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Clinical placements for undergraduate diagnostic radiography students amidst the COVID-19 pandemic in Singapore: Preparation, challenges and strategies for safe resumption

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ABSTRACT
Introduction: The COVID-19 pandemic resulted in the suspension of clinical training for undergraduate radiography students in Singapore. Coordinated preparation plans and strategies between the university and hospitals were needed to safely resume clinical placements within national and hospitals’ risk control measures against COVID-19 transmission.

Methods: Singapore Institute of Technology (SIT) and the Radiology Department of Singapore General Hospital (SGH) had collaborated to meet requirements for safe resumption of clinical placements. SIT prepared students by emphasising compliance to all risk measures, addressing concerns of risk transmission, meeting learning objectives, and reassessing infection control competencies. In tandem, SGH prepared an orientation programme and used technology for open communication among faculty, clinical educators and students which included monitoring of well-being and rapid dissemination of updates. Of note, SGH reorganised operating procedures and physical spaces to meet national standards of safe physical distancing, restricted movement between treatment areas and teams, and rosters to remain committed to the supervision and education of students.

Results: Clinical placements resumed 3 months following suspension. Clinical educators faced the challenge of the need for balance between increasing clinical load and student supervision. A solution was frequent engagement and support by faculty, with educators and students via video conferencing platforms. Students’ well-being was frequently checked. There was less variation in cases which simulation training made up for some of the learning objectives.

Conclusion: Adaptation and commitment to continue active and quality clinical education while ensuring students’ safety were vital during a pandemic. Clinical training within stringent precautionary measures may shape the era of the new norm.
SGH a réorganisé ses procédures d’exploitation et ses lieux physiques afin de respecter les normes nationales de distanciation physique sécuritaire, de réduire les déplacements entre les zones de traitement et les équipes, de même qu’entre les groupes, de façon à maintenir l’engagement envers la supervision et la formation des étudiants.

Résultats : Les stages cliniques ont repris trois mois après leur suspension. Les maîtres de stage ont été confrontés au défi d’établir un équilibre entre une charge de travail clinique en augmentation et la supervision des étudiants. Une solution a été de susciter l’engagement et le soutien fréquents des enseignants avec les étudiants et les maîtres de stage par vidéoconférence. Le bien-être des étudiants a été fréquemment évalué. Comme il y avait moins de variété dans les cas, la formation en simulation a permis d’atteindre certains objectifs d’apprentissage.

Conclusion : L’adaptation et l’engagement à poursuivre une formation clinique active et de qualité tout en assurant la sécurité des étudiants étaient cruciaux pendant la pandémie. La formation clinique assortie de mesures de précaution strictes pourrait conduire à une nouvelle normalité.

Keywords: Singapore; COVID-19; Undergraduate; Clinical placements; Radiography

Introduction

Clinical placements are regarded as cornerstones of undergraduate diagnostic radiography education. They take up a large proportion of the curriculum in Singapore, as much as 60 European Credit Transfer and Accumulation System (ECTS) credits. In clinical placements, students perform professional activities in hospitals and clinics guided by experienced radiographers and practice the required psychomotor, cognitive and affective skills to carry out their future roles as safe, professional and competent radiographers.

However, with the outbreak of a severe acute respiratory syndrome coronavirus-2 (COVID-19) in Singapore, all clinical placements for undergraduate diagnostic radiography students were suspended. This move was in tandem with the Ministry of Health (MOH) raising its risk assessment level of COVID-19 to a Disease Outbreak Response System Condition (DORSCON) Orange on February 7, 2020. Consequently, Singapore Institute of Technology (SIT), the main university training undergraduate allied health students, withdrew 3rd Year cohort diagnostic radiography students, who were in the midst of their clinical placements, from all healthcare institutions (HCIs).

Given the importance of clinical placements, its suspension raised concerns of the outcomes and progression of undergraduate diagnostic radiography students in Singapore. To practice as a licensed radiographer, the regulatory body in Singapore, Allied Health Professions Council (AHPC) mandates that undergraduate students exit the programme with a minimum of 1200 h of clinical practice. Anecdotal lessons from the experience of 2003 SARS outbreak had taught us not to undermine the impact of removing students from clinical placements. First, suspending clinical placements delayed the graduation of radiography students then, and with the addition of mandatory clinical hours, the current risk of delayed graduation would be even higher. Insufficient number of radiographers in our healthcare system will become a real threat for the nation, especially in this crisis when radiology departments are essential services in identifying and monitoring COVID-19 positive patients. The concern of inability to build the capacity of radiology departments and capability of radiographers was also echoed in a framework paper in the United Kingdom (UK), suggesting an imperative need to continue with planned placements. Secondly, suspension of clinical placements may overload clinical sites post-COVID, potentially resulting in overcrowding of the clinical environment and poorer quality teaching and supervision.

