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THE IMPACT OF COVID-19 ON FIRST YEAR UNDERGRADUATE NUCLEAR MEDICINE STUDENTS' PRACTICAL SKILLS TRAINING

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ABSTRACT

RATIONALE:

Clinical placement is an important component of any undergraduate nuclear medicine program. For first year students, it is an introduction to clinical nuclear medicine which helps them better understand the profession as well as consolidate their learning to date. At The University of Newcastle, Australia part of the clinical placement course includes radiopharmacy laboratory sessions in a simulated environment to develop necessary skills and confidence. Due to the Covid-19 pandemic, restrictions were put in place that meant that clinical placements for first year students were cancelled and time in the radiopharmacy laboratory was reduced from two hours to one hour per session. The aim of this study is to evaluate whether a clinical alternative portfolio in lieu of clinical placement was effective in increasing the students' knowledge and skills in nuclear medicine practice and if specifically developed instructional videos for preparation of the radiopharmacy laboratories compensated for the reduced time.

METHODS:

A paper-based survey was given to the 50 students enrolled in the first-year professional practice course. This survey containing 56 questions consisted of both open questions and closed Likert-scale questions about the changes to the radiopharmacy laboratories and the clinical alternative portfolio in two separate sections. Quantitative and qualitative analysis was performed on the resulting data.

RESULTS:

There was a 94% response rate to the survey. The majority of students watched the preparatory radiopharmacy videos at least once and strongly agreed that each video adequately prepared them for the associated lab session. Just over half (51%) of the students thought the reduced time in the lab was sufficient to complete the required tasks. The majority of students agreed that the modules included in the clinical alternative portfolio increased their knowledge of nuclear medicine practice.

CONCLUSION:

In spite of the restrictions put in place due to Covid-19, the learning outcomes of the first-year nuclear medicine professional practice course were met. The preparatory videos for the radiopharmacy laboratories and the clinical alternative portfolio was positively received and gave the students a good introduction to clinical nuclear medicine.

INTRODUCTION

Clinical education for any health care student has long been used to develop the student's practical skills and knowledge and reinforce the theoretical knowledge taught at university (*1*). Experiencing actual patients in a real clinical situation gives the student a unique learning experience, not achieved in the classroom (*2*). For first year nuclear medicine students, their first clinical placement is their initial foray into clinical nuclear medicine. As well as consolidating their learning, it gives the student a better understanding of the profession as a whole, helping them realise whether this is the correct career choice for them (*1*).

As part of the Bachelor of Medical Radiation Science (Nuclear Medicine) (Honours) Program at The University of Newcastle, Australia, students complete a total of 43 weeks of clinical placement over four years. Clinical placements for first year students usually take the form of two weeks full-time attendance at a nuclear medicine site. The emphasis of this clinical placement is to develop communication skills between themselves and patients and staff, develop technical skills (for example using the gamma camera) and to put into practice any theory learnt. They are assessed on their clinical competence by a clinical supervisor who is a practicing nuclear medicine technologist working at the clinical site. There are also written assessments for the student to complete, including a case study and reflective report.

To develop the crucial technical skills needed for their first placement, students are educated in radiopharmacy techniques in a specifically designed radiopharmacy, located within The University of Newcastle. The radiopharmacy laboratory has ten student benches and an instructor's bench, each fitted out with a commercial L-block and all the necessary equipment to maintain radiation safety in the

workplace (for example, lead pots and syringe shields). For first year students, time in the radiopharmacy involves learning about radiation safety, needle skills, ^{99}Mo/^{99m}Tc generator elution and quality control of the eluate. Students also learn how to draw up doses and basic kit reconstitution. In the simulated environment, there is no radioactivity involved, the generator systems are pre-used, over six months old and saline is used to practice drawing up doses. This way, the student can develop the necessary skills and confidence, without contaminating themselves and their environment. The advantages of using this simulation-based education includes protecting the student, clinical supervisor and ultimately the patient from unnecessary risks (in this instance unnecessary ionising radiation exposure) and the opportunity to practice high risk events while receiving feedback in a safe environment (*3*,*4*).

The radiopharmacy laboratories and the two weeks clinical attendance are combined into the course MRSC1330: Nuclear Medicine Professional Practice IB which sits in Semester Two, Year One of the Bachelor of Medical Radiation Science (Honours) (Nuclear Medicine) Program.

IMPACT OF COVID-19

The COVID-19 pandemic imposed several restrictions on the delivery of MRSC1330. This necessitated a change in the course to adapt to the restrictions while still providing a quality learning experience for students. Radiopharmacy laboratories, which were conducted on campus face-to-face, were allowed to continue during 2020, however strict social distancing rules applied, and the amount of time students and staff were in the same room was regulated. All persons not living together were instructed to stay 1.5 metres away from each other and there was a limit of one person per four square metres allowed

within a room, this meant that a maximum of six students and the instructor were allowed in the radiopharmacy laboratory for each session, instead of the usual ten. Each session was repeated nine times to accommodate the 50 students enrolled in the course. Each session also needed to be limited to one hour instead of the usual two hours, limiting the time available to demonstrate the learning task each week. To combat this time constraint, a set of six instructional videos were made by the course coordinator (MS) for each learning task (Table 1).

