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The use of simulation and moulage in undergraduate diagnostic radiography education: A burns scenario

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ABSTRACT

Introduction: There is a national drive to increase allied health professions simulation training. However, there is a paucity of literature within diagnostic radiography in relation to clinical simulation. No research could be found regarding the impact of simulation in radiography with complex clinical burns scenarios. This research aims to explore the perceptions of radiography undergraduate students regarding their preparedness for the complex care requirements in imaging examinations of clinical burns cases using a mixed methods approach.

Method: A small-scale simulation-based teaching session was developed in a Scottish HEI, using role play and moulage to create realism. Twenty-eight undergraduate student radiographers participated in the scenario. Students completed pre and post-scenario questionnaires using Likert scale and free response data. Focus groups were undertaken three months after the simulation to obtain rich qualitative data. Common themes were identified via a process of initial coding and a 6-phase thematic analysis.

Results: Thematic analysis demonstrated a marked increased perception of preparedness post-scenario; students felt more prepared to undertake their role in the imaging of complex care patients (Likert scoring increased with both mode and median post-scenario). Common themes that were identified were patient centeredness, realism and learning.

Conclusion: Within this limited pilot project, the use of simulation was an effective means of preparing students to understand their role within the complex care setting (with respect to the traumatic realism of burns) in preparedness for professional practice. Additionally, students related to the practical understanding of the complexity of human factors that exist within clinical practice.

Introduction and background

Burns patients suffer physically, psychologically and sociologically[1]; requiring specialised care from trained healthcare professionals. The National burn care standards[2] require radiology services to be available 24 hrs and diagnostic radiographers play a primary role in the diagnosis and care of these patients. Caring for these patients presents many challenges for the healthcare professional: technically, intellectually, physically, emotionally and spiritually.[3] Physical appearances of burns can have a lasting impact on both the patient and the professional caring for them[4]; Hulbert–Williams et al.[1] found that imagery of burned body areas also raises the anxiety levels of non-sufferers, inferring that student radiographers with little to no prior exposure may find undertaking an imaging examination on a burn's patient an uncomfortable task.

Despite practice-based learning being integral to a radiography pre-registration programme, undergraduates find transitioning to clinical placement challenging.[5–8] Hyde and Strudwick[6] focused on first year students' preparedness to work with service users who were acutely unwell and highlighted student concerns that could be linked to imaging patients with burns: service users in pain, carrying out mobile imaging examinations and services users requiring complex care. There is an increase in burns incidence and admissions rates within the United Kingdom.[9] However, the British Burn Association[10] identify only thirty-seven specialist burns services across the United Kingdom which limits the availability of placement opportunities restricting exposure and experience with this patient group. As clinical education cannot fully prepare students for all eventualities,[7] Hyde and Strudwick[6] recommend

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the use of simulation in Higher Education Institutions (HEIs) to provide situational experience.

Simulation is defined by Health Education London[11] as: 'the reproduction of part or all of a clinical encounter through the use of manikins, computer resources and simulated patients'. It is a pedagogical approach that provides a safe learning environment enabling students to practice skills, question practice and reflect on their performance without impacting on real patients' care.[12] Literature shows simulation to be used with variable approaches in radiography education; using computer software,[13–15] in situ simulation,[16] interprofessional learning[16–19]; and following professional registration.[15,20] Immersion, fidelity and realism are essential factors for situated learning and to transfer knowledge and skills to the real world.[21] The use of moulage by applying make-up in simulated scenarios increases the authenticity and realism, allowing participants to become more immersed in the experience enhancing the learning opportunity.[22,23] Shiner[24] found no Simulation Based Education (SBE) within radiography used moulage, although this search was limited to conventional radiography, a gap evaluating the use of moulage in this context still exists.

The aim of this simulated teaching session was to provide undergraduate students with an opportunity to explore their role of imaging a burns victim using reflection through peer to peer and peer to tutor discussion during the simulation. Highly skilled tutors with experience of burns patients facilitated reflection and abstract conceptualisation to help the student make sense of the simulated event.[25] Specific objectives were to gain student perceptions related to the use of SBE to enhance preparedness for imaging patients with complex care presentations.