Globally, there were challenges in implementing clinical training during COVID-19. To the best of our knowledge, there is a paucity of reports on the impact of COVID-19 on student radiographer placements. There were more on radiology education, which shared how educational institutions adjusted teaching and learning activities through virtual platforms and remote feedback-giving could help cope with the COVID-19 challenges. However, the competencies of radiographers differ from those of the radiologists, where the former group needs hands-on training facilitated through onsite clinical placements. Nevertheless, there were common challenges in clinical settings, such as balancing the competing demands of clinical work and educating students, reduced practice opportunities with reduced non-urgent cases and adhering to national precautionary measures.

While the duration and response to the COVID-19 situation are uncertain, clinical training of undergraduate radiography students in Singapore cannot be suspended indefinitely. For a safe resumption, SIT and various HCIs must harmonise preparation plans and strategies to overcome challenges inherent with the COVID-19. This article examines the collaborative process between SIT and the radiology department of Singapore General Hospital (SGH) to prepare for the safe resumption of clinical placements, challenges faced and redefined strategy and priorities to mitigate the crisis.

Method

‘Circuit breaker’ measures

It is important to put into context how SIT and SGH prepared the students for the challenges and designed strategies...
for safe resumption of clinical placements. Like many parts of the world when the World Health Organisation (WHO) classified the COVID-19 virus outbreak as a pandemic on March 11, 2020, Singapore went into a ‘partial lockdown’, which was termed as ‘circuit breaker’ on April 7, 2020. National circuit breaker measures included mandatory wearing of masks at all times in public spaces, banning the gathering of people from different households, practising social distancing of 1 m and registering entry at community places for contact tracing. In HCIs, new precautionary measures, such as segregation of healthcare workers by teams or by physical boundaries, movement restriction between teams or HCIs restricting contact between personnel, twice-daily temperature recording and safe physical distancing (where possible), were added to existing good hygiene practices, such as hand washing and the use of protective personal equipment (PPE).

On March 16, 2020, the MOH began an online dialogue session with HCIs and SIT on a feasibility plan to resume healthcare students’ clinical placement progressively. Following a few iterations, a plan was finalised. It included priority placements for final and penultimate year students to ensure graduation would not be affected and no-go areas that were considered high risks of COVID-19 transmission, such as emergency departments and COVID-19 designated wards. MOH and HCIs needed the assurance that students would strictly adhere to the national and HCIs’ risk control measures. Safe resumption had also seemed possible, contingent on the availability of on-site clinical educators (CEs).

Preparations from SIT

The assurance of strict compliance to national and HCIs’ risk control measures came in the form of a clinical practice information package for submission to MOH. This communiqué was developed for all SIT Health and Social Science (HSS) students in preparation for their clinical placement resumption and had all elements of risk control measures for students’ compliance. A pre-clinical briefing was also conducted to reinforce the importance of risk control measures in place, allay students’ concerns and address any gaps in understanding of the need for strict compliance. A survey was conducted to obtain an overview of Year 2 and 3 radiography students’ concerns to resume clinical placement during DORSCON Orange, using a web-based platform (Qualtrics, Provo, UT). A total of forty-five year 3 students (81.8%) and 46 year 2 students (82.1%) had completed the survey.

As a requirement to meet MOH’s and HCIs’ protocols for infection control measures including the use of PPE at workplace, SIT embarked on a refresher training course to build on radiography students’ competency in these areas. Onsite face-to-face ‘refresher’ session was not possible due to campus closure in the pandemic state, and hence, was converted to an online session. Students performed the infection control procedures guided by training material and a competency checklist. Performance was recorded and submitted to SIT’s infection control team for assessment of the competencies. All Year 2 and 3 radiography students successfully obtained the competency.

