Radiography 31 (2025) 320–327

Contents lists available at ScienceDirect

Radiography

journal homepage: www.elsevier.com/locate/radi

"Watch them do what they do": Effects of the clinical learning environment on radiography students' clinical placement experiences

J.L. Ago [a, b, *], S. Anim-Sampong [b], J.J. Neequaye [b, **], G. Acquah [b], L.G. Marteki Markwei [b], S.N. Adu Tagoe [b], W.K. Antwi [b], D.N. Aidoo [c]

[a] Discipline of Medical Radiations, School of Health & Biomedical Sciences, RMIT University, Bundoora Campus, Australia
[b] Department of Radiography, School of Biomedical & Allied Health Sciences, University of Ghana, Korle-Bu Campus, Ghana
[c] Department of Medical Imaging Technology, Faculty of Applied Sciences, Accra Technical University, Accra, Ghana

ARTICLE INFO

Article history:
Received 7 November 2024
Received in revised form
28 November 2024
Accepted 9 December 2024
Available online 20 December 2024

Keywords:
Best practice clinical learning environment
Clinical placement
Radiography
Clinical skill development

ABSTRACT

Introduction: Clinical placement (CP) is essential to radiography education, providing students with opportunities to put theory into practice. However, a 'Best Practice Clinical Learning Environment' (BPCLE) for radiography students, is one that is adequately resourced, both in terms of equipment and professionals, as these are critical to the development of students' professional skills. Consequently, this study examined the effects of the clinical learning environment on Ghanaian radiography students' CP experiences.
Methods: An interpretive phenomenological study design with three focus group discussions was used to gather data on how the clinical learning environment (CLE) affects radiography students' CP experience in line with the BPCLE framework. Purposive and convenience sampling techniques were used to recruit 3rd and 4th year Ghanaian radiography students. The data were imported into NVivo™14 and analysed thematically.
Results: The participants acknowledged a positive and inclusive teamwork culture at the placement centres, although some radiographers were perceived to be less receptive while others provided hurtful comments and feedback to students. BPCLEs motivated students and increased their eagerness and desire to improve their clinical competence, whereas non-BPCLEs demotivate students, reduce their wellbeing, and create less avenues for them to have adequate hands-on training. The latter was identified as the main cause of students' reduced CP experience. Thematic analysis further identified availability of resources and effective supervisor support as strategies to overcome this challenge.
Conclusion: The students agreed that their experience at the CLE was positive. However, the inadequate resources and lack of supportive supervisors call for strategies to enhance their learning experience.
Implications for practice: To achieve a BPCLE in low-resourced settings, educators need to identify and engage well-resourced facilities to provide a supportive learning environment for students.

Introduction

Radiography education and training aims to equip students with appropriate theoretical knowledge and clinical skills for effective professional practice upon graduation. The latter is acquired through clinical placement (CP), described as "*… the authentic nature of learning in clinical departments which provides direct observation, hands-on clinical practice and precise feedback from clinical mentors and educators that enables students to acquire relevant knowledge and skills to succeed in the [radiography] profession*".[1] CPs, therefore, expose students to the requirements of professional practice[2] and provide them with opportunities to put acquired theoretical knowledge into practice. Ultimately, CPs support students' clinical skill development such as confidence, professional identity, interpersonal skills, and patient care,[3,4] leading to improved work-readiness.[5]

In contrast to typical classroom learning where activities occur in a structured manner, the clinical learning environment (CLE), encompassing the equipment, clinical supervisors, clinical staff, patients, and organisational culture, offers an unstructured approach to learning.[6] This may lead to varying CP experiences,[7] potentially resulting in under-achieved clinical training outcomes.

* Corresponding author. Discipline of Medical Radiations, School of Health & Biomedical Sciences, RMIT University, Bundoora Campus, Australia.
** Corresponding author.
E-mail addresses: s4065685@student.edu.au, jacobleonardago@gmail.com (J.L. Ago), jjoaneeq@gmail.com (J.J. Neequaye).

https://doi.org/10.1016/j.radi.2024.12.009

Many studies have examined radiography students' CP experiences.[8–10] Nonetheless, little is known of the effect of the CLE on radiography students' CP. A holistic consideration of the impact of the CLE on radiography students' CP, especially in resource-constrained settings, can serve as a roadmap for developing appropriate support strategies to improve students' wellbeing and enable them to achieve their learning objectives.

This study, therefore, examined the influence of the CLE on Ghanaian radiography students' CP experiences. Again, since the current clinical learning environment specific to radiography in Ghana is unclear, the study sought to identify and compare that to the "Best Practice Clinical Learning Environment" (BPCLE) framework[11] and how deviations from it could be corrected.

The "Best Practice Clinical Learning Environment"

This study was based on the BPCLE framework[11] developed by the Department of Health and Human Services, Victoria, Australia, in conjunction with educators and learners from diverse health professions and health services. The BPCLE framework is a guide to the delivery of consistent, high-quality training for health professions students and fosters the creation and maintenance of positive education cultures in CLEs. It is underpinned by six fundamental elements of a quality learning environment[11] as shown in Fig. 1.

