%) indicating they felt students lacked confidence. 92% (n = 11) of respondents felt that students were receptive to feedback or proactively sought and acted upon it.

Qualitative responses

Each respondent had two opportunities to provide free text responses (Table 2). Free text responses were received from all respondents, though one participant provided only one response, resulting in 23 of a possible 24 free text responses. Several themes

were drawn from responses to these questions regarding the benefits of pre-placement SBE for learning and assessment, or any negative impact of the new structure of year one.

Theme 1: Skills

Respondents commented that students were already orientated to the x-ray room environment and imaging examinations and so required less instructions than previous students on their first placement.

'I felt like I was having to explain less of the basic controls in the room, so maybe being more familiar with the x ray room setting from mock ups, more hands on positioning etc. has helped.' [CS6]

'Those that have attended the simulation sessions seem to have benefited from it as it gave them the base knowledge to be applied into practice with real patients.' [CS8]

'Patient care from all students is high.' [R2]

Theme 2: Behaviours

The confidence of students was noted by respondents in terms of working within the clinical environment.

'..on the whole the students have attended placement ready to get going and stuck in, rather than being a bit overwhelmed' [CS6]

'The students who are doing well seemed to settle in quicker and take less time than usual to feel confident in the clinical placement environment...' [CS1]

Positive student engagement was demonstrated in the students' attitude to learning and motivation.

Table 2

Survey questions to ascertain first year students' level of performance in clinical practice.

-
- Q1. I have read the participant information sheet and consent to taking part in the survey. *(Multiple choice)*
- Yes
 - No
- Q2. Please indicate which of the following roles you undertake with student radiographers: *(Multiple choice)*
- Radiographer
 - Patient assessment supervisor^a
 - Clinical supervisor^b
- Q3. Please indicate which best describes your interaction with the first-year students this year during their May to July placement: *(Multiple choice)*
- I have not interacted with any of the first-year students
 - I have occasionally interacted with and supervised the first-year students
 - I have frequently interacted with and supervised the first-year students
- Q4. Please indicate which NHS Trust providing radiography student placements you are employed in: *(Multiple choice)*
[All practice partner trusts were listed as options]
- Q5. My perception of the first years professional behaviour is best described as: *(Multiple choice)*
- Did not act in a professional manner
 - Acted in a professional manner some of the time
 - Consistently acted in a professional manner
 - Acted in a highly professional manner
- Q6. What did you think about students' ability to undertake routine examinations of the appendicular skeleton (e.g. fingers, hand, wrist, foot, ankle, knee)? *(Multiple choice)*
- Students needed more than the expected level of assistance with routine examinations of the appendicular skeleton
 - Students needed an expected level of assistance with routine examinations of the appendicular skeleton
 - Students needed less than the expected level of assistance with routine examinations of the appendicular skeleton
- Q7. What did you think about the first-year students' ability to undertake routine examinations of the axial skeleton (e.g. Lumbar spine, pelvis, C-spine)? *(Multiple choice)*
- Students needed more than the expected level of assistance with routine examinations of the axial skeleton
 - Students needed an expected level of assistance with routine examinations of the axial skeleton
 - Students needed less than the expected level of assistance with routine examinations of the axial skeleton
- Q8. What was your perception of the first-year students' knowledge of radiographic anatomy? *(Multiple choice)*
- Students' knowledge of radiographic anatomy was less than I expected
 - Students' knowledge of radiographic anatomy was what I would expect
 - Students' knowledge of radiographic anatomy was better than I would expect
- Q9. Were students able to work safely applying radiation protection measures for the patient and staff? *(Multiple choice)*
- Students needed assistance in following radiation protection measures
 - Students followed radiation protection measures when prompted
 - Students followed radiation protection measures without prompting
- Q10. How competent were students with implementing infection control measures (hand washing, PPE etc)? *(Multiple choice)*
- Students needed assistance in following infection control measures
 - Students followed infection control measures when prompted
 - Students followed infection control measures without prompting
- Q11. The majority of students' interactions with service users is best described as: *(Multiple choice)*
- Needing improvement
 - Appropriate
 - Exceeding expected level
- Q12. What were your perceptions overall of the students work ethic? *(Multiple choice)*
- Needed to be more engaged, involved, and proactive with the workflow and their learning
 - Appropriately engaged, involved and proactive with the workflow and their learning
 - Excellently engaged, involved and proactive with the workflow and their learning
- Q13. Overall, the attendance of the new first year students is best described as: *(Multiple choice)*
- Poor
 - Acceptable
 - Good
 - Excellent
- Q14. What were your perceptions overall of the students' confidence on their first placement? *(Multiple choice)*
- Lacked confidence in their performance and abilities
 - Some confidence in their performance and abilities
 - Confident in their performance and abilities
- Q15. How well do you feel students received feedback? *(Multiple choice)*
- Not receptive to feedback
 - Receptive to feedback to support development
 - Proactively sought feedback and acted on it
- Q16. What benefits, if any, have you seen from undertaking clinical education and assessment in simulation at the university in year 1 prior to commencing their first clinical placement in May? *(Free text response)*
- Q17. In your view, have there been any issues or negative impact/s with clinical education being structured in this way in year 1? Please explain or state 'none.' *(Free text response)*
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^a Trained to assess students undertaking radiographic examinations.^b Role that leads co-ordination of student radiography clinical education within the clinical site and conducts summative assessments.