The simulation

The simulation took place in the university's clinical ward setting where unobtrusive video camera (SMOTs™) footage could be acquired. The primary researcher played the role of the patient and it should be noted was also this cohort's personal tutor for the previous 3 years. Moulage was applied to the cheek, hand and arm to recreate third degree and 2nd degree burns (See Figs. 1 and 2). Additional medical equipment including a nasogastric tube, oxygen mask and cylinder, blood pressure cuff, electro cardiogram leads and monitor, venflon and saline drip and urinary catheter with simulated haematuria (tea and red food colouring) was added to the simulation (See Fig. 3). In addition, a 'GoPro' video camera was attached discreetly to the chest of the 'patient' to acquire footage of the students' reactions to the simulation. Noise from the monitoring device added a realistic background ambiance. Students were invited to observe the 'patient' who was non-communicative, in discomfort and restless.

The second researcher facilitated discussion with the students; exploring the complex care needs of the patient, imaging requirements, infection control procedures, communication skills and discussed further systemic pathologies experienced in this scenario. Debrief and peer to peer discussion took place with both researchers and all participants during and immediately after the simulation, enhancing the learning and reflective process.

Methodology

Data was collected from all the students (n = 28) who took part in the simulation in the form of a mixed methods questionnaire by combining quantitative and qualitative approaches along with gathering video footage to fully evaluate the session and gain an insight into verbal and non-verbal reactions of the students. Focus groups were undertaken three months post simulation. A mixed methods approach is strongly associated with pragmatism which is

Figure 1. Third degree burn.

Figure 2. Second degree burn.

Figure 3. Setting.

a paradigm focussed on 'what works' deemed ideally suited to the aim of this study.[26]

Sample

Purposive sampling was used as all students were in stage 3 of the 4 year BSc (hons) Diagnostic Radiography course in a Scottish HEI and undertaking a module in patient pathways. These participants had successfully completed 3 out of 6 clinical placements and were all invited to take part in the study.

Ethics

Participation Information Sheets were provided to all participants and informed consent gained in accordance with ethical procedures. Researchers considered the beneficence of the research, to ascertain the value it would add to the participant, future patients and the student experience on the programme. It was felt the benefits out-weighed the considered risk; with the risk of emotional distress being reduced by in-situ debriefing, access to university well-being services and further opportunity for discussion as part of a focus group. All raw data was kept confidential on a password protected computer. Analysis of the questionnaires and focus group data was coded for anonymity. Consent was gained to use video footage and images for dissemination.

Data collection

The first phase of data collection consisted of a pre-and post-questionnaire (n = 28) consisting of four quantitative questions (Likert scale) (see Tables 1 and 2).

The second phase of data collection involved the use of SMOTs™ cameras and a GoPro camera to gather verbal and non-verbal communication to uncover social and cultural meanings, and to capture initial reactions when meeting a burns patient. The impact of the Hawthorne effect[27] was considered and minimised, students by stage three of the course are used to SMOTs™ cameras in clinical areas and the GoPro was placed discreetly on the patient using a chest mount and partially hidden by a hospital gown.

The third phase of data collection was purely qualitative and gained from students (n = 12) randomised into two focus groups and undertaken 3 months post simulation. The delayed period allowed for a time of reflection, use of knowledge or skills learnt and for the immediate emotions to settle. This method allowed the two researchers to explore any lasting impact following the simulation and examine attitudes and behaviours. Further advantages included a secondary debrief following the simulation, allowing participants to reflect and share their feelings about the experience. The focus group discussions were recorded and transcribed verbatim. While the process of transcription may be deemed an onerous task, it has been recommended as an invaluable tool for familiarisation with the data.[28] It is recognised as a method to discover meanings rather than merely a mechanical way of inserting spoken word on to paper.[29] The raw data from the transcriptions were analysed using thematic analysis as advocated by Clarke and Braun[30] using a six-phase coding process (see Table 3).

Once the themes were identified, verbatim quotes from the student focus groups were used to further support the findings. Furthermore, a concordance check was completed between the two researchers once the themes had been determined to map to the transcriptions. The three emerging themes were: patient centeredness, learning and realism, these topics form the basis of the discussion.

Results

All 28 students completed both pre-and post-questionnaires with quantitative data analysed using descriptive analysis. Tables 1 and 2 display the pre- and post-simulation results, a positive mode and median shift was observed for questions 1 (likert point 3 to 4) and question 2 (likert point 1 to 2) and a median shift for question 4 (likert point 2 to 3). It should be noted that some students marked between points on the likert scale this had been interpreted as a 0.5 within the statistics. Graphs 1 and 2 display the positive shift against all the results.