Challenges faced by SIT and redefining strategy

The survey findings revealed that half of Year 3 and Year 2 students (51% and 54%, respectively) had concerns about resuming clinical placement amidst the current COVID-19 situation. The concerns were similar between the two cohorts, with the risk of contracting the virus as the top concern. Students feared contracting the virus at clinical placements and during travels on public transport between placement site and home and passing it on to their family members. The clinical coordinators reassured the students that they would not be placed in high risk areas, and there was no evidence to suggest that a healthcare worker in Singapore had contracted the virus in the course of work. To reduce the time spent traveling in the community, the coordinators matched students to the nearest clinical site based on their home address. Written logs of radiographic examinations signed off by the supervising radiographer were used as patient log sheet records for contact tracing. This was simultaneously used as evidence in the form of a portfolio to support the completion of competencies. SIT worked with SGH on the surveillance of students’ health by sharing a weekly report of temperature monitoring.

The second concern was on the potential problem in meeting the learning objectives due to the limited number and types of cases encountered. The lower caseload for students was further exacerbated by the removal of high-risk areas as placement sites. In order to support students and address their concerns, faculty supervisors used video-conferencing platforms for students to check in on their progress at midyear and end of placements and provided pastoral care. However, in this COVID-19 pandemic, it was clear that ensuring placements for all students was a challenge as HCIs had introduced new temporary rules to limit placement capacity. Working with limited placement options, SIT redesigned the structure of clinical placement by halving the duration of each placement to allow splitting of the cohort into two groups with students taking turns at placements.

Despite the reduction, students could still fulfil AHPC’s registration requirement of 1200 clinical hours. Simulation in skills-based labs at Philips Medical Asia Pacific Centre, Singapore, replaced the reduced duration of placements to ensure that learning objectives were met. In addition, academic modules were repositioned in the curriculum to fill in the 3-month suspension of clinical placements.

SIT faced another challenge when allocating students to sites. Where work was performed in smaller rooms, such as an X-ray examination room, HCIs allowed only one student to adhere to the safe physical distancing measure. SIT was also cognisant of the reduced manpower at SGH and other HCIs due to temporal segregation of COVID-19 designated wards from the other wards, which meant that the CEs (usually the more experienced ones) at these wards could not supervise students. It was also possible that a CE could be
burdened by increased workload as a result of rising cases of transmission in the community and the urgent need for a quick turnaround.\textsuperscript{19} The clinical coordinators worked with each HCI partner to recalibrate the CE-to-student ratio. At many sites, the ratio reduced from 1:2 or 1:3 to a ratio of 1:1. The division of the cohort into two groups helped in making the ratio of 1:1 feasible.

Preparations of the radiology department at SGH

To meet compliance of precautionary measures in the ‘circuit breaker’ period, preparations to resume placements at SGH leveraged the use of technology, reorganising training areas and the orientation programme.

Technology was extensively used as a lever for rapid health monitoring and recording. Capitalising on lessons learned from the experience with SARS on the need for surveillance, detection, and response during outbreaks, a new Staff Health Surveillance System (S3) was commissioned on July 2018 as a one-stop, centralised healthcare workers records database.\textsuperscript{20} Students were enrolled onto the national S3 system to facilitate temperature reading submission. For a more responsive contact tracing process, all students were required to download and use the TraceTogether application (GOVTECH, Singapore), a Singapore government initiative. The application used the Bluetooth technology to identify persons in close proximity, including timestamps, and expedited contact tracing in the community. In addition, students were also required to log their check-in and out time from the hospital through the SafeEntry (GOVTECH, Singapore) system by scanning a Quick Response (QR) code displayed at the hospital with their mobile phones. Similar to the TraceTogether application, the SafeEntry system leveraged on extensive use of technology to document time stamps. Health monitoring requirements were aligned with SIT’s information package provided to students.

There was a need to manage the well-being and mental health of students during adversity. Survey findings from SIT were shared with SGH. To manage this, the WhatsApp mobile communication application (WhatsApp Inc, California, United States of America) was used to create a chat group comprising of students, CEs and clinical education coordinator. This provided an additional communication channel for them to check in when needed.

To prioritise students’ safety while on placement, student rosters were planned to avoid assignment to areas deemed high-risk such as emergency department, intensive care unit/ high dependency and COVID-19 designated wards. They were also not allowed to work with dedicated scanners for isolation and high-risk cases, such as the mobile radiography service. Similarly, they were not on placement at clinical settings performing aerosol generating procedures.

During the period of clinical placement, they were supervised in small groups with a clinical educator to student ratio of 1:1. Students would stay with the same clinical educator for the entire duration of placement and minimal interaction was ensured among different teams (including peers on placement with other teams), especially during the change of shift and movement across different work areas. In addition, students were reminded of adherence to the measure of not meeting their friends from other HCIs outside of workplace. Small group size also facilitated safe physical distancing and prevented overcrowding.

