Original article

RADIOGRAPHY CLINICAL EDUCATION AMIDST THE COVID-19 PANDEMIC: PERSPECTIVE OF RADIOGRAPHY STUDENTS INTERNATIONALLY

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ABSTRACT

Purpose: The COVID-19 pandemic has significantly impacted clinical practice. This study explored the impact of the pandemic on diagnostic radiography clinical education from the perspective of radiography students internationally.

Materials and methods: A qualitative approach was used to gain insight into students' experience of clinical placement during the pandemic. A total of sixteen radiography students from six countries were recruited from an international Radiography summer research school. Qualitative data was gathered via three semi-structured focus groups (5-6 students per focus group). Data was analysed using Braun and Clark's phases of thematic analysis.

Results: Five key themes emerged in relation to clinical education during the COVID-19 pandemic, (i) unequal student access to personal protective equipment (PPE) (ii) challenges in achieving clinical learning outcomes (iii) impact of online education on clinical readiness (iv) emotional impact, and (v) coping strategies. Students indicated that they were particularly afraid of transmitting COVID-19 to their family and friends. Some students reported that they felt under pressure to receive COVID-19 vaccinations prior to clinical practice. Others reported confusion with respect to infection control guidelines and application of PPE.

Conclusion: Student radiographers identified key challenges which require consideration by educators to ensure students are appropriately prepared for and supported on clinical placement during a pandemic.

Implications for practice:

- The COVID-19 pandemic has impacted clinical education internationally and this study identifies the implications for radiography students in terms of clinical readiness and their clinical placement experience.
- Simulation-based in-person learning in the X-ray lab and PPE training were perceived by students to be important factors impacting clinical readiness.

INTRODUCTION

On the 5th of January 2020, the World Health Organisation (WHO) reported the emergence of the COVID-19 virus. This highly infectious virus rapidly spread across the world, resulting in a global pandemic (1). A variety of protective measures were introduced in response to the COVID-19 pandemic such as social distancing, mask wearing, contact tracing, travel restrictions and COVID-19 vaccinations. Education traditionally delivered in-person was replaced predominantly with online modes of delivery (2,3). Some critical elements of curricula, such as clinical training of healthcare professionals, could not be delivered online.

Radiography is a healthcare profession that is built upon exposure to learning and practice in the clinical setting. This is key to developing radiography students' competence, reflective practice, and professional identity (4). The pandemic posed several challenges with respect to clinical placements such as lack of staffing for student supervision, altered work patterns, limited physical space for social distancing, and PPE shortages (5,6). Radiography plays an important role in the management of patients with COVID-19. therefore radiographers are considered frontline health professionals likely to be exposed to infectious patients (7). Although not required for diagnosis, imaging (typically chest X-ray or chest CT) is essential for assessing the severity and disease progression of COVID-19 (8). Whilst the frequency of chest imaging increased during the pandemic, the frequency of other radiological examinations decreased due to curtailment of non-urgent healthcare services (6). Some clinical placements were cancelled or postponed as a result (3,6,9). The provision of clinical placements for students in their final year of their degree was prioritised in order to graduate healthcare professionals to join the depleted workforce.

Students' experience in clinical practice can have a significant impact on their learning, professional development, and personal satisfaction (10). Several researchers have investigated radiography students' perspectives of clinical placements during the pandemic using online surveys (2,3,11–13). In a study by Rainford et al, the risk of transmitting COVID-19 to members of the household identified as challenging, as was isolation from family, travel to clinical placements (3). Similarly, Elshami et al and Solís-Barquero et al identified students' primary concern was in relation to transmitting COVID-19 to family members they were living with (3). These studies employed short surveys (designed to be completed in <10 minutes), consisting predominantly of closed-ended questions generating quantitative data. These were advantageous in terms of achieving a high response rate and a wide geographical spread. However qualitative methods of data collection, such as focus groups, are preferable to gain rich, experiential feedback (14). Only two qualitative studies have been conducted on this topic; these studies used semi-structured interviews involving a small sample of UK students (n=9) (15) and new graduates (n=5) (16). These interview-based qualitative studies focussed solely students and newly graduated radiographers in the UK. This study aims to explore the impact of the pandemic on diagnostic radiography clinical education internationally from radiography students' perspectives through the use of focus groups.