Methods

Study design and data collection process

An interpretive phenomenological design with subjectivist epistemology and relativist ontology[12] was used to explore the participants' lived experiences of the CLE. This design was appropriate because the researchers are clinical and academic radiographers and are unable to "bracket" (i.e. set aside) their experiences of the phenomenon.[12]

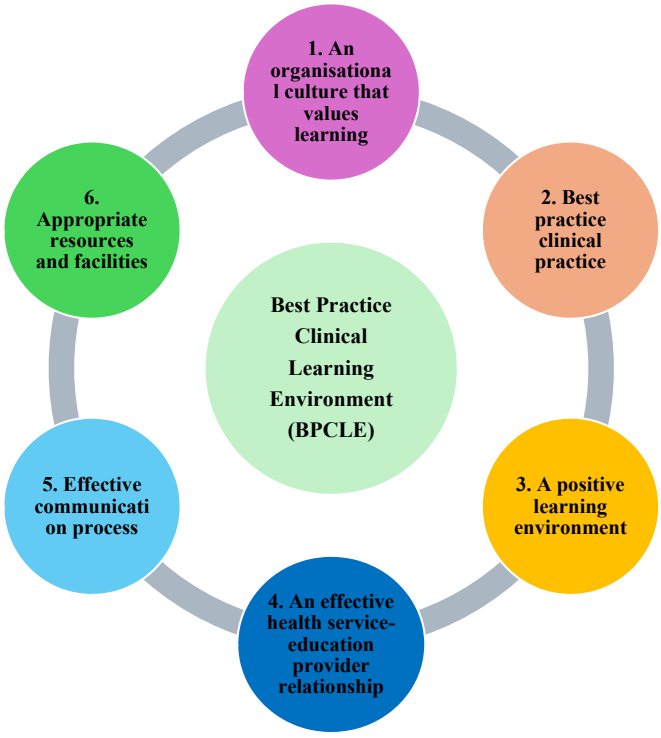

Figure 1. Elements of the "Best Practice Clinical Learning Environment" framework.[11]

The study employed a purposive[13,14] followed by a convenience sampling technique to recruit third and fourth year diagnostic radiography students from five public universities in Ghana. The purposive sampling enabled recruitment of participants with at least three years of clinical placement experience while the convenience sampling allowed for participants who indicated their availability for the virtual focus groups to be recruited.

Ethics approval was granted by the University of Ghana School of Biomedical and Allied Health Sciences Ethics and Protocol Review Committee (SBAHS/AA/RAD/10898355/2023–2024). Following this, invitations to participate in the study were advertised on the potential participants' social media platforms (specifically WhatsApp and Telegram) through the heads of departments of the participating institutions. Students who expressed interest were asked to contact JJN for consent and data collection processes. Volunteers were required to provide written informed consent prior to their participation. Additionally, participants were informed of their right to exit the focus group discussions (FGDs) at any point without any consequences, reiterating this during the FGDs. Apart from the students who expressed interest, all other eligible students were excluded. Of note, 13 eligible students indicated their availability for the virtual FGDs. However, due to network disruptions, one volunteer could not join any of the discussion sessions, resulting in 12 participants for this study. A FGD guide (Supplementary 1) developed from the BPCLE framework[11] was used to gather information from participants. The FGD guide was developed by JLA and assessed by two radiography academics with over ten years of academic and clinical experiences.

The participants were given summaries of the transcripts to check for correctness in a member-checking process before data analysis began. Additionally, the use of direct quotations from participants enhanced confirmability, whereas transferability is achieved through the clear description and explanation of the recruitment, data collection, and analysis processes provided in this study as suggested by Johnson et al.[15]

Three FGDs were conducted by JLA and JJN via Microsoft Teams™ (Redmond, USA, 2024). Each group consisted of four participants and the average duration was 50 mins. The recordings provided by Microsoft Teams™ were transcribed verbatim and de-identified. The third group marked the point of data saturation as the same themes emerged from concurrent data collection and analysis; hence no additional data was collected afterwards.

Data analysis

The transcribed and de-identified data were imported into NVivo™14 software (QSR International Pty Ltd., Australia). A six-step reflexive thematic analysis approach[16,17] (Table 1) was used to develop codes and themes and to draw patterns from the data. The analysis was undertaken independently by JLA and GA. Consensus on the codes and derived patterns were reached in regular meetings with other team members.

Results

Details of the FGDs

Three FGDs were conducted with four participants in each group. The average duration of the discussions was 50 mins. Each focus group consisted of students of the same academic level (see Table 2).

Table 1
Thematic analysis process.

Steps	Activities	Objective
1 Familiarisation of data	Verbatim transcription of audio recordings and researcher immersion	Managing the data
2 Generating initial codes	Coding significant part of the data	
3 Searching for themes	Organising and gathering codes into themes	Describing the data
4 Reviewing themes	Reordering codes to refine themes	
5 Defining themes	Finalising themes based on the nature of the data and each theme	
6 Producing the report	Developing and drawing conclusions through data synthesis	Drawing conclusions and reporting

Students' perception of the attitudes of radiographers

Lack of quality supervisor attributes (such as radiographers' distrust in students' abilities and negative criticisms) and supportiveness were the two themes found for radiographers' attitudes towards students during CP.