Discussion

Patient centeredness

A key objective of this simulation was to introduce students to a patient suffering burns. Initial reactions were captured using both the SMOTs™ cameras and a GoPro. Students were initially very quiet around the patient (see Fig. 4) adopting defensive postures suggesting unease or lack of confidence in the situation.[31] This impairs communication with the patient which negatively impacts on building patient trust. Nonverbal communication encompasses facial expression, gaze, posture touch and more, which can substantially influence a patient's perception of a person and the conversation.[32,33] As gaining patient trust is reliant on perceived practitioner competence and nonverbal communication; the defensive postures adopted by the students in this scenario may impair patient satisfaction, cooperation and improved health which are linked to trust.[34] The students recognised the importance of what others see and how their reactions may have impacted on a real patient; valuing the opportunity to experience this in a safe environment.

> F2 S6: "*You also saw the reaction of other people as well, so you can understand what's going through other peoples head when they see something like that and not just your own reactions. So like you have to be aware of what other people are seeing just the same as you and know what's going through their head.*"

> F1 S5: "*Cause I saw some peoples faces and they looked pretty scared.*"

Table 1
Pre-simulation questionnaire.

LIKERT SCALE							
Question	1	2	3	4	5	Mode	Median
	(Not at all)				(Extremely well)		
Q1. How well do you understand the role of a radiographer within a burns unit?	3	6	11	7	1	3	3
Q2. How much exposure/experience have you had with a burns victim in the clinical setting?	28	0	0	0	0	1	1
Q3. How prepared do you feel to communicate with a burns victim in the clinical setting?	4	8.5	12.5	3	0	3	3
Q4. How prepared do you feel to have physical involvement with a burns a victim in the clinical setting?	5	10	11	2	0	3	2

Table 2
Post-simulation questionnaire.

LIKERT SCALE							
Question	1	2	3	4	5	Mode	Median
	(Not at all)				(Extremely well)		
Q1. How well do you understand the role of a radiographer within a burns unit?	0	0	3	23	2	4	4
Q2. How much exposure/experience have you had with a burns victim in the clinical setting?	12	13	2.5	0.5	0	2	2
Q3. How prepared do you feel to communicate with a burns victim in the clinical setting?	0	2	15	10	1	3	3
Q4. How prepared do you feel to have physical involvement with a burns a victim in the clinical setting?	0	5	13.5	8.5	1	3	3

Table 3
Phases of coding.[30].

Phase	Description of the process
1. Familiarising yourself with your data:	Transcribing data (if necessary), reading and re- reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each code.
4. Reviewing themes:	Checking in the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells; generating clear definitions and means for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

F1 S5: *"And I think that's good to get that out the way to be able to respond the way you would instead of having to put on a professional face. If you did that in real life with the first burns patient you saw….. You know it's better to get it over and done with and see it, so that next time you're not as scared and you kinda know half of what to expect."*

A pivotal moment in the simulation was the point the 'patient' removed the oxygen mask and looked at the students. Students displayed shock with 'gasps' when they realised the 'patient' was their personal tutor (see Fig. 5). Shock can impede communication skills, both verbal and nonverbal; negatively impacting on the quality of care received by patients.[35] Students had been transfixed on the burns and hadn't recognised their personal tutor which became an active discussion point in the focus groups.