MATERIALS AND METHODS

Study design

A qualitative study involving focus groups was conducted to explore the lived experiences and perceptions of student radiographers. Focus groups enable data collection from numerous participants at once and promote rich discussion in a group setting, which can stimulate participants to generate further questions and clarify their views (17). An inductive approach with open-ended questions was used to capture participants' feelings, perceptions, and thoughts. Inductive content analysis was used to explore and develop new themes from the participants experiences of clinical placement during the COVID-19 pandemic

Study participants

A purposive sample was chosen from a reasonably homogenous population of radiography students attending a research summer school in the University of Ljubljana, Slovenia, in August 2022. All radiography students attending this summer school were informed of this research project in person and provided with information leaflets regarding this study. Sixteen radiography students volunteered to participate in this study and were assigned to focus groups of 5-6 students. There were 5 male participants and 11 female participants, ranging in age from 19-30 years of age. Participants were undertaking Radiography degree programmes in the following countries: Switzerland (n=5), Slovenia (n=1), The Netherlands (n=3), Portugal (n=2), Ireland (n=3) and a non-European country (n=2). The non-European country is not named to protect the anonymity of these participants. All students had prior experience of clinical placement; two had completed their first year of Radiography, eight had completed their second year and six had completed their third year of a four-year BSc Radiography degree programme.

Data collection

A neutral room was selected for hosting the focus groups which was spacious enough for participants to be comfortable, yet not so large that it would hinder productive discussion between participants (18). As seen in Figure 1, participants were seated in a semi-circle facing each other to promote an open discussion.

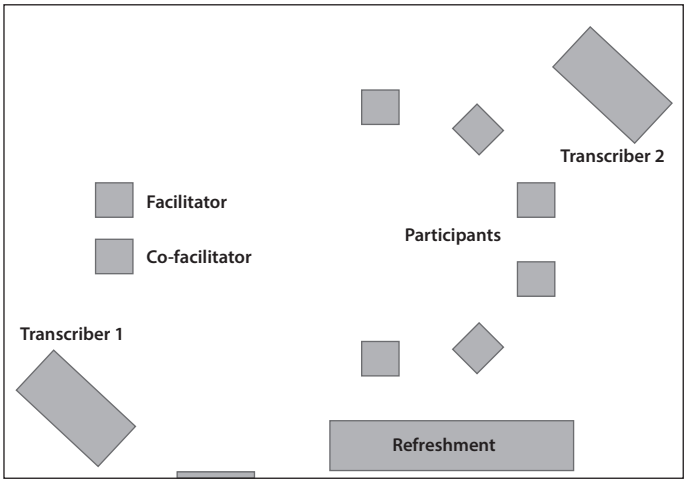

Figure 1: Focus group room organisation

The facilitator led the discussion and asked trigger questions focused around the physical, social, and emotional experiences of participants related to clinical placement during the pandemic e.g. How has it been for you undertaking clinical practice during the pandemic? What have you learned from your experience in clinical practice during the pandemic? What else would you like to share about your placement experience? The co-facilitator adopted a more supportive role in clarifying obscure comments or drawing in participants who haven't contributed. Two transcribers were present so that transcriptions could be compared, merged, and participants approached if there were any discrepancies between transcriptions. To ensure the anonymity and confidentiality of the participants, their names were not used in the transcript. A numerical system was used to code participants for transcriptions. The nationalities of the participants were recorded to identify any country-specific trends in participants' responses.

Data analysis

Each researcher independently coded the final focus group transcriptions using the Braun and Clarke model (19), which is presented in Figure 2. Codes were then revised and refined by all researchers. Finally, common themes were extracted, discussed by the research group, and agreed by consensus.