'The students' attitude to learning in clinical has been very good'
[R2]

'Most of the students (but not all as clear exceptions) seem more motivated than we have seen at this stage' [R1]

'They have quickly become part of the team and it is refreshing to have students who really seem to want to be here and do well in their career.' [CS1]

Theme 3: Staff expectations

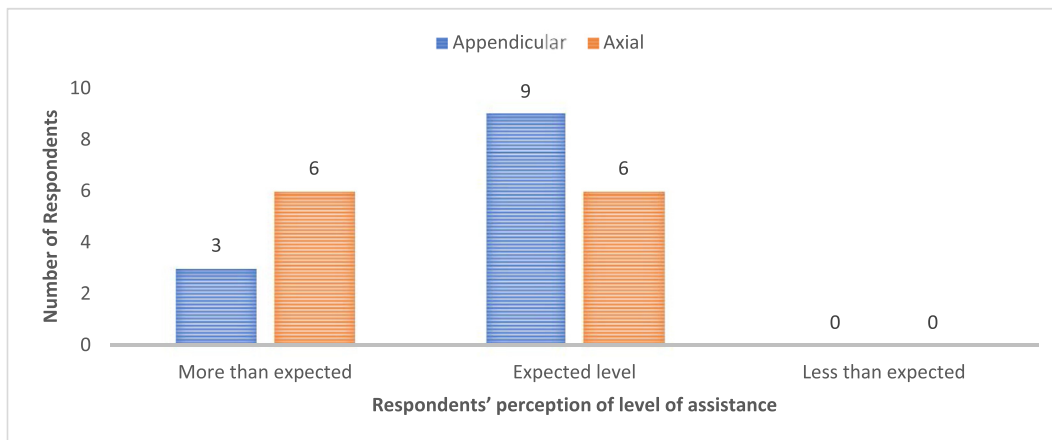


Figure 1. Level of assistance required to undertake routine examinations of the appendicular and axial skeleton.

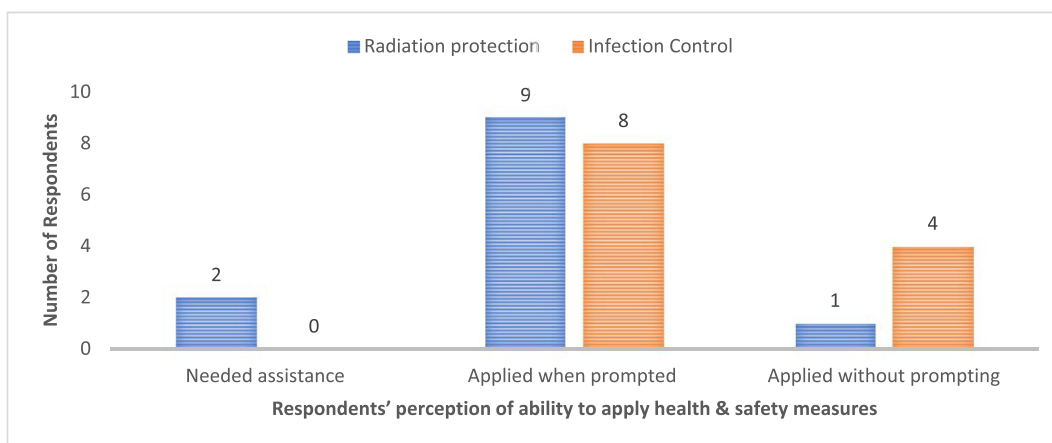


Figure 2. Ability to apply radiation protection and infection control measures.

Table 3 Performance related to areas of professionalism.