Friendly and supportive supervisors

Some participants recounted that some supervisors were very supportive and friendly to work with.

> *"… The radiographers were ever ready to teach us at our assigned [CP] centres. They made us feel like [we] are a family. … Sometimes they allowed us to try our hands on the procedures. …"* (Participant 2).

> *"The radiographers have been very welcoming at all the places I've been to"* (Participant 12).

However, these experiences varied depending on factors such as the type of facility (public or private) and the previous relationship with the radiographer(s) as indicated by a participant:

> *"I think it's dependent on the type of hospital, my first [CP] was a teaching hospital, and I had the chance to work with the radiographers … I also believe it's just a matter of your relationship with the radiographers."* (Participant 1).

Poor attitude of some radiographers

In contrast to the previous theme, the participants indicated that some radiographers expressed doubt in the students' clinical abilities:

> *"Sometimes they [radiographers] overly doubt us. It isn't as though we cannot do [perform]it; but then they doubt our clinical abilities too much"* (Participant 1).

Some clinical supervisors lacked patience and treated the students as qualified professionals instead of learners. In this respect, a participant stated that:

> *"… if you attend a [CP] rotation and they [clinical supervisors] take you through [a particular procedure], they expect you to perform as an expert or competent radiographer the next time a similar case comes up. They expect us to know everything. But [they should know that] we are students undergoing training"* (Participant 6).

The students regarded some of the radiographers as less receptive and less supportive. They reported that:

> *"I've been to a variety of [CP] training facilities, where the radiographers were willing to help. Their reception was very nice and were friendly … and I've been to other places also where the [radiographers] could be described as: watch them do what they do and then pick it up from them"* (Participant 9).

> *"… at other times some of the radiographers in other units are not too friendly and sometimes I don't know whether they have temper issues"* (Participant 7).

Experiences from public and private CP centres

The participants revealed varying experiences between placement centres. The private facilities provided students with better learning opportunities due to the availability of many imaging

Table 2
Demographic distribution of participants.

Demographic	Institution	Gender	Level	Age (years)	Duration
Focus group 1					53 min.
Participant 1	University of Cape Coast	Male	300	21	
Participant 2	Kwame Nkrumah University of Science & Technology	Female	300	20	
Participant 3	University of Ghana	Male	300	21	
Participant 4	University of Health and Allied Sciences	Male	300	19	
Focus group 2					50 min.
Participant 5	University of Health and Allied Sciences	Female	400	22	
Participant 6	University for Development Studies	Male	400	24	
Participant 7	University of Ghana	Male	400	22	
Participant 8	University of Health and Allied Sciences	Female	400	20	
Focus group 3					47 min.
Participant 9	University of Ghana	Female	400	21	
Participant 10	University for Development Studies	Female	400	21	
Participant 11	University of Health and Allied Sciences	Female	400	22	
Participant 12	University of Ghana	Male	400	23	
Total		n (Males) = 6 n (Females) = 6	L300: n = 4 L400: n = 8	Mean ± SD: 21.3 ± 1.3 years	Mean: 50 min.

Key: Level 300 [L300] = 3rd year; Level 400 [L400] = final year.

modalities and functional equipment. In contrast, the public facilities exposed students to several clinical scenarios, although they had difficulty asking questions due to the high workload, as indicated below.

> *"[For the public facilities], … you are exposed to a lot [of procedures], you have to work under pressure … and due to the high workload (lot of cases needed to be attended to) they [the radiographers] wouldn't mind you if you asked questions,* (Participant 6).

A participant who had experienced CP events at both public and private facilities commented:

> *"… every facility is different. I think it will depend on your supervisor because every preceptor decides whether to allow you to use certain modalities. At a private facility I visited, I never had the chance to use their MRI machine. But then for the government facilities I have visited so far, the chance to use certain modalities depended on the student and the assigned [CP] unit."* (Participant 5).

Effective communication and mechanisms for conflict resolution

Effective communication and mechanisms for conflict resolution are important for enhancing radiography education and improving communication with stakeholders. In this regard, some participants indicated that their placement coordinators visited the facilities occasionally, although there were some difficulties addressing grievances, while others channelled their challenges directly to the heads of department (HoDs) of the radiography programme.

> *"… we have some of the lecturers [who] come around … and enquire from our preceptors how well we are doing, … [but] if you have issues and your supervisor is not able to help, you have to wait until you return to campus [because] there's no one to help."* (Participant 4).

Another student stated that:

> *"… the HoD calls me from time to time to ask about the [CP] and if my class has any associated issues …"* (Participant 9).

However, other students indicated that they never had a coordinator who visited them during CPs. They reported that:

> *"From first year to final year we didn't have any visits from both our clinical tutors and our coordinators."* (Participant 12).

> *"For all the [CPs] I've had, I've not had any supervisor coming around. There's no one to seek for immediate help. Sometimes the supervisors don't know how to contact the school"* (Participant 1).

Challenges with CP: inadequate hands-on practice

The main factor that hindered participants' CP experiences was inadequate hands-on practice. Three associated subthemes were found (Fig. 2).