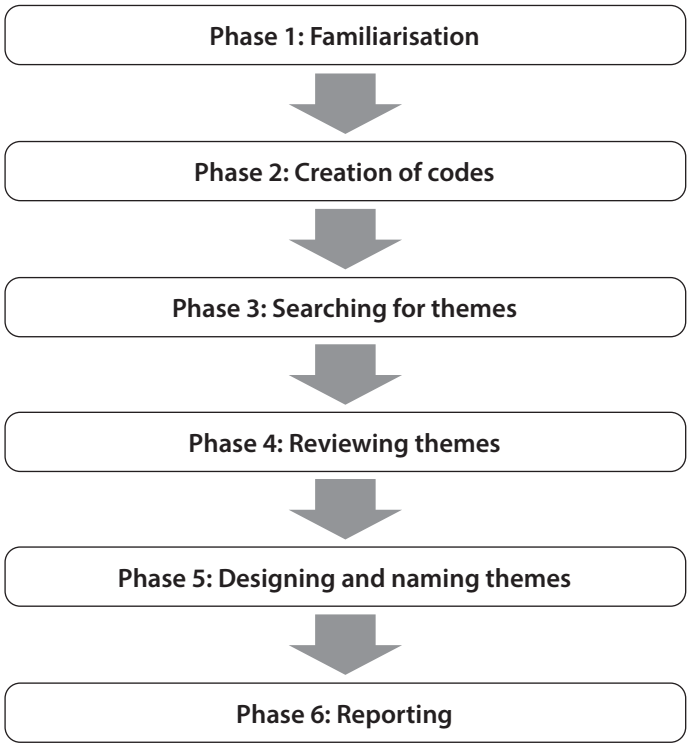

Figure 2: Braun and clarke thematic analysis phases (19)

Ethical considerations

This study received ethical approval from both the lead author's university and the host university. Research was conducted in accordance with the Declaration of Helsinki from the World Medical Association (20). Participation was on a voluntary basis and participants were made aware that they could withdraw from the study if they wished. Researchers adhered to the principles of the General Data Protection Regulations (21). Participant details and any identifying information contained within their responses were de-identified. If participants became upset by the questions the researchers were on hand to offer support.

RESULTS

Clinical placement provision varied during the first wave of COVID-19, with some participants reporting clinical placement postponements, whilst others proceeded with clinical placement. Participants reported feeling pressure from clinical sites and universities to get vaccinated against COVID-19 as many clinical sites did not permit students to practice unvaccinated. Participants felt communication from universities and hospitals in relation to clinical placement rescheduling and pre-clinical requirements could have been clearer and more consistent.

Five main themes emerged in relation to clinical education during the pandemic as depicted in figure 3.

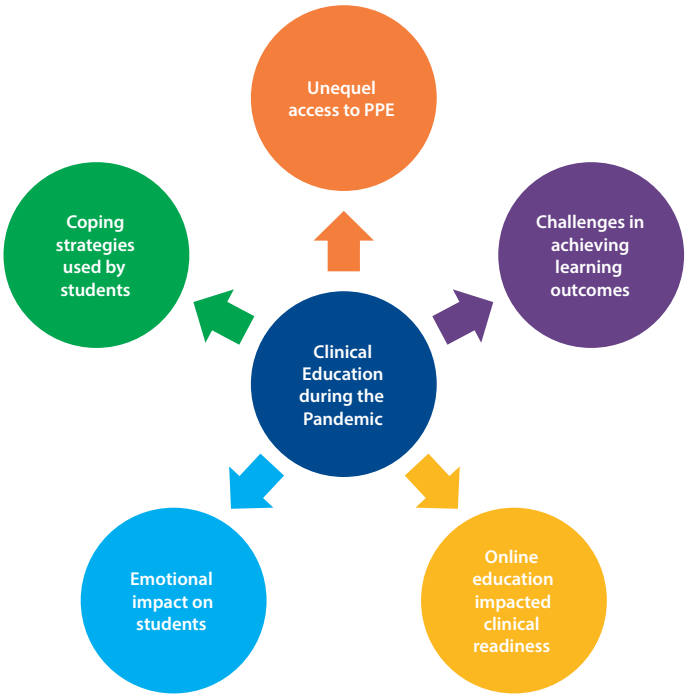

Figure 3: Key themes in relation to radiography clinical education during the pandemic

Unequal access to personal protective equipment (PPE)

Participants who undertook clinical placement in European hospitals reported that PPE was readily available in their clinical sites, whereas those in non-European clinical sites described major issues in relation to PPE shortages in their hospitals. Participants from the non-European country revealed that were instructed by clinical staff to reuse disposable PPE over an extended period of time.

> *"In hospitals, there were financial problems, therefore students given one gown to wear until it tears and then will get another gown. One surgical mask was provided to students every day. We were told to wear PPE for as long as possible but were allowed change gloves" (SR16).*

"In Government hospitals we had to buy our own masks. The hospital was buying the cheaper masks (referring to surgical masks). I was afraid to use them. I bought my own FFP2 mask" (SR7).