Measures had also been put in place to ensure safe distancing at the different social spots within the hospital campus such as food outlets and staff rest areas. Students were reminded to practice social distancing, even at mealtimes. In short, mealtime socialising and team building were prohibited during this period.\textsuperscript{21}

An orientation programme served as an important element to welcome students to the department. In this period of uncertainty and potential fear, the orientation programme played a more important role in reassuring and integrating students to the clinical environment. PowerPoint slides prepared by the hospital’s Education Office took guidance from the Radiological Sciences Academic Clinical Programme (RADSC ACP) Education Committee which comprised of appointed members from the field of radiological sciences undertaking educational functions in Singapore. Table 1 showed a summary of the orientation. Students were shown around in the radiology department, including the designated meal areas within the hospital. They were also introduced to their respective CE who would review the students’ learning contract and share their expectations for the clinical placement.

**Result**

Meeting the feasibility requirements, MOH approved the 2nd and 3rd year (penultimate) undergraduate radiography students to resume clinical placements on May 4, 2020.

**Challenges at SGH & redefining strategy**

When a radiographer was reported in the press to have contracted the virus while working at a satellite facility,\textsuperscript{22} there was concern on the volatility of students’ emotions –

| Table 1 | Summary of the content covered during orientation. |
|---|---|
| Content Covered | |
| COVID-19 Briefing (Transmission mode, Case definition, Close contact definition) | |
| Comply with travel advisories | |
| Comply with movement restrictions in healthcare institution | |
| Infection Control and Personal Protection Equipment | |
| Social activities and Social Distancing | |
| Self-monitoring – daily temperature taking | |
| Contact tracing – maintain a patient contact log sheet | |
| Sickness management | |
| Designated areas for meals | |
| Access to relevant policies/documents/guidelines relating to clinical training for healthcare students | |
| Important contact personnel | |
| Information Technology security | |
| Personal Data Protection Act | |
| Fire safety and evacuation guidelines | |
| Radiation safety guidelines | |
fear, panic, stress, and/or anxiety. To allay their concerns, messages were sent through the chat group to reassure students that the clinical environment was still safe and that their health had been of utmost priority. In this time of crisis, CE could help to support students in their learning journey by having clear and frequent communication.

Since the COVID-19 crisis began, temperature recording has been seen as a liability by many staff. There were instances that students had forgotten to perform and record their temperature on their rest day. To mitigate this, students were required to send text messages indicating their temperature and time of submission to S3 through the WhatsApp chat group. A team leader was appointed from the group of students to ensure temperature recording compliance. Faculty supervisors were also kept in the loop for surveillance purposes.

As the situation was constantly evolving, WhatsApp was also used to manage rapid sharing of accurate and critical updates, such as daily COVID-19 instructions issued by the hospital disease outbreak taskforce. To minimise the impact of information overload and misinformation, summaries were curated to highlight essential points relevant to their clinical placement during their orientation.

The reduction in the number of cases across the department and manpower crunch carried the risk of reduced clinical exposure and practice. There was a need to ensure learning outcomes and progression were not compromised. This was mitigated through broad, but essential learning outcomes written by SIT. Furthermore, the student’s learning contract related to the placement area was developed in collaboration with the CE to encourage student-centric learning. This allowed understanding of expectations and ensured that no students were missing out on learning. Using the learning contract, the CE engaged students regularly to discuss learning progress. While the students were excluded from handling patients with COVID-19, CEs continued to create learning opportunities for them by sharing the department’s policies and procedures on the management of COVID-19 patients. This included an overview of the pre-procedure room and patient preparation, scanning techniques and infection control prevention and practices through case-based learning.

With a smaller educator-to-student ratio, more manpower was needed to supervise students. While it was stressful to divide the work between managing patients and students, it was important that educators understood the importance of clinical education. Throughout the clinical placement, there were increased support, feedback and assistance provided to the students from both stakeholders (faculty and CE) than in pre-COVID situation.

Discussion

The widespread of COVID-19 presented a massive test on the global healthcare and education system with the initial suspension of clinical training of undergraduate radiography students and the uncertainty surrounding the epidemiologic data of COVID-19. However, it was critical to resume clinical placements for a timely graduation, thereby producing safe and competent diagnostic radiographers to meet manpower shortage. It was also vital for safe resumption of clinical placements. The paper had described the preparatory steps taken by the university and HCI to integrate and increase the awareness of precautionary measures as part of training and the strategies to overcome implementation challenges without compromising essential learning outcomes.