Limited modalities and frequent equipment breakdown

Most of the participants identified limited modalities and frequent breakdown of equipment as the major contributor to their inadequate hands-on practice. The students reported that:

> *"The most common issue [is] equipment breakdown"* (Participant 8).

> *"… another challenge is the [frequency of] equipment breakdown. Mostly the public facilities experience a lot of breakdowns with their CT and MRI machines."* (Participant 5).

> *"We don't have fluoroscopy among the spectrum of modalities. So I don't really know how the fluoroscopy machine works."* (Participant 2)

> *"The [main] problem was the fact that most of the facilities do not have adequate modalities"* (Participant 1).

Some participants also indicated that the issue of inadequate resources depended on the type of facility.

> *"Compared to public facilities, private facilities normally are … better funded. So there you have more equipment such as the MRI and CT to work with; you also have more resources to use. So*

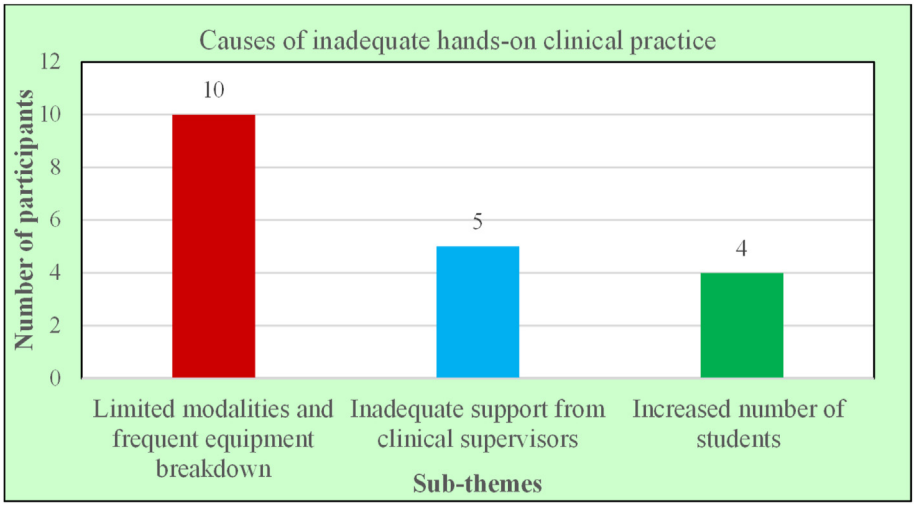

Figure 2. Subthemes describing causes of inadequate hands-on clinical practice. *Key: the frequencies indicate the number of participants (out of 12) who commented on the given subtheme.*

protocols like infection control are easier to practice because you have access to more resources for the procedures" (Participant 8).

Inadequate support from clinical supervisors

In some cases, the students relied on the benevolence of national service personnel or clinical interns (graduates undergoing one-year post-qualification clinical work placements under professional supervision) to help them with patient positioning.

"… it was one of the national service personnel who helped us with patient positioning techniques because the one in charge of the CT won't even allow you to touch the CT machine, not to talk of you knowing how to operate it." (Participant 9).

Participant 11 added that the only modality students were mostly given access to was general X-ray.

"When you go to [some] departments, for example, conventional X-ray, they [radiographers] give you … a little freedom to try and do the procedures yourself, but for other modalities like MRI and CT, you only watch them do their thing, … when you ask questions, you will be told to go and read on it." (Participant 11).

The major concern raised by the participants regarding the lack of support from clinical supervisors was lack of access to some equipment even when they were functional.

"My [major] concern is that the supervisors stopped us from accessing more advanced equipment such as the MRI, even when it is operational" (Participant 8).

"… even [when] certain modalities and equipment like CT [and MRI] were available, they [radiographers] disallowed us from touching [them]. So [CP] rotations at such facilities were reduced to sit and observe the entire day" (Participant 10).

Participant 10 suggested that students could be given education on the equipment to improve their understanding.

"My problem was that although some imaging equipment were not operational, they could have taken us through the modalities. For example, if an MRI equipment was not functional, they could let us have access to the MRI room and educate us on how it works. By that we could familiarise ourselves with it and acquire some clinical knowledge and education on its utilisation." (Participant 10).

Increased number of students at the placement centres

The participants indicated increased number of students as one of the factors that resulted in low hands-on practice during CP.

"… one [challenge] was that the students were many, and due to that I didn't get enough time to study as everyone rushed on a particular case. In such situations, it is difficult to have the time to learn what you want to learn." (Participant 10).

Participant 3 added that students must adopt strategies to make the most of the situation.

"… there are lot of students [at some facilities]. So sometimes you don't get the chance to practice, except that you find time to learn on your own. …" (Participant 3).