The two weeks of clinical placement were also cancelled. In its place, a clinical alternative portfolio consisting of four modules was created to offer another learning experience for the student. Details of the clinical alternative portfolio are provided in Table 2. The portfolio was designed to be closely aligned to existing clinical placement learning outcomes. The portfolio constituted 80% of the total marks for the course, with the other 20% coming from a radiopharmacy skills assessment task.

RADIOPHARMACY INSTRUCTIONAL VIDEOS

The students were instructed to watch the pre-recorded videos and read the laboratory notes before attending their radiopharmacy session each week. These were designed to familiarise the students with the material to be covered each week due to the reduced timeframe of the laboratory sessions. The pre-recorded videos and the laboratory notes were available from the BlackBoard Learning Management System for the course making it suitable for the students to watch the videos online from home.

CLINICAL ALTERNATIVE PORTFOLIO

The Communication Module consisted of a set of pre-readings and a workshop. The pre-readings contained information on communication techniques and the importance of effective communication.

To accommodate COVID 19 restrictions four communication workshops were held on campus where three workshops had 12 students and the fourth had 14 students in attendance. Each workshop was broken into two separate two-hour blocks over two days. In the first two-hour block, students had interactive discussions about the importance of introductions, who they might need to communicate with whilst on placement as a student technologist, what some of the issues their patients might be faced with, non-verbal communication and cultural sensitivities. The students were also shown videos of nuclear medicine technologists interacting with patients. In the second two-hour block, students were divided into groups of two and were required to perform scenario-based exercises to develop their communication skills. The activities included students role-playing being either a technologist or a patient for various medical conditions, including vision impairment, cancer patient, dementia patient and a patient in pain. For assessment, students were required to write a reflective report. The report was designed to assist students increase their understanding of effective communication and to help inform their future experiences when communicating with patients and clinical staff (*2*).

The Work, Health and Safety (WHS) Module was developed to inform students of the protocol and processes in place to maximise safety in the workplace. As well as being a key capability for nuclear medicine technologists (workplace safety forms part of the Medical Radiation Board of Australia's Professional Capabilities document)(*5*), young workers may be less aware of WHS risk and responsibilities and therefore at more risk of workplace injury (*6*). As an assessment, students were required to complete a Hazard Identification Risk Assessment and Control worksheet on an area of

their choice (e.g. workplace, shopping centre). The worksheet was developed by a WHS academic from the university, with input from the course coordinator (MS).

The case study module was developed as writing case studies are an integral part of the assessment of clinical placements within the nuclear medicine program at The University of Newcastle. In this module, students were required to choose one pathology commonly imaged using bone scans and then write it up in the style of a case study.

As part of the Introduction to Nuclear Medicine Practice Module, the students were given short videos of the operation of gamma cameras (supplied by GE Healthcare and Siemens) and a video of a bone scan. For the assessment, students were required to make a short audio recording explaining a bone scan to a "patient". This task simulated what they would have been doing whilst on clinical placement, but also tied together the knowledge learnt in the Communication Module. They needed to be able to correctly identify the patient as well as communicate information about a bone scan at a level a typical patient would understand.

AIM

The aim of this study is to evaluate if the radiopharmacy instructional videos provided sufficient information to allow the student to confidently complete the laboratories in the reduced time and if the clinical alternative portfolio was effective in increasing the students' knowledge and skills in nuclear medicine practice.

METHODOLOGY

STUDY PARTICIPANTS

The participants were all 50 students enrolled in the first year Nuclear Medicine Professional Practice 1B course in 2020. Ethics approval was granted by The University of Newcastle's Human Research Ethics Committee under their quality assurance scheme (QA242). As this was an anonymous survey, signed written consent was not obtained as consent was implied through completion and submission of the survey.

DESCRIPTION OF SURVEY

A paper-based survey was given to the students, as well as a participant information statement explaining the details of the study. The survey was administered following the final course assessment. The students were informed that participation was entirely their choice and non-participation would have no bearing on their marks or progression in the course. The survey consisted of two main sections. Section A contained 33 questions relating to the radiopharmacy laboratories and the six Instructional Videos, Section B contained 23 questions about the clinical alternative portfolio. The questions were a combination of closed questions using five-point Likert scales and open-ended questions for written comments.

ANALYSIS OF RESULTS

Quantitative data from the survey was analysed using weighted sum averages (WSA) of the Likert Scale scores. The WSA analysis allowed the comparison of the usefulness of each pre-radiopharmacy video and the clinical alternative tasks.