Area evaluated	Perceptions of student performance n (%)			
Behaviour	Did not act in a professional manner 1 (8.3)	Acted in a professional manner some of the time 5 (41.7)	Consistently acted in a professional manner 6 (50.0)	Acted in a highly professional manner, exceeding expectations of year one 0 (0)
Attendance	Poor 1 (8.3)	Acceptable 7 (58.3)	Good 4 (33.3)	Excellent 0 (0)
Work ethic	Needed to be more engaged, involved and proactive in the workflow and their learning 6 (50)	Appropriately engaged, involved and proactive in the workflow and their learning 5 (41.7)	Excellently engaged, involved and proactive in the workflow and their learning 1 (8.3)	
Service user interaction	Needing improvement 3 (25)	Appropriate 8 (66.7)	Exceeding expected level 1 (8.3)	
Student confidence in their performance & abilities	Lacked confidence 2 (16.7)	Some confidence 8 (66.7)	Confident 2 (16.7)	
Feedback	Not receptive 1 (8.3)	Receptive 9 (75)	Proactively sort & acted on 2 (16.7)	

Inhomogeneity of learners

Responses indicated some polarisation of levels of skill, knowledge and behaviours were observed between students. There was a perception from some respondents that this was more about the learners as individuals and less about the changes to the

structure of the first year of the programme, given the same opportunities were available to all learners.

‘Some students are outstripping others by far, I think it depends on individual students, their type of learning, and their actual grasp of the intended outcomes i.e. good radiographic techniques.’ [R2]

'We have students from both ends of the spectrum so difficult to answer in an 'overall' way' [CS1]

'I'm not sure that the problems we have encountered are necessarily due to the new structure of the course. Perhaps it's more of an issue with the admission process and getting the right kind of students who actually want a career in Radiology.' [CS1]

It was however felt by one respondent trained to assess students that there was not consistency of expectations between clinical assessors, and between the clinical assessors and academic staff.

'from talking to other staff who assess in placement, I think we are all still assessing at different levels/severity.' [A1]

Simulation as lesser/equal/exceeding clinical placement in supporting student development

Three respondents stated 'none' to any negative impacts of structuring year 1 of the programme in this way. Comments demonstrated that there was a perception that SBE had enabled students to have appropriate learning opportunities, and in some areas better enabled student's development.

'[Simulated] clinical education and assessment has enabled the students to have similar educational experience as they would have if they had been out on placement...' [CS3]

Three participants felt that there hadn't been any additional benefits to simulation-based education. In some cases, respondents felt that it could not replace clinical practice as it did not present the students with a real-life experience. There were some misconceptions about SBE and the new first year structure of clinical learning, teaching, and assessment.

'none [in response to the benefits of SBE]. They have not had a chance to consolidate their learning throughout the year. This leaves a gap that is only realised when they come into placement at the end of the year.' [CS4]

'Interaction with service users and being in a real-life clinical environment not introduced early enough. ...Simulation can never replace shop floor experience.' [A1]

Discussion

The survey demonstrates encouraging findings related to developing the capability of first year diagnostic radiography students in clinical practice through this embedded package of simulation-based education. The majority of radiographers felt students were able to undertake standard appendicular radiographic examinations with an expected level of assistance and demonstrated the expected level of anatomical knowledge. Simulation exercises where students undertake projectional radiography with a manikin in peer groups have been demonstrated to be a useful adjunct to learning in other studies.²⁵ SBE facilitates exploration of the impact of incorrect technique on resultant image appearance to develop deeper learning around radiographic technique without the risk of ionising radiation to patients.²⁵ The opportunity for this cohort to repeat tasks and undertake self-paced learning with the provision of immediate results and feedback appears to have supported student learning; attributes of SBE previously reported to enhance learning.^{1,4,25,26} The students transfer of knowledge and skills in to the practice setting

was evidenced through radiographers comments that the students required less teaching and instruction from staff, and studies have shown student performance is not disadvantaged from learning in a simulated placement.^{19,27} The survey demonstrated radiographers felt students were able to apply health and safety measures they had explored in simulation sessions within the clinical environment, enabling them to work safely. Other first year diagnostic radiography students have reported a greater understanding of departmental policy and procedures, including infection control and radiation safety, following SBE.¹⁵

Radiographers reported that students were receptive to feedback, which may have been developed through the cycle of immediate tutor feedback, debriefs, peer feedback and self-reflection embedded in the SBE and supporting workbook. The importance of tutor feedback and debrief of simulation sessions is identified as an important factor in students constructing knowledge and strengthening theory-practice integration through SBE.^{1,15,25} The confidence students displayed in clinical practice was substantiated by the radiographers with observations that students had settled in more quickly, were more motivated and involved themselves in workflow and were less overwhelmed than previous cohorts. This appears to demonstrate the value in familiarising students with what to expect in the clinical environment and operating real imaging equipment through the prolonged period of SBE, despite the inevitable variations they encountered once in their respective clinical placement sites. Similarly other studies have reported SBE prior to clinical placement prepares students for what to expect in practice, reduces pre-placement anxiety and increases their confidence.^{15,19,21}