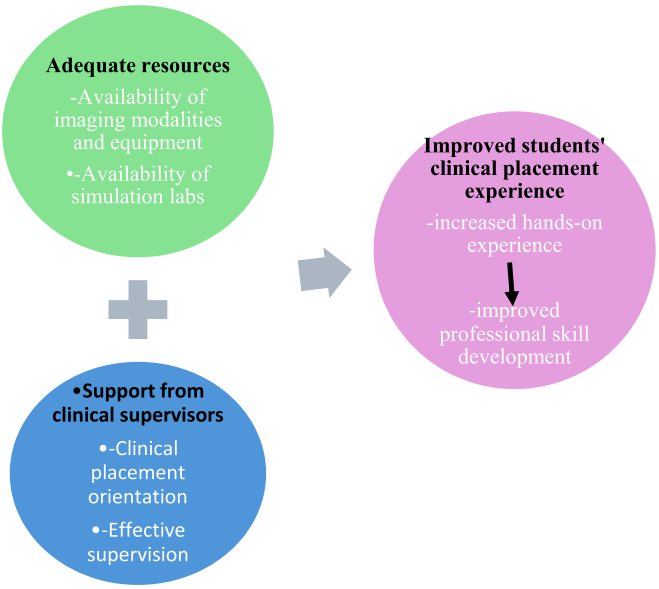

Figure 3. Thematic findings for ways to improve CP.

Strategies to improve students' clinical training experiences

Two themes (i.e. adequate resources and support from clinical supervisors) were identified as strategies to improve CP experiences and professional capabilities of radiography students (Fig. 3).

Availability of resources

The participants suggested that availability of imaging modalities and equipment will improve their clinical training experience and professional capability development.

"… when a facility has more equipment, it puts some kind of pressure on you to be able to improve yourself, you don't restrict yourself to only one modality." (Participant 3).

Another significant subtheme was the need for institutions to have simulation laboratories. Two participants believed that this would enhance their skill development.

"… if the universities have their own [simulation labs] where students practice, it will help reduce the stress … and improve our [skills] before placement." (Participant 4).

Even though Participant 7 shared the same opinion as Participant 4, the former believed this may take time.

"This suggestion seems like a long time agenda; [but] I feel like radiography schools should have their own laboratory units where they have phantoms available so that students can have as much practice [as possible]." (Participant 7).

Support from clinical supervisors

Clinical orientation and effective supervision were the main support strategies required of clinical supervisors to enhance students' workplace learning as indicated by the participants.

Clinical placement orientation. Regarding CP orientation, Participant 6 contended that CP orientation would help educate students on what is expected of them. He added that it would reduce the fear that students will mishandle the equipment.

> *"I think … hardly do we get orientation at the various facilities … clinical placement orientation for students will help us know certain things about the hospital and what is expected of us, [it'll] help a lot …"* (Participant 6).

Student empowerment through effective supervision. On the other side, participants discussed effective supervision, through supervised practice, as a key factor to improving their professional capability development. They indicated that this would enable them to have adequate hands-on experience.

> *"I think with proper supervision, they can allow us to do the hands-on practice"* (Participant 11).

> *"… I think when [there is] effective supervision and they allow [us] to do some of the cases [under supervision] and correct us when we make a mistake, it will improve our clinical competence."* (Participant 1).

Influence of the CLE on students' CP experiences

The influence of the CLE was in two folds: consistency with the BPCLE framework and deviations from the BPCLE framework (Fig. 4).

Effects associated with facilities that are consistent with the BPCLE framework

In an environment where students are provided with constructive feedback, they are motivated to participate in the clinical activities without the fear of making mistakes.

> *"Some supervisors have a way of talking to you so you don't get offended, when you make a mistake"* (Participant 4).

Such environments also increase students' desire and eagerness to improve their clinical competence.

> *When a facility has a lot of resources … and the radiographers are supportive, there is that curiosity to know more, there is that curiosity to do more, [and] there is that curiosity to become better."* (Participant 3).

Effects associated with facilities that deviate from the BPCLE framework

In contrast, placement centres that are inconsistent with the BPCLE framework could demoralise students and hinder their ability to learn effectively. For example, one participant disclosed that even though some radiographers were ready to correct them, the kind of language used, and the mode of delivery were not always appropriate, indicating a lack of constructive criticism.

> *"… and sometimes they want to correct you regarding something that happen[ed] … [and] give you some advice concerning a particular procedure … but the sort of language they use, excuse me to say, makes you [sick], while their demeanour makes you feel [less of yourself]."* (Participant 8).

In a sad tone, Participant 1 expressed how these unsupportive attitudes of some radiographers affected his wellbeing.

Personally, I have had an experience that I was working on [a procedure] … but I was a bit fumbling, and the radiographer chastised me so much that [his] comment ruined my day … It was very hard for me [because it] killed my spirit.

Additionally, deviations from the BPCLE framework were found to result in inadequate hands-on practice due to inadequate supervisor support and student overcrowding, and students' inability to ask questions due to high workload on radiographers as described above.

Discussion

The CLE has the potential to affect students' professional growth, either positively or negatively.[6] Fenton[18] described a conducive CLE as one that has a friendly atmosphere and offers good relationships. Additionally, it has been reported that students exhibit confidence and are motivated to learn in an environment where they are supported, respected, and treated as team members.[19] The BPCLE has six fundamental elements (Fig. 1) which serve as a framework to provide a holistic and effective clinical learning for health professions students.[11] The discussion of this paper is guided by the six elements of the BPCLE framework.