Challenges in achieving clinical learning outcomes

Participants discussed several challenges in achieving the prescribed learning outcomes and competencies in clinical practice during the pandemic. They perceived a lack of mentorship and limited exposure to diverse imaging examinations to have hindered their learning opportunities. Worryingly, some participants described scenarios where they were expected to undertake duties of a qualified radiographer without supervision due to the department being short-staffed.

"There was no placement plan. They (radiographers) said, can you do MRI alone as we need to go to the CT? I was alone working in MRI, I had no choice but to learn. They told me that if I was stuck, I could find them in CT. It was difficult for me" (SR6).
"We couldn't learn the things we needed to. It was a bit more restrictive. I was employed as a student and expected to be professional" (SR5).
"At the University hospital I was mostly working in intensive care. Every patient was intubated and I had to X-ray the patients in ICU" (SR7).

Some participants reflected on the onerous infection control measures associated with imaging COVID-19 positive patients, which they felt were time-consuming and exhausting.

"We did all the COVID patients then disinfected the area. We used a UV lamp to look, then left everything clean for the next day and for the regular patients. We needed more time to deal with patients, time to dress up (put on PPE) and undress (take off PPE) for infection control" (SR1).

Some reported confusion over infection control protocols with regards to the application of PPE.

"It was difficult knowing when to wear masks and then rules changed on which masks to wear and when to change them" (SR11).

Some students talked about not being excluded from imaging examinations of COVID-19 positive patients and from busy clinical areas.

"We were not allowed to X-ray COVID patients" (SR15).

Several expressed the sentiment that they did not have enough practical experience during clinical placement to achieve the prescribed competencies.

"We did not have enough clinical practice time" (SR5).

Impact of online education on clinical readiness

Many participants reported that they did not feel adequately prepared to undertake clinical placement during the pandemic. They reported low self-confidence with regards to their practical radiographic skills and knowledge of infection control measures in the clinical setting.

"It was difficult knowing when to wear masks…" (SR11).

Some attributed their lack of confidence in practical radiographic skills to the lack of simulation-based learning in the X-ray skills lab in advance of clinical placement. Travel restrictions in place during the peak of COVID-19 prohibited students from travelling to the campus to attend practical labs.

"If you are motivated, online education was better for learning theory but more challenging for the practical, more human part of the job. I felt less prepared for clinical practice" (SR11).
"We had more image viewing tutorials, but practically I had only touched an X-ray tube twice before placement" (SR12).

Some participants experienced virtual reality (VR) radiography training online prior to clinical placement. These students had mixed opinions on the value of online VR simulation-based learning.

"VR was not realistic enough to prepare us for clinical placement" (SR12).
"I felt more knowledgeable after online study as the recordings meant we could rewatch lectures at our own pace and we could practice (radiographic technique) using VR software" (SR15)

Emotional Impact

Participants reported that they felt fearful undertaking clinical placement during the pandemic. Most participants described their fears of transmitting COVID-19 to family, friends and patients, rather than fear for their own health.

"I was afraid for my family not me" (SR2).
"I was a bit afraid of COVID. I didn't want to live at home during placement as my parents were at risk" (SR10).
"I was a little bit afraid for my father. My mother didn't work, and my father would earn less money if he missed work due to COVID-19" (SR7).
"I lived beside an old man and my aunt so after work before seeing them, I would shower and then keep a social distance and wear a mask. I also got the vaccine. I tried not to give them covid" (SR16).
"I was scared of getting COVID-19 and of giving COVID-19 to patients" (SR5).

Some participants noted that this initial fear subsided as they learnt more about COVID-19 and how to protect themselves and others.

"In the beginning clinical placement was stressful. Everyone made such a big deal. We had to wear PPE and I was afraid to touch people but as time went on, I started to understand covid and became more relaxed" (SR16).

An additional emotional impact participants highlighted was loneliness. Some participants described a sense of isolation associated with online education and a lack of socialisation with peers outside of clinical practice.
"I felt lonely, it was just me in my room with the computer. I was very lonely" (SR6)

Coping Strategies

Some participants described ways that they found for coping with the anxiety and loneliness felt during the pandemic. These coping mechanisms included exercising, spending time outdoors, communicating with family and friends, connecting with peers via media use and engaging in culinary activities.