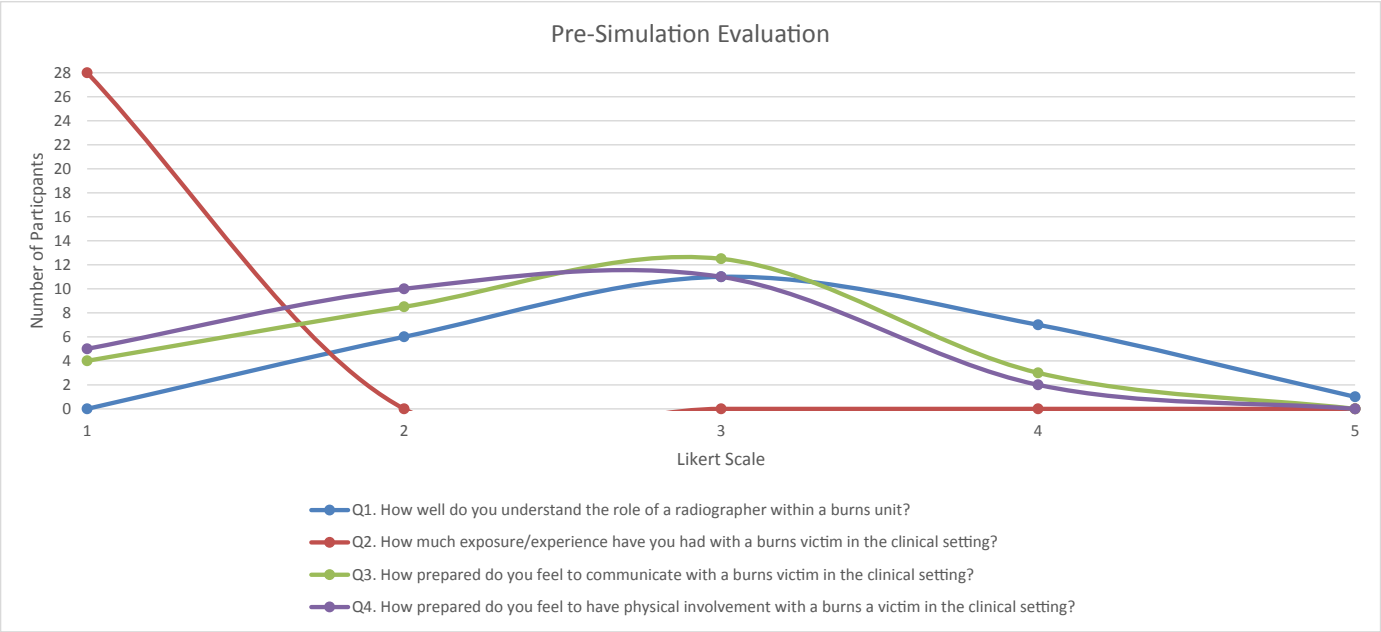
F1 S3: "……..*we hadn't realised it was…….you thought that we knew……. We realised and we all came to, and then we could focus on why we were doing it and the point."*

Strudwick[36] identified that radiographers label their patients for planning imaging. The labelling or categorising of patients means they are no longer seen as individuals resulting in patients becoming depersonalised in imaging departments.[37] This was apparent within the simulation when students saw only the burn not the 'patient' behind the burn. Martin et al.[38] found this to be problematic for burns survivors, who experience internal conflict between wanting to forget their injuries and addressing people's curiosity to understand what had occurred. The debriefing allowed for this point to be explored further; this opportunity is unlikely to have arisen in clinical placement and students acknowledged this as a valuable point.

F1 S1: *"Makes you think more of appreciation for the patient rather than just the condition like we learnt alot about why you would use imaging in this case, but it makes you think actually this a person here and how do I need to approach this."*

F2 S3: "*And think more about the wider picture, this is a patient and their family, they will have psychological issues after that. I think the simulation was good for thinking about that, not just I've got a job to do and I'll do it ……Sometimes on placement in scary or unusual environments it's easy to keep focus or keep your radiography brain on, but that gave you time to discuss it and talk about your feelings about the simulation. Not everyone was comfortable with it but I think it was good as you were able to say it out aloud instead of being the perfect student and being calm in every situation."*

The Francis report[39] identified several failings in the Mid-Staffordshire NHS Trust and a recommendation of this report is the increased focus within education on compassion and caring.