Valuing students' learning

The participants acknowledged a positive and inclusive teamwork culture at the placement centres, as Participant 2 indicated that the staff made them feel like a family. Students from a related

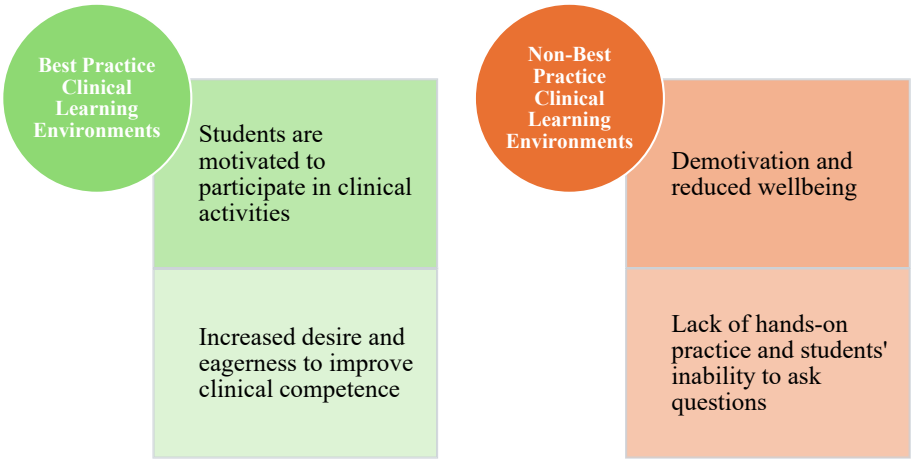

Figure 4. Influence of the clinical learning environment on radiography students' CP.

study[20] indicated encouragement from their supervisors to engage actively as team members. Notably, the theory of experiential learning espouses that students actively make meaning from real-life experiences, and hence, it is paramount that clinical facilities and radiographers, express interest in students' learning. Additionally, when radiography students feel accepted as part of the team, they will be able to make meaning from their experiences.[21] This emphasises the importance of CP centres to provide appropriate support to academic institutions in the training of students as this will enable them to achieve their learning objectives.

Best practice clinical practice & a positive learning environment

Welcoming and supportive attitude

The students perceived some radiographers as receptive while others were regarded as unwelcoming. This, they believed, depends on the type of facility and previous relationship with the clinical staff. Jeyandrabalan et al.[22] contend that students' personal and professional growth are developed through interaction with their clinical supervisors and other health professionals while on CP. The unwelcoming attitude of some radiographers could hinder students' learning, and the overall attainment of their required learning objectives. This is because students become frustrated when their desire to learn is impeded by supervisors' lack of engagement, thereby making them reluctant to ask questions.[23] Consistent with literature,[24] the students reported that some radiographers passively engaged them in their duties, leaving them with long observational periods. Although Participant 9 indicated that this resulted in a "watch them do what they do and pick it up from them" effect, this could have been due to the high workload on radiographers as alluded by Participants 6. However, this phenomenon, can reduce students' professional capability development. To enhance their learning,[25] the students reportedly incline towards clinical staff who are approachable and friendly, just as documented in the literature.[6] Radiography managers should recruit "highly skilled, knowledgeable, and competent"[11] radiographers, with adequate teaching and interpersonal skills, to supervise students' learning.[6]

Feedback

Feedback is considered essential under the third pillar of the BPCLE framework.[11] Defined as communication strategy used by supervisors with the intent of modifying a student's attitude to improve learning,[26] feedback (and effective communication) from clinical supervisors are crucial to students' professional capability development.[27] The participants indicated that comments and feedback from some radiographers were hurtful and made them felt unworthy. However, radiographers who provide constructive feedback to students are regarded as the 'best' clinical supervisors.[28] Additionally, learning from international settings, the Australian professional capabilities for medical radiation practitioners,[29] requires radiographers to *"… use appropriate strategies to effectively supervise students in the work environment and deliver feedback (verbal and written) to the student and the education provider on their performance"*. The radiographer is therefore considered as a significant stakeholder in the training of radiography students. An effective and constructive feedback will provide a positive learning environment[11] for students, ensuring adequate skill development during CP, and raising students' awareness of special attention and making them professionally competent.[18]

Consequently, radiographers are urged to provide a constructive, timely, and specific feedback to students[6] to prevent them from perceiving their poor performances as good and subsequently passing them on to others.[26] This has the potential to reduce quality patient outcomes. It is therefore imperative for radiography educators to provide placement supervisors with adequate knowledge and skills on how to, effectively and constructively, provide feedback to students during CP.

Orientation

During CPs, students are exposed to new, potentially exciting and/or emotionally stressful learning situations which could be challenging for them, irrespective of experience.[30] The participants indicated that they would appreciate if their supervisors orientated them when they begin their CPs. This will enable students to interact effectively with all clinical staff and patients, subsequently ensuring positive coping strategies to deal with challenges encountered while on placement.[30] It is therefore important for radiography educators to collaborate with CP centres in organising orientations for students prior to or on the first day of placement. Killam et al.[31] opined that this would aid the smooth transition of students from classroom learning to the CLE.

