

Bond University

Australian Journal of
Clinical Education



Volume 9

Issue 1

2021

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Adapting simulation education for rural medical students during COVID-19

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Abstract

The outbreak of the COVID-19 pandemic changed