To determine if the restructured radiopharmacy laboratories had any effect on student learning, the results from the 2020 (COVID 19 restricted) radiopharmacy skills assessment was compared with the results from students taking the assessment in 2019. The 2020 cohort completed their first clinical placement in April 2021, and the effect of the clinical alternative portfolio was assessed by comparing the results from the 2021 clinical placement with the results of the 2019 cohort after completion of the same (though their second) clinical placement block. A one-tailed t-test was used to assess statistical difference in the results of students between corresponding years.

The written comments from the survey were independently analysed using thematic analysis by the authors. A range of themes and sub-themes were derived and reviewed for agreement. Any disagreement was resolved through discussion.

RESULTS

A total of 47 out of 50 students (94% response rate) completed the evaluation survey. While three papers were incomplete, completed parts of the survey have been included in the analysis.

QUANTITATIVE ANALYSIS

Radiopharmacy Laboratories

Most students (98% (45/46)) watched each video at least once, with students watching most videos at least twice (Table 3). The exception was the radiopharmaceutical video, with 34% (16/46) of students watching it more than three times. Students strongly agreed that each video was easy to understand, with the WSA ranging from 4.61/5 for the Point Source and Dose Dispensing video to 4.79/5 for the Laboratory Induction video (Figure 1).

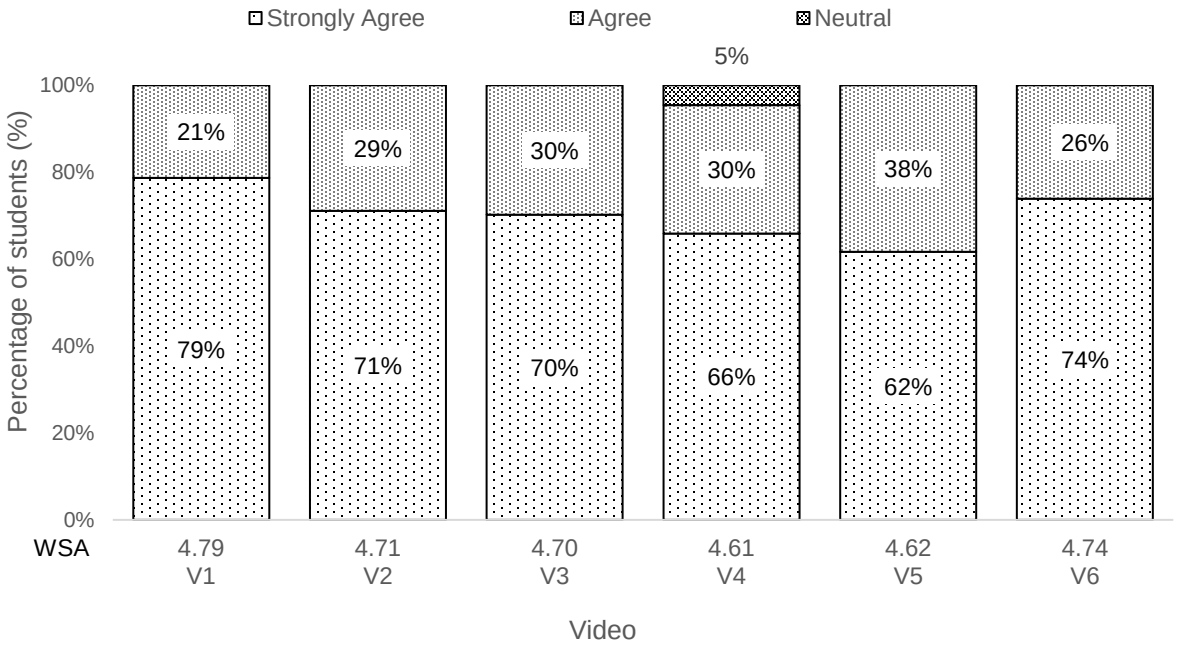

Figure 1: Percentage of students indicating that the video was easy to understand. Video names are provided in Table 2

When asked if each video adequately prepared them to participate in the associated radiopharmacy laboratory, again most students strongly agreed (Table 4). The lowest ranked was the Technegas video and the highest ranked video was the Radiopharmaceutical video.

In response to questions about the length of the laboratory sessions, 19% (9/47) of students strongly agreed ("plenty of time") and 32% (15/47) agreed that there was "just enough time" (Figure). Thirty-six percent of students (17/47) thought that "some sessions could have been longer" in disagreeing or that "all sessions could have been longer" in strongly disagreeing to the question. Overall, the WSA was just over neutral at 3.19.