Effective communication and effective health service-education provider relationship

Most of the participants indicated how difficult it was for them to be accepted by the placement centres as they had to contact the centres on their own. The adverse effects associated with this approach is that many students may end up not attending the CP or, may look for training facilities without adequately trained supervisors, but are willing to accept them. The fourth pillar of the BPCLE framework requires a continuous partnership between education providers and clinical facilities,[11] to provide appropriate support to students. Similarly, Kyei and Antwi[32] called for effective collaboration between education providers and clinical facilities to enhance students' CP experiences. Students being denied access to the training facilities could be due to lack of communication and collaboration/agreement between these two relevant parties. To resolve this, the CP team should include both academic and clinical staff to achieve a consensus on the requirements of each stakeholder. Additionally, educators need to collaborate with CP centres to facilitate a positive CP experience for students.[1]

Appropriate resources and facilities

Resource inadequacy is a major challenge to radiography education in Ghana. The participants indicated that their CPs are usually affected by inadequate hands-on practice due to limited resources and high student numbers at placement sites. However, a BPCLE is one where "*learners … have access to the facilities and materials needed to optimise clinical learning.*"[11] Consistent with literature,[33] the inadequate modalities, especially in public clinical settings, affect radiography students' CP experiences. Tellingly, the participants expressed their frustration about how some radiographers denied them access to advanced imaging modalities. In contrast, a BPCLE should have an organisational culture where the *"use of facilities and resources [by students] are optimised for all educational purposes."*[11] Thus, it is important for educators in low resource settings to identify facilities with adequate resources and to collaborate with senior clinical staff to engage uncooperative and unsupportive staff on how to support students' professional growth through effective relationships[34] and supervision.

Limitations

The use of online focus groups affected students' participation as one volunteer could not participate due to network disruptions. However, the number of participants were adequate to achieve data saturation. The study only focused on students' account of the CLE.

However, the BPCLE framework was developed with input from students, educators, and clinical facilities. We recommend future research to include the account of all stakeholders to provide a complete understanding of Ghana's radiography CLE.

Conclusion

The study revealed that radiography students in Ghana generally perceived their CPs as positive, highlighting supportive learning environments and professional growth. However, inadequate resource and CP supervision limited students' hands-on experience. To achieve a BPCLE in low-resourced settings, educators need to identify facilities with adequate resources and to continuously engage with these placement centres to provide a supportive learning environment for students. Educators, especially in resource-constrained settings, could also collaborate with professional associations to organise continuous professional development (CPD) activities to train radiographers on how to effectively engage students during CPs.

Conflict of interest statement

None.

Acknowledgements

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. We appreciate the support of all participants and the heads of radiography departments.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.radi.2024.12.009.