> *"I went to talk things over with my buddy/ best friend and that helped a lot. I took fresh air. That was very helpful" (SR8).*
> *"Going out cycling with the family helped me to deal with stress" (SR4).*
> *"I got a lot of new hobbies such as cooking and baking cakes" (SR8).*
> *"I was very lonely. We arranged WhatsApp group calls with other students in the class so that we could talk about the course, which was good. It was like I met people" (SR6).*
> *"Teachers made WhatsApp groups. That was helpful" (SR16).*

Participants talked about forming closer relationships with their family members due to the additional time spent at home during the travel restrictions.

> *"We improved our relationships in our family" (SR11).*

DISCUSSION

The aim of this study was to gain an insight into radiography students' experience of clinical education amidst the COVID-19 pandemic. The challenges in achieving clinical learning outcomes and clinical readiness were central themes that emerged across focus groups. The impact of the pandemic extended beyond clinical practice into participants' social and personal lives. Coping strategies used by students to deal with heightened levels of anxiety and isolation were identified.
According to several participants in this study, the transition to online education during the pandemic negatively impacted their clinical readiness. Participants attributed this to the lack of practical X-ray labs in advance of clinical placement. Practical labs and other on-campus learning activities were cancelled for a period in line with COVID-19 related travel restrictions imposed by Governments. This study highlights the importance of simulation-based learning in the X-ray lab in preparing radiography students for clinical practice. Simulation-based learning enhances radiographic knowledge and clinical decision-making skills (22). Some participants experienced online virtual reality (VR) simulation-based learning. These participants had mixed opinions on the benefits of VR learning. The VR software enabled students to practice positioning virtual patients, setting up X-ray equipment and selecting exposure parameters in the virtual environment. However, it did not involve patient communication. Studies have reported the enhancement of student confidence (23,24) and competence through VR learning, with VR deemed as effective as traditional X-ray labs in the development of technical skills proficiency for novice students (25,26). Participants reported that they felt ill-prepared for the 'human' element of the job such as interacting with patients and clinical staff. These soft skills contribute to professionalism and are integral to radiography education (27). Our findings reiterate the importance of incorporating clinical skills lab-based learning into Radiography curricula.
Participants described several difficulties in achieving the prescribed clinical learning outcomes. Lack of supervision and mentorship was at the forefront of these challenges. Participants described scenarios where they were left unsupervised or with minimal supervision due to departmental staff shortages and redeployment of practice educators. Radiographers may have minimised their involvement in student supervision out of fear of the infection risk posed by students (3). Some student radiographers felt that they were relied upon to work as qualified radiographers, which likely contributed to the sense of unpreparedness for clinical practice. A lack of clinical supervision meant students missed out on opportunities to discuss their work performance in a safe environment with qualified radiographers. Students reported confusion over infection control protocols with regards to application of PPE, which could have been clarified through further interaction with supervising radiographers. Feedback on performance in the clinical practice setting is critical for the development of a competent practitioner (28). Students rely on supervising radiographers to observe their practice and provide feedback so that they can modify, develop, and improve their practice. Furthermore, the work undertaken by students in the clinical environment should be monitored by qualified professionals to ensure it meets necessary quality standards (29). Professional supervision is integral to sound clinical governance and should be considered a normal part of working practice in radiography departments (30). Poor or infrequent supervision is a potential trigger for disengagement (31). Radiography students learn professionalism in part through observation of radiographers in practice, particularly in aspects such as patient care and communication skills, ethical behaviour, and technical competence (32). The conflicting demands of care of the patients and student supervision faced by healthcare professionals (28,33) seem to have been exacerbated during the pandemic.
Another key challenge reported by participants was the limited range of radiological examinations they were exposed to during the pandemic. Participants considered this a direct result of the decreased range of imaging examinations performed in hospitals during the pandemic along with the exclusion of students from busy clinical areas. Whilst students garnered lots of experience with portable chest radiography in intensive care units, they reported that they did not feel confident in performing several other radiological examinations due to lack of exposure. With the exception of chest imaging, the frequency of radiological examinations performed during the pandemic decreased due to curtailment of non-urgent healthcare services (6). Participants talked about being excluded from imaging COVID-19 cases and removed from busy clinical areas to minimise the numbers of staff present in line with infection control guidelines. Social distancing was an issue in some clinical areas due to physical

space constraints. Students reported feeling frustration initially as they felt that their learning was compromised from lack of exposure to various imaging modalities but later described an appreciation for the importance of preventing the spread of COVID-19.