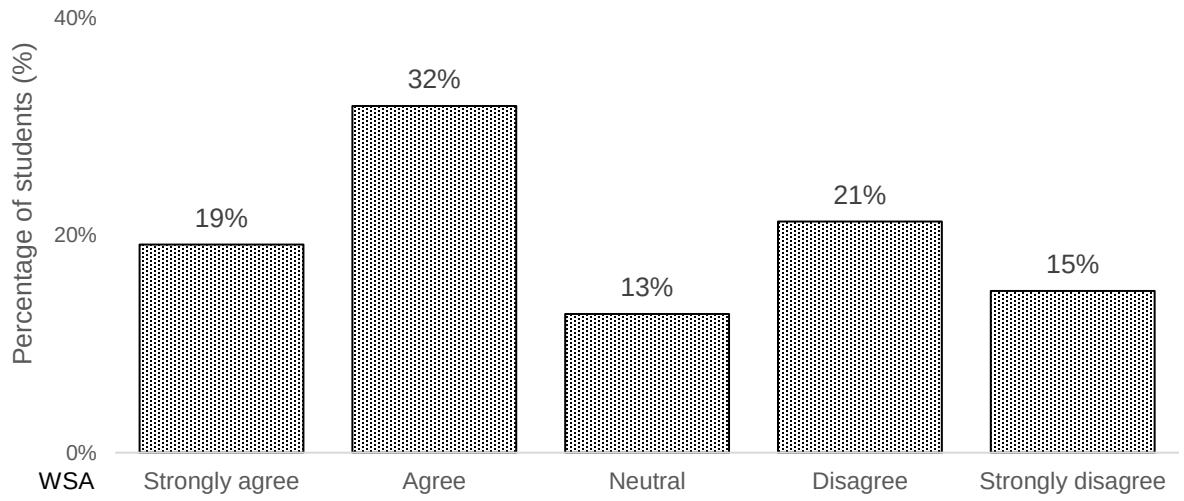

Figure 2: Percentage of students indicating that the laboratory sessions were long enough to complete each task

Clinical Alternative Portfolio

Students were asked if they believed that the clinical alternative portfolio increased their knowledge of nuclear medicine practice (Figure 3). Most students either strongly agreed or agreed with this, with the WSA ranging from 4.11 for the Risk Assessment module to 4.37 for the Introduction to NM Practice module. While a couple of students disagreed that some parts of the portfolio increased their knowledge (Case Study and Communication Module), no student strongly disagreed.

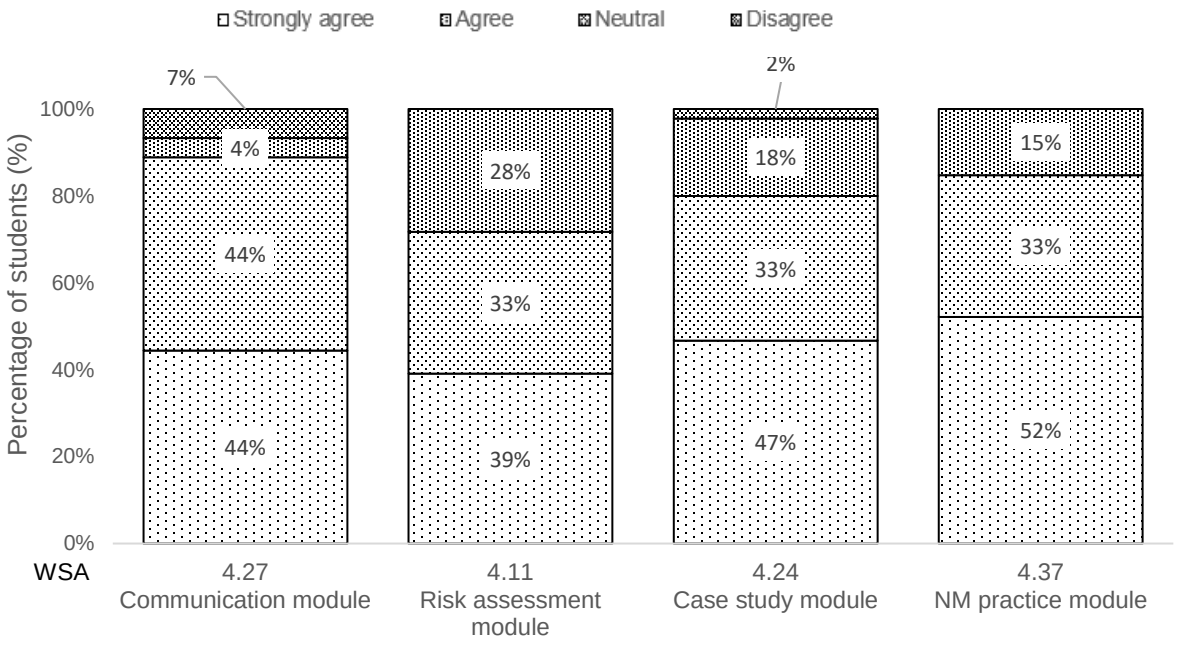

Figure 3: Percentage of students indicating that the Module increased their knowledge of Nuclear Medicine Practice

Most students indicated that the Communication Workshop was effective with increasing their awareness of communicating with both patients and people in general (Table 5). Only 1 student thought that the workshop was "helpful in parts" when they disagreed with the question.

Of the three videos that students were instructed to watch as part of the Introduction to Nuclear Medicine Practice module, most students watched them at least once (Table 6). While all three videos ranked well, the GE video on the operation of the gamma camera scored slightly higher than the Siemens video for both ease of understanding (WSA 4.53 vs 4.42) (Figure 4) and in supporting student learning (WSA 4.65 vs 4.45) (Figure 5).