Maintaining students’ psychological well-being was key to a positive clinical learning experience. Our survey finding that infection risk was the biggest concern among students at clinical placements highlighted the need for strategies such as frequent check-ins on their mental health and emotional well-being. Sustaining mental health in the midst of an extremely disrupted curriculum was also raised in a perspective paper. Similarly, high stress levels were also found in radiology education. Our strategy in using WhatsApp extensively had the potential to encourage open communication among students, CEs and faculty supervisors to detect and discuss any well-being issues. It also served as a platform to negate unfortunate consequences of social distancing and manage information overload, misinformation and reminders pertaining to risk control measures. Creating a supportive environment for staff and students that would foster individual well-being during COVID-19 placements resonated with the recommendations from other healthcare professional groups. The use of WhatsApp may also be easily adopted among millennials as knowledge resource for mediated learning.

Adhering to national registration and accreditation bodies may ensure that radiographers transit from undergraduate students to professionals with adequate competencies. Requirements differ between registration and accreditation bodies of various countries. For example, the College of Radiographers in UK does not require a minimum number of clinical hours at placements while Singapore’s AHPC requires 1200 clinical hours. Notwithstanding, all registration and accreditation bodies require evidence of educational institutions having met learning outcomes of the programme, even during the COVID-19 pandemic. Fortunately, SIT’s four-year undergraduate diagnostic radiography programme had originally carved for more than 1200 clinical hours and could afford to reduce clinical placement duration. To supplement any gaps in meeting learning outcomes from shortened clinical placements in this pandemic, SIT utilised simulation training as it had been shown to be a valuable approach for technical skills training, patient communication, managing complex cases and increasing confidence and motivation in students. In addition, the use of virtual platforms for teaching and learning during COVID-19 could be a potential approach to augment learning outcomes. However, there were no prior plans in place on the use of virtual technology to maintain the education of Singapore student radiographers during an outbreak. This serves as a timely reminder for us to
exploit technology-enhanced learning in the clinical setting in the
future.

Although the local radiography students may be limited by
the availability of alternative technology-enhanced learning
experiences compared to other allied healthcare profes-
sionals, CEAs can still contribute to a meaningful student
learning experience by being positive role models themselves. 32
Building a positive educator-student relationship may be chal-
gen in the COVID-19 situation as CEs may experience
additional burden and stress with increasing workload and
smaller teams. This was highlighted as SGH’s challenge in
managing smaller CE-student ratio where more manpower
was needed for student supervision and assessment. While it
might be arguable that students may benefit from a 1:1 ratio
model where CE could focus solely on the student, a paired-
student model would provide peer-assisted learning. 33
However, there has been no clear advantages between the CE-
student ratio models, 33 hence the strategy to develop a strong
belief among CEs in the value of clinical education was more
important than standardising ratio models. A partnership be-
tween SGH’s CEs and SIT with close communication was key
to support CEs in ensuring that students had met all expecta-
tions and competencies for entry level clinical practice. 34
Embracing students as members of COVID-19 teams would
help build a positive relationship. 35

The first batch of penultimate senior year students had
recently completed a placement during the ‘circuit breaker’
period. A survey is ongoing to measure how successful the
preparation and strategies implemented had been in terms of
providing fulfilling learning experience amidst the restric-
tions imposed onto clinical placements.

Conclusion

Despite the uncertain COVID-19 situation, clinical place-
ments are essential components for graduation and therefore,
safe resumption of undergraduate diagnostic radiography clin-
ical placements was needed. SIT’s strategies to assure SGH
and other HCIs included raising students’ awareness to
mandatory adherence to strict national and HCI’s regulations
by creating an information package, a pre-clinical briefing and
a survey to address any concerns. SIT also conducted an in-
fec tion control and PPE use refresher training and ensured close
communication with CEs in the allocation and supervision of
students. SGH emphasised on a more comprehensive orienta-
tion package to students on protocols for risk control mea-
sures within SGH, including team and temporal segregation
and even lunch etiquette in line with safe distancing. SIT
and SGH had collaborated in many aspects of clinical place-
ments, namely managing students’ well-being, meeting
learning outcomes and adhering to national and HCIs’ risk
control measures through the use of WhatsApp, open
communication among students, educators and faculty, and
continuous SIT’s support for CEs. All strategies were planned
with learning outcomes in mind. Where learning outcomes
might not be achieved in COVID-stricken placements, these

were supplemented by simulation training. With the end of
COVID-19 not anywhere near, the acceptance of training
within restrictions to curb the spread of virus may be the
new ‘norm’.

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