One of the key protective measures in preventing spread of COVID-19 in the clinical setting is use of PPE (34). Radiography student participants who undertook clinical placement in European hospitals reported no issues with access to PPE and were surprised to hear the experience of their counterparts who trained in a non-European country. Participants who trained in non-European hospitals described drastic PPE shortages and substandard infection control practice. For example, participants were provided with a single surgical mask and disposable gown and were instructed to wear it for as long as possible regardless of exposure to COVID-19 cases. This contravenes best practice infection control guidelines for dealing with COVID-19 (34). Similar PPE shortages were experienced in many low-income countries during the pandemic (35).

There was confusion amongst the cohort regarding the infection control guidelines related to PPE use. Our findings concur with another international study of student radiographers, in which 66% of students who experienced COVID-19 imaging were confident with PPE use (3). This reinforces the importance of educational institutions and clinical departments providing regular theoretical and practical PPE training for student radiographers. The lack of confidence regarding PPE use likely impacted participants' fears of contracting COVID-19 in clinical placement and transmitting it to friends and family at home. Participants were less concerned about the risk to their own health. Participants in this study were aged 19-30 years, thus were less at risk of the detrimental health effects of COVID-19 that affect older people with underlying health conditions (36). In two large survey-based studies, 87.8% (3) and 95.1% (2) of student radiographers internationally had concerns related to the risk of infecting their family, whereas 62.2% or less were worried about their own health (2,3). The fear of transmitting COVID-19 to vulnerable family members was an emotional burden carried by many participants in this study. Some described that their solutions to this situation was to move out of home and isolate themselves from family members. However, these solutions had ramifications in terms of adding to financial pressures and feelings of isolation experienced by students. These feelings of isolation were compounded by online education (37) and the lack of socialisation with peers outside of clinical practice. Many participants appreciated the opportunity to socialise with their classmates in the clinical setting. Human interactions with clinical staff and patients also alleviated the sense of isolation felt by participants during the pandemic. These were some of the few positives of clinical placement during the pandemic, highlighted by participants.

Fatigue and pressure to be vaccinated negatively impacted participants' clinical placement experience during the pandemic. Some participants raised the issue that they were not permitted to enter clinical placement until they had been vaccinated against COVID-19. This was a contentious matter for participants as some reported concerns regarding the potential side effects of the recently developed COVID-19 vaccination and their preference not to be vaccinated. On the contrary, others reported that being vaccinated allayed some of their fears regarding transmission of COVID-19 to family members. The constant donning and doffing of PPE during clinical placement were deemed exhausting by participants. Occupational burnout in radiography increased during the pandemic (38). Student radiographers are also liable to experience burnout whilst undertaking clinical placement during the pandemic. The risk of burnout amongst student radiographers should be considered by educators, particularly during pandemic times.

A variety of coping strategies were outlined by student radiographers in this study in relation to dealing with the emotional toll of the pandemic. Students reported that their familial relationships strengthened as a result of spending so much time with them during the period of travel restrictions. They felt the routine created by clinical placement along with the opportunity for in-person social interaction were strong positives aspects of clinical placement during the pandemic. Outside of clinical placement, participants adapted by creating their own routine at home, keeping active and engaging in their hobbies e.g., cooking, yoga, and walking. Participants highlighted the value of university support, particularly in the form of regular communication from academic staff.

Limitations

There was a risk that participants for whom English was not their first language wouldn't comprehend questions or would miscommunicate their response. Participants were encouraged to let facilitators know if they didn't understand any information or questions so that these could be rephrased as necessary. This was remediated by participants receiving the trigger questions in a typed format a day in advance of the focus group. Participants were recruited from an international summer research school, delivered through English, and had a high standard of English.

CONCLUSIONS

This study explored the experiences of student radiographers who undertook clinical placement during the COVID-19 pandemic. Student radiographers identified several challenges in relation to their clinical placement. At the forefront of these challenges were lack of supervision, PPE shortages, confusion regarding infection control guidelines and the limited range of radiological examinations performed in clinical practice. Simulation-based learning in the X-ray lab was perceived by students to be important factor influencing clinical readiness. Participants reported that they were particularly worried about passing COVID-19 to friends and family. Students identified strategies for coping with the anxiety and loneliness experienced during the pandemic, such as creating a routine at home, exercising, and using social media to connect with their peers.

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