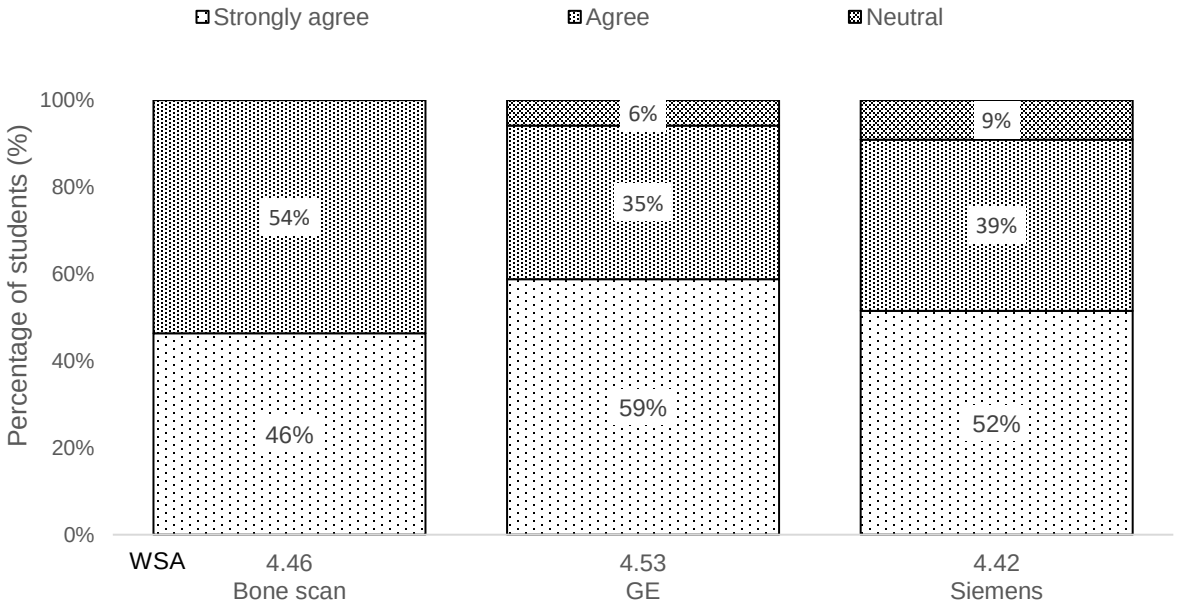

Figure 4: Percentage of students indicating that the Introduction to Nuclear Medicine Practice video was easy to understand

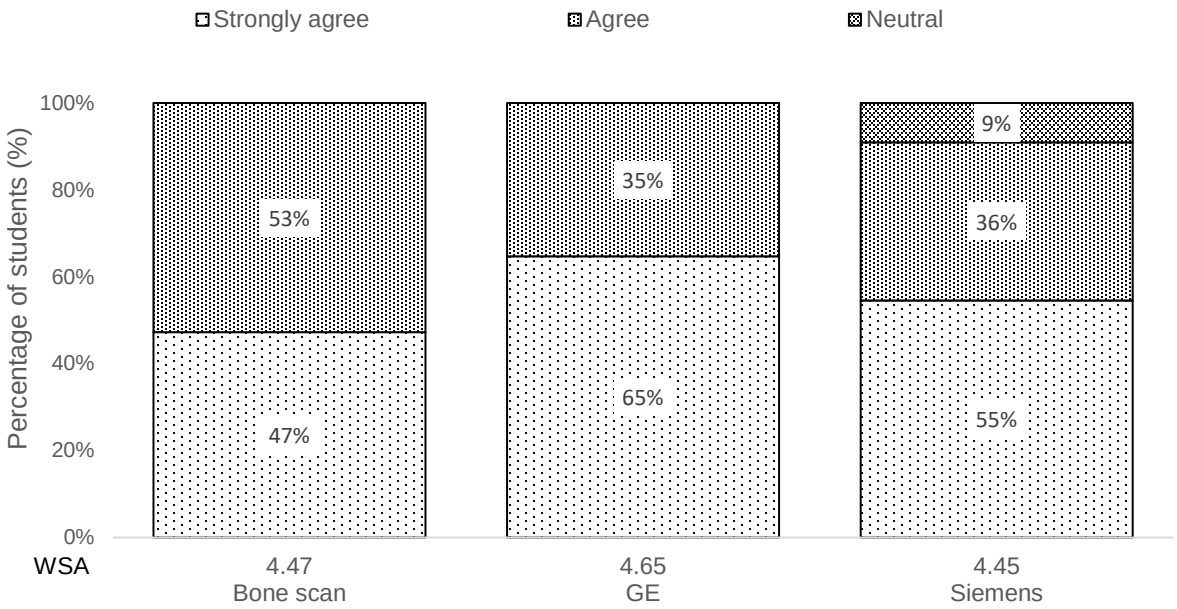

Figure 5: Percentage of students indicating that the Introduction to Nuclear Medicine Practice video supported their learning

Comparison of results with previous cohorts

A comparison of marks was performed with this COVID-19 affected 2020 cohort and the 2019 cohort (not affected by COVID-19 restrictions). There was no statistical difference ($t = 1.23$, $p = 0.11$) between the 2019 and 2020 radiopharmacy results, despite the students in 2020 (average = 94.5%, SD = 5.84) obtaining slightly higher results than the students in 2019 (average = 92.5%, SD = 8.09).