Respondents felt that students needed a greater level of assistance than expected in undertaking axial skeleton examinations. These are arguably more complex examinations, with the additional considerations of the use of the bucky and the automatic exposure device, however this may indicate that students require further development in this area either in SBE or the clinical setting. Despite the SBE sessions not involving service users, expert patients, or actors for this cohort of students, students' interaction with service users during their clinical placement was rated as appropriate. The findings of other studies suggest interpersonal skills would only improve if these were embedded in SBE activities and the fidelity of the sessions increased.¹⁹ Interestingly, the themes identified through radiographers' free text responses demonstrates it was particularly service user interactions that made some staff believe SBE could never replace traditional radiography placements. In a 2022 Delphi study,¹³ the main limitations of SBE were the perception that learning in a simulated environment without patients would not be realistic and the concept that some things cannot be simulated was identified. As the authors of the study highlight, providing a wholly accurate replication of the clinical experience is rarely the objective of SBE.¹³ Whilst SBE was used in this cohort to replace the majority of the clinical placement hours in the first year of the programme, it is only part of the wider strategy to develop clinical skill development along with traditional placements across the entirety of the programme. The results of this survey therefore identify opportunities to collaborate with placement providers regarding any perceived gaps or areas for student development and where this learning should be supported. Collaboration between universities and clinical sites, informing how clinical training is best implemented in conjunction with the simulated training is deemed important.²²

A wide variation in student performance was noted by respondents, particularly around professional attributes. It was also apparent through thematic analysis that respondents did not

attribute perceived underperformance of some students to the SBE, as personal qualities and wrong choice of career were identified as some of the factors. Despite intentional teaching, assessment and socialisation around professional behaviours and attributes in SBE, some students may not have successfully transferred this learning to clinical practice.²³ Bowman et al.²³ found the transfer of learnt behaviour and attributes from pre-clinical simulation to the workplace was not uniform, with demonstrating initiative the least transferable behaviour. Radiographers in Ireland supporting student learning have also reported poor student attitude which was equated to disinterest and not accepting constructive feedback.²⁸ The authors however raise the question of what radiographers perceive as positive attitudes and whether these are founded in an evidence-based understanding of student learning behaviours.²⁸ Motivational theory models have been utilised in the simulated learning environment to implement motivational strategies to positively impact on the quality of learning, something that could be adopted in the clinical setting.²⁹ The rate of progression and the diversity of learners perhaps needs to be recognised in order to individualise support and develop professional behaviours, attitudes and self-motivation alongside practical skills within the clinical placement.

Limitations

The sample size of radiographers who had worked with this cohort of first years was unknown and therefore the response rate could not be determined. The distribution method of the survey may have limited the number of responses; however, this may also be symptomatic of the known pressures the workforce is currently under.²⁸ The responses of four radiographers may have been influenced by their 'occasional' interaction with students during their clinical placement. It is acknowledged that the degree of information conveyed to radiographers about the SBE students had undertaken, and the specific intended outcomes may have been an influencing factor in misconceptions around SBE. There was no control group undertaking the traditional clinical placement model in this cohort to enable comparison. Whilst radiographer perception as a measure of student performance may be open to some subjectivity where expectations differ, it does provide some new valuable insight into the impact, implementation and acceptance of SBE from clinical staff involved in supporting student learning.

Conclusion

In this study, radiographers' perceptions indicate simulation-based education showed encouraging results in enabling students to undertake standard imaging techniques, knowledge of radiographic anatomy, interact appropriately with patients and operate safely under supervision in the clinical environment. In addition, the use of pre-placement SBE was seen to have positively impacted on student confidence, and the integration of debriefs, assessment of practice and feedback in SBE resulted in students being receptive to feedback from clinical staff. The findings provide an opportunity for simulation-based activities to be refined, and the impact re-evaluated to determine its influence on professional qualities and attitudes and those intrinsic to individuals. The role of clinical placements and supervising radiographers in developing such attributes should also be made explicit.

Changes to clinical placement models require close collaboration, and communication of expected learning outcomes within SBE should be discussed with practice partners. This will facilitate consistency of expectations of student performance and identify areas to focus learning on in the clinical setting that were not, or only partially addressed in SBE. This holistic approach will ensure

that SBE can play an effective and complementary role in partial clinical placement replacement in the wider context of stage appropriate learning across a programme of study integrated with learning in the clinical setting.

Implications for practice and further research

Embedding simulated learning requires a holistic approach: alignment with curriculum content and other programme activity, clearly defined learning outcomes, mechanisms for feedback and debriefing, careful optimisation with clinical placements, and importantly the evaluation of the impact. Collaboration with clinical placement partners can avoid misconceptions of SBE, level staff expectations of students and focus areas of purposeful learning and support in the clinical practice environment. The differences in, and areas for improvement identified around student professionalism, and the support to develop these in the clinical setting, is worthy of further exploration in future studies. As this was a small-scale survey, further work into the perceptions of radiography staff of the impact of SBE on student performance would be beneficial as the expansion of SBE in diagnostic radiography education continues.

Conflict of interest statement

None.

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