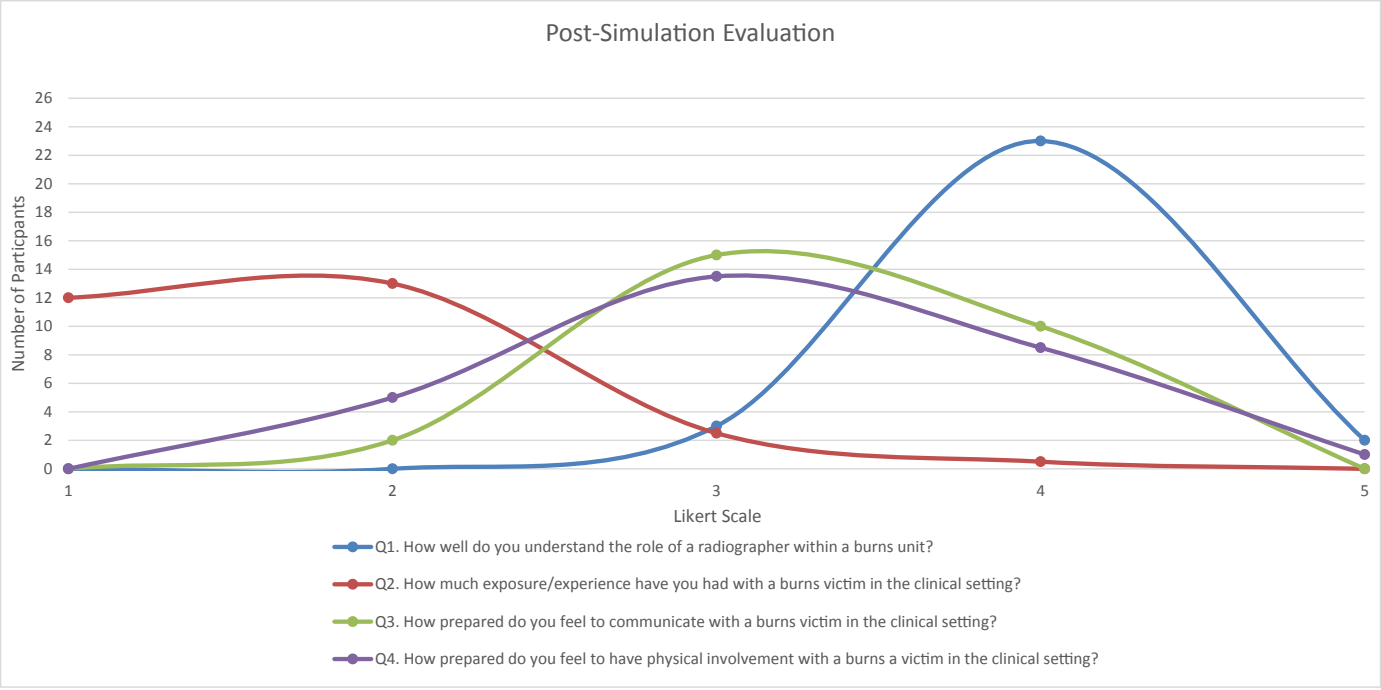
Graph 1. Pre-simulation evaluation displaying median results.

The environment radiographers work within can challenge communication for example the physical distancing of the radiographer to the patient during exposure.[40] This simulation highlighted this to the students and their non-verbal reactions to the burns patient, the in-situ debrief allowed for this to be explored which can be more challenging in clinical practice as acknowledged by the students.

F1 S4: *"I've never seen a burns patient with extensive burns like the one in the simulation. So I think it does prepare you to an extent, that face that we pulled when we first saw it, or like the way we felt it won't be as bad when you see it in real life, like obviously you'll still be completely shocked and taken aback but the inital shock has gone a bit I think."*

Realism

Moulage techniques are used within simulations to mimic wounds, act as cues or to increase fidelity adding to the realism of the scenario.[41] Research using moulage dominates in clinical areas



Graph 2. Post-simulation evaluation displaying median results.

Figure 4. Patient perspective captured by a chest mounted GoPro.

such as dermatology[42–47] and burns.[48–50] Adult learners transfer theory to practice best when it is closely linked to the real-world environment.[51] The quantitative data indicated all 28 students felt they had little to no experience before the simulation with this patient group in the clinical setting, however despite a lack of comparable experience students reported the wound to be realistic. A student thought an actual patient had been brought into the university, whilst for others it prompted a physiological and psychological response. Jain et al.[43] reported a similar finding with students mistaking the moulage as an actual melanoma on the patient's skin thus provoking emotions. Stokes-Parish et al.[41] consider that in these instances the moulage may be 'too real', preventing participants from differentiating between the executive and entertainment spaces detracting from the learning experience.[52] Similarly, Diamond et al.[53] maintains that participants should retain some awareness that the simulation is a learning opportunity; in the case of this research the presence of a researcher facilitating the simulation throughout overcomes these challenges and acts as a support to students experiencing the scenario.

Figure 5. Captured using SMOTs™ camera. Student on the left realises it is her personal tutor.