Similarly, there was no statistical difference ($t = 1.89$, $p = 0.12$) between the 2019 and 2021 (COVID affected) clinical placement results, despite the students in 2021 (average = 78.6%, SD = 13.82) obtaining higher results than the students in 2019 (average = 74.64%, SD = 14.06).

QUALITATIVE ANALYSIS

Radiopharmacy Laboratories

The written comments from the open-ended questions concerning the radiopharmacy laboratories uncovered four major themes. These were:

1. Timing
2. Delivery
3. Content (of the videos)
4. Student learning/understanding /confidence

Timing of the laboratories

Just over 50% of the students indicated that there was enough time in the lab each week to finish their specific tasks and that "any longer than 1 hr and I feel it would drag on for too long" (P44) and reported that "we always had enough time and also to ask questions if we needed to" (P10). However, some students felt that the lab time was too short, and they felt rushed as "by the time you get organised and put gloves/gowns on its not enough time to have multiple goes at eluting the generator and practicing getting doses" (P25), "I would have liked more time, a lot of our labs were cut short and rushed" (P15). One student who indicated that there was sufficient time in the lab, commented that "more practice to help understand the method" (P5) was needed. Students also commented that it "would have been better if we had more individual time with the lab instructor" (P13) and that there was "not enough time to check everyone individually" (P27).

Delivery of the laboratories

Some students felt that the labs needed to be delivered more than once a week "the labs were good, however it would have been more efficient if we did them twice a week" (P23), "it is also hard to solidify skills 1 hr a wk, as after a week has passed I felt I had forgotten everything" (P33). It was also felt that another revision lab was needed "maybe two labs before the test would have been more beneficial than one" (P20). The smaller group size was felt to be a positive consequence of the Covid restrictions as "smaller groups allow for a better group dynamic" (P47).

Content of the videos

The preparatory radiopharmacy videos were well received by all students "They were very clear and extremely helpful" (P1). Students felt that the content within the videos was extremely helpful for their preparation each week with "the intro video alongside the in-class video helped me understand the lab thoroughly" (P9), and that "all the videos were great as a hands-on learner watching them made it easier to grasp before heading in" (P45) and "they matched what we were expected to do" (P27). However, some students were looking for some more specific content to be added to the videos "however a top down…. camera angle could have helped with organising arranging the materials" (P28), "a little more detailed" (P34), "High camera view on generator" (P40), "Additionally adding some 'tips and tricks' would be great e.g. how to remove a tricky needle cap" (P16).

Student Learning/understanding/confidence

Overall, the students felt that the videos added to their learning experience "really great for reviewing what we have learnt. I watched them multiple times." (P27), "I believe that every subsequent year after

this should have them as they provide a great source of study and reassurance" (P28), "I think every year they should be done. I know they were only done for COVID-19 but I think they are very beneficial." (P33). Specific videos also helped students understand health and safety aspects of the lab "This video helped me avoid a needle stick injury" (P42). Students were able to watch the videos at any time during the semester, which also made them useful for their assessment "good tool to revise for practical exam" (P16), "I loved having them there to look back on" (P10). However other students felt that the videos helped with their understanding "They were really good for my understanding" (P17), "the …. video helped me understand the lab thoroughly" (P9). The videos also helped with students' confidence "they really helped reduce some of the anxiety and stress of the labs because you know what you're in for before you get there" (P16).

Clinical Alternative Portfolio

The written answers from the clinical alternative portfolio open-ended questions revealed four major themes. These were:

1. Preparation for future clinical placement
2. Communication skills
3. Better understanding/increase skills
4. Content of modules

Preparation for future clinical placement

Students felt that the clinical alternative portfolio prepared them for future clinical placements, especially the communication, introduction to nuclear medicine practice and case study modules "gave

us a real insight into clinical situations. How to prepare for placement, what to expect, how to talk to patients" (P21), "Case studies will be done throughout my career - this gives me experience" (P42), "good to organise thoughts on how things work in a practice" (P16).

Communication skills

Learning how to communicate in a nuclear medicine setting was helpful for students "communication in a clinical setting is very different from everyday settings, and this is not something you realise without exposure. It made me aware of what I did not know and provided skills that will make adjusting to clinical practice less of a shock" (P16). Having different scenarios meant that the students were able to experience a diverse range of clinical situations "the workshop helped me understand how to communicate with all different patients with different needs. I gained a better understanding about communication towards patients, and how important it is" (P24) and that "It made me more aware of how to communicate effectively with a wide range of professionals and patients" (P46).