References

1. Chamunyonga C, Singh A, Gunn T, Edwards C. Strategies to develop student support mechanisms in medical radiation sciences clinical education. *J Med Imag Radiat Sci* 2020;**51**(4):512–7. https://doi.org/10.1016/j.jmir.2020.08.004.
2. Ondari BO, Rajeswaran L, Ekemiri KK, Xavier SF, Baptiste NJ. Experiences of medical imaging students and clinical learning in a limited resource setting - a qualitative study in Rwanda. *Journal of Global Radiology* 2019;**5**(1). https://doi.org/10.7191/jgr.2019.1059.
3. Baglin MR, Rugg S. Student nurses' experiences of community-based practice placement learning: a qualitative exploration. *Nurse Educ Pract* 2010;**10**(3):144–52. https://doi.org/10.1016/j.nepr.2009.05.008.
4. Murphy F, Rosser M, Bevan R, Warner G, Jordan S. Nursing students' experiences and preferences regarding hospital and community placements. *Nurse Educ Pract* 2012;**12**(3):170–5. https://doi.org/10.1016/j.nepr.2011.12.007.
5. Zhang J, Makanjee C, Hayre CM, Lewis S. Australian graduate radiographers' perspectives and experiences of work readiness. *J Med Radiat Sci* 2023;**70**(3):254–61. https://doi.org/10.1002/jmrs.675.
6. Bwanga O, Lidster J. Radiography students' perceptions and experiences of their clinical placements: a qualitative systematic review. *East African Scholars Journal of Medical Sciences* 2019;**2**(7):367–80.
7. Armstrong-James L, Khine RNM, Thorne RJ, Tuckey MJE, Bennett C. Radiotherapy students' perceptions of support provided by clinical supervisors. *J Radiother Pract* 2019;**19**(1):15–9. https://doi.org/10.1017/s1460396919000426.
8. Ogbu SOI. Radiography students' perceptions of clinical placements – a Nigerian perspective. *Radiography* 2008;**14**(2):154–61. https://doi.org/10.1016/j.radi.2007.01.003.
9. Bwanga O, Iyamvwa P, Chanda E, Bwalya M. Perceptions of radiography students regarding the qualities of an effective clinical educator in Zambia. *South-East Asian Journal of Medical Education* 2022;**16**(2):54–61. https://doi.org/10.4038/seajme.v16i2.385.
10. Kyei K, Antwi WK, , K. B-Q, Offei RO. Challenges faced by radiography students during clinical training. *Clin Med Res* 2015;**4**(3):36–41. https://doi.org/10.11648/j.cmr.s.2015040301.18.
11. Department of Health and Human Services Victoria. *Best practice clinical learning environment framework*. https://www2.health.vic.gov.au/health-workforce/education-and-training/building-a-quality-health-workforce/bpcle-framework. [Accessed 15 June 2024].
12. Urcia IA. Comparisons of adaptations in grounded theory and phenomenology: selecting the specific qualitative research methodology. *Int J Qual Methods* 2021;**20**. https://doi.org/10.1177/16094069211045474.
13. Creswell JW, Creswell JD, editors. *Research design: qualitative, quantitative, and mixed methods approaches*. 5th ed. SAGE Publications; 2018.
14. Flick U. Challenges for qualitative inquiry as a global endeavor. *Qual Inq* 2014;**20**(9):1059–63. https://doi.org/10.1177/1077800414543693.
15. Johnson JL, Adkins D, Chauvin S. A review of the quality indicators of rigor in qualitative research. *Am J Pharmaceut Educ* 2020;**84**(1):138–46. https://doi.org/10.5688/ajpe7120.
16. Braun V, Clarke V, Hayfield N, Terry G. Thematic analysis. *Handb Res Methods Health Soc Sci* 2019:843–60. chap [Chapter 103].
17. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;**3**(2):77–101. https://doi.org/10.1191/1478088706qp063oa.
18. Fenton P. Student perceptions of a quality clinical experience: findings from the literature and their application to radiation therapy. *Radiographer* 2013;**52**(1):30–3. https://doi.org/10.1002/j.2051-3909.2005.tb00028.x.
19. Ohagwu CC, Eze JC, Ezugwu EE, Umeano JK, Ochie K, Eze CU, et al. Challenges of training and clinical skill acquisition in radiography education: perceptions of students in resource-poor southeastern in Nigeria. *South Afr Radiogr* 2016;**54**(2):7–13.
20. O'Connor M, McNulty JP. Radiography students' viewpoints of the clinical learning environment: a cross-sectional study. *Radiography (Lond)*. 2024;**30**(1):367–74. https://doi.org/10.1016/j.radi.2023.12.005.
21. Yardley S, Teunissen PW, Dornan T. Experiential learning: transforming theory into practice. *Med Teach* 2012;**34**(2):161–4. https://doi.org/10.3109/0142159X.2012.643264.
22. Jeyandrabalan M, Punch A, Rogers JM, Jimenez YA. Insights into Diagnostic Radiography students' perception of clinical stressors. *Radiography* 2022;**28**(2):499–505. https://doi.org/10.1016/j.radi.2021.12.014.
23. McPake M. Radiographers' and students' experiences of undergraduate radiotherapy practice placement in the United Kingdom. *Radiography (Lond)*. 2019;**25**(3):220–6. https://doi.org/10.1016/j.radi.2019.01.008.
24. Portanier Mifsud C, Castillo J, Portelli JL. Radiography students' clinical placement experiences in MRI: a phenomenological study. *Radiography* 2015;**21**(1):e17–20. https://doi.org/10.1016/j.radi.2014.06.012.
25. Cunningham J, Wright C, Baird M. Managing clinical education through understanding key principles. *Radiol Technol* 2015;**86**(3):257–73.
26. Harden RM, Laidlaw JM. *Essential skills for a medical teacher-An introduction to teaching and learning in medicine*, **2**. Elsevier; 2017.
27. Snowdon DA, Sargent M, Williams CM, Maloney S, Caspers K, Taylor NF. Effective clinical supervision of allied health professionals: a mixed methods study. *BMC Health Serv Res* 2019;**20**(1):2. https://doi.org/10.1186/s12913-019-4873-8.
28. Ingrassia JM. Effective radiography clinical instructor characteristics. Radiologic Technology. *Radiol Technol* 2011;**82**(5):409–20.
29. *Professional capabilities for medical radiation practitioners (MRPBA)*. 2020.
30. Barry K, Shields M, McGavin S, Blefari C. How to navigate the evolving world of clinical placement: an Australian university collaboration to support clinical supervision. *J Med Imag Radiat Sci* 2021;**52**(4S):S39–44. https://doi.org/10.1016/j.jmir.2021.08.015.
31. Killam LA, Montgomery P, Raymond JM, Mossey S, Timmermans KE, Binette J. Unsafe clinical practices as perceived by final year baccalaureate nursing students: Q methodology. *BMC Nurs* 2012;**11**(1):26–38. https://doi.org/10.1186/1472-6955-11-26.
32. Kyei KA, Antwi WK. Effect of clinical placement on Radiography students in Ghana. *Clin Med Res* 2015;**4**(3):14–9. https://doi.org/10.11648/j.cmr.s.2015040301.14.
33. Chinene B, Sanyamandwe C, Hlahla T. Challenges experienced by radiography students during clinical placements in a low resource setting: a qualitative phenomenological study. *South Afr Radiogr* 2023;**61**(2):32–40. https://doi.org/10.54450/saradio.2023.61.2.753.
34. Hyde E. A critical evaluation of student radiographers' experience of the transition from the classroom to their first clinical placement. *Radiography* 2015;**21**(3):242–7. https://doi.org/10.1016/j.radi.2014.12.005.