F1 S3: *"The makeup was really realistic looking, I couldn't tell it was makeup at first. Which I thnk is better as it looks more realistic – it looked like an actual burn, I actually thought it was a real person in uni."*

F1 S2: *"To be honest you couldn't really hide it was intense."*

F1 S4: *"I could feel the blood pumping around my head."*

F1 S3: "……*it was a really intense environment, which I guess it would be in real life."*

These are powerful comments and indicate an emotive connection to their learning experience. Stokes-Parish et al.[54] discusses realism, authenticity and the impact on student engagement which reflects the theory of Empiricism, that knowledge is based on experiences derived from the senses.[55] This simulation offered a multisensory experience increasing authenticity though a further development would be the incorporation of simulated smells.

Learning

The use of SBE links closely to the work of Simons,[51] who describes many conditions that improve the accessibility of information and skills in memory. The use of simulation addresses a number of these points: provide practical experiences; increase the metacognitive skills by creating learning environments that call upon the skills required whilst broadening the generality of knowledge by offering opportunities for reflection. It is evident from the focus group that students found this experiential learning had improved their memory recall for their exam but more importantly could see the value for their future practice.

F2 S3: *"For me it felt like definitely one of the topics I was most prepared for as I'm a visual learner. …..It has stuck in my mind and I can still visualise today, rattle off all the different things you can expect with a burns patient. It was so much more helpful than just sitting down in a lecture and taking notes of all the different complications and having then to discuss it and see it was far more helpful."*

F2 S2: "*During the OSCE I thought back and it kinda helped, I remember thinking back to it about breathing and things, the complications."*

F1 S2: *"I think in real life I would think back about the discussion we had, I would remember and think you've got to think about this, this and this."*

These comments correlate with the quantitative data with a clear positive shift in the answers to questions 1 and 3 following the simulation relating to communication and understanding the role of the radiographer within the burns unit. It would appear that the students retained the knowledge and understanding of patient care of a burns victim indicating that SBE is a valuable pedagogical approach in radiography education.

Recommendations

Students identified the value of simulations to their learning, requesting additional simulations to be integrated within the programme. When asked what type of simulations, students provided examples of patients requiring more adaptive techniques and trauma.

F2 S2: "E*ven if you did like a simulation on like a broken leg or like a hip as you often get so many people on a trolley in A&E curled round and won't move their hips."*

F2 S2: "*To have a simulation you can actuallly discuss it and have an understanding of why your doing what your doing.*"

Further to this, students also reflected on how moulage can improve other simulated activities already experienced and reported by Brown et al.[16] in terms of trauma simulation.

F1 S2: "*…..it's like just a doll, if you did a simulation to see what sort of injuries you get from RTA to prepare them for the whole with a seat belt without a seat belt because you do get shocking injuries and you could prepare them prior to going to hospital.*"

There is a paucity of research in the use and evaluation of the impact of moulage as reported by Stokes-Parish,[41] as the radiography profession works in multidisciplinary areas it is well placed to explore moulage in SBE further. Developing this research further with the use of simulated smells may enhance the learning experience. Students appear to have an emotional response to the sight of wounds and therefore this is an area requiring further investigation to explore if the pedagogical approach of SBE using moulage can improve the transition of students to clinical practice.

Limitations

This research was undertaken in one HEI and with a solitary cohort limiting the generalisability of the results however it is believed that the results of this small-scale study provide a meaningful contribution to the limited evidence base on this topic. As this teaching session was the first use of moulage at this HEI, it could be argued the shock experienced by the students related to the change in pedagogical delivery over the sight of the wound. However, the students had experienced three clinical placements and had seen real-life injuries though none had witnessed burns in the clinical setting. Efforts were made to reduce the Hawthorne effect by partially concealing the cameras however this may have still impacted on the students' responses.

Conclusion

The aim of this simulation was to provide students with an opportunity to witness and engage with a burns patient and reflect on the experience to enhance learning. Students considered the simulation to have offered them this exposure and perceived an increase in preparedness and understanding of their role for imaging a burns patient. The application of moulage to the 'patient' proved realistic, improving students' memory recall in relation to the issues surrounding imaging of a burns victim. The wounds distracted students from the 'person beyond' which is reflective of a burns patients experience.[38] Debriefing allowed this point to be explored in more depth improving the understanding of a patient centred care approach and self-awareness. This simulation was an innovative approach to bridging an experiential gap in the students' learning and it is believed that it played some part in supporting the transition to clinical practice.

Conflict of interest

No conflict of interest.

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