Better understanding/increase skills

For some students, the clinical alternative portfolio gave them a better understanding of nuclear medicine as it "Helped me to better understand what scans are for, what other images need to be done and how they are done" (P37). Due to the extra reading required to complete some assessment tasks "I noticeably gained knowledge of NM in general due to extensively researching" (P1). The clinical alternative portfolio also built on the basic skills and knowledge the students had acquired from courses delivered in semester one, "Refreshed my memory and helped" (P43) and had learnt during the course "Allowed us to put into practice what we learnt in previous modules" (P36).

Content of modules

Some students felt that simulating the clinical setting in the communication workshops made the learning easier "I didn't understand how daunting communication could be and I'm glad I learnt before placement" (P15), and that they were "Able to interact without the pressure of a patient" (P44). The Gamma Camera Operation videos were also well received as "In some ways it could possibly be even more helpful than work placements. Such as the videos of the cameras that we can revisit and pause - allowing us to learn at our own pace" (P47). The risk assessment module, although helpful to some students "made me aware as to just how many risks there could be in a workplace" (P25) and "it was able to bring my attention to things I may not have thought about"(P26), lost some importance to others as it was not specifically focused on a health care setting "it did not aid to my knowledge about the workplace" (P28) and that it "Didn't necessarily provide insight into safety hazards within a hospital setting" (P32).

Overall, the clinical alternative portfolio was seen to be an excellent alternative to attending clinical placement for some students "I believe this was the best possible alternative to a clinical practice" (P14) and "it was helpful and an impressive solution to missing work placement" (P47), "I thought it provided us with the knowledge needed to take us into placement next year" (P3), "the portfolio was a great assessment that helped due to the cancellation of placement" (P8). However, some students didn't feel there was much benefit in completing the alternative tasks "As we weren't able to use the machines or deal with patients it was hard to understand the normal practice" (P36) and when asked what they

would change about the clinical alternative portfolio, some students simply answered, "go on placement".

DISCUSSION

Both the radiopharmacy instructional videos and the clinical alternative portfolio, put in place because of COVID-19 restrictions, were successful in terms of student learning. The radiopharmacy instructional videos provided sufficient information for the student to confidently complete the laboratories given the reduced time spent in the lab each week. Similarly, the clinical alternative portfolio increased the first-year student's knowledge and skills in nuclear medicine practice due to the cancellation of their clinical placement.

Radiopharmacy Laboratories

Most students strongly agreed that the instructional videos adequately prepared them for the weekly radiopharmacy lab, with the majority of students watching each video at least twice and found them easy to understand. However, only half of the students thought that the amount of time spent in the lab each week was sufficient for their learning. At the time, the videos were made in response to a reduced amount of time spent in the lab each week, allowing for a briefing on the learning objective to be done prior to entering the lab. However, this study has shown that the videos were much more than that. The videos helped students with various learning styles prepare for the lab each week. It is the role of the health science educator to accommodate the different learning styles of students (*7*), which include concrete experience (feeling), reflective observation (watching), abstract conceptualisation (thinking) and active experimentation (doing) (*7*). In this instance, the students are provided videos and written

instructions (watching and thinking) and then given the opportunity to practice what they have learnt (doing). The videos added to the learning experience provided by the simulation-based radiopharmacy laboratories, providing essential knowledge and the chance to re-watch for revision purposes. The labs provided first year nuclear medicine students with a realistic and relevant learning experience, an essential element of simulation-based education (*4,8*). Although their time in the lab was reduced, each student received the same level of training, sometimes not afforded in clinical practice, due to the inconsistent teaching styles of supervisors (*1,4,9*).

Clinical Alternative Portfolio

The decision to cancel the clinical placement was not taken lightly, as there are many known advantages of exposing the student to the profession at such an early stage in their studies (*1*). Most students either agreed or strongly agreed that all four modules of the portfolio increased their knowledge of nuclear medicine practice and safety in the workplace and prepared them for future clinical placements. This was backed up with similar clinical placement results when comparing this cohort with the previous cohort.

Preparation for future clinical placement

As with the radiopharmacy labs, all students received the same educational experience, therefore eliminating the inequality in learning faced due to varying clinical placement encounters *(1,4,9*). A recent study by Ketterer et. al. (*9*) stated that participation in simulated placement activities did not disadvantage the therapeutic radiography (radiation therapy) student, and that simulated placement activities "should play a major role" in the training of students. However, the lack of patient interaction

and the inability for the student to immerse themselves in the profession will ensure that this portfolio is used as a preparation tool and not a replacement for clinical placement.

Communication Skills

Effective communication within any medical setting is imperative, it reduces patient anxiety, addresses any concerns the patient may have as well as educating the patient about the procedure (*10*). The first-year nuclear medicine cohort had varying levels of experience in terms of communication skills, ranging from no experience, communication experience through retail work, to already being a health professional (some students in this cohort are trained dental hygienists and nursing assistants), however the majority of students strongly agreed or agreed that the module increased their awareness of how to communicate with patients or people in general. The inclusion of communication skills training in the clinical alternative portfolio provided examples of effective communication within the workplace as well as patient/technologist interactions within a safe learning environment. This environment allowed students to practice their evolving communication skills and make errors without the fear of reprisal (*4*,*10*).

Content of Modules

The modules in the clinical alternative portfolio were designed to be equivalent to the learning outcomes of clinical placement. Whilst on placement, previous first year students were assessed on their communication skills with both staff and patients and they were required to complete a risk assessment task and a bone scan case study. They also needed to write a reflection based on a personal interaction with a person from a culturally diverse or indigenous background. By aligning the set tasks in the

clinical alterative portfolio with the traditional placement learning outcomes, the students in this study were provided with the same learning opportunities as previous students in an attempt to increase their understanding of nuclear medicine practice. A mixture of teaching methods were used in the portfolio, including face-to-face teaching, pre-recorded lectures, self-directed learning, and industry-recorded videos. As well as catering for different learning styles, this gave students the flexibility of blended learning (*11,12*).

Limitations

A limitation of this study was the relatively small sample size (n=47), though this represented 94% of the eligible participants. Another limitation was the lack of generalisability due to the research being conducted for a single course at one Australian university.

CONCLUSION

During 2020, in the midst of a worldwide pandemic, first year nuclear medicine students at The University of Newcastle were provided with a safe environment to develop their radiopharmacy skills as well as introduce them to clinical nuclear medicine practice. The learning outcomes of the radiopharmacy laboratories were still met, despite the time restrictions put in place, and the student learning experience was enhanced by the preparatory videos. With the loosening of Covid-19 restrictions and following student feedback, the students will return to two-hour radiopharmacy labs in 2021. The videos will also be used as part of the pre-lab preparation. The clinical alternative portfolio enabled students to get a basic understanding of clinical nuclear medicine without the need to attend a nuclear medicine practice. Although the clinical alternative portfolio was positively received, it should

not replace clinical placement for first year students. Instead, it should be used as preparation for students about to embark on their first clinical placement in a nuclear medicine department.

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Table 1: Description of pre-radiopharmacy laboratory videos

Video	Description	Length
Video 1	Lab Induction	5 Minutes
Video 2	Needle Skills / Dose Calibrator	11 Minutes
Video 3	Generator Elution & QC	10 Minutes
Video 4	Point Source and Dose Dispensing	7 Minutes
Video 5	Technegas	8 Minutes
Video 6	Radiopharmaceutical Kit	4 Minutes

Table 2: Clinical Alternative Portfolio

Module	**Description / Summary of Learning**	**Assessment**
Communication	• Effective communication techniques • The types of people technologists need to communicate with • Hands-on communication workshop	Reflective report (20%)
Work, Health and Safety	• Health and safety in the workplace • Risk assessment	Hazard Identification Risk Assessment and Control worksheet (20%)
Case Study	• How to write a case study	Bone scan case study (20%)
Introduction to nuclear medicine practice	• Identifying the patient, consent, privacy • Typical procedure for a 3-phase bone scan • Gamma camera operations	Audio recording of a bone scan explanation (20%)

Table 3: Number of times that students watched each radiopharmacy preparation video

		Percentages (n = 46)				
Video	Number of Times	0	1	2	3	>3
V1	Lab Induction	0%	43%	51%	4%	2%
V2	Needle Skills / Dose Calibrator	0%	27%	47%	16%	11%
V3	Generator Elution & QC	0%	40%	33%	14%	14%
V4	Point Source and Dose Dispensing	2%	24%	46%	13%	15%
V5	Technegas	0%	55%	30%	11%	4%
V6	Radiopharmaceutical Kit	2%	17%	28%	19%	34%

Table 4: Percentage of students indicating that the videos adequately prepared them to participate in the associated radiopharmacy laboratory

	Adequately Prepared					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	WSA
Lab Induction	68%	28%	4%	0%	0%	4.64
Needle Skills / Dose Calibrator	67%	29%	2%	2%	0%	4.60
Generator Elution & QC	64%	32%	4%	0%	0%	4.60
Point Source and Dose Dispensing	70%	26%	4%	0%	0%	4.65
Technegas	64%	30%	6%	0%	0%	4.57
Radiopharmaceutical Kit	72%	26%	2%	0%	0%	4.70

Table 5: Percentage of students indicating that the Communication Workshop increased their awareness of how to better communicate with patients and with people in general

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	WSA
With patients	66%	30%	2%	2%	0%	4.6
Generally with people	52%	35%	11%	2%	0%	4.4

Table 6: Number of times that students watched each Introduction to Nuclear Medicine Practice video

	Percentages (n = 46)				
Number of Times	0	1	2	3	>3
Bone Scan Video	11%	46%	33%	9%	2%
GE Video	24%	50%	20%	7%	0%
Siemens Video	28%	54%	13%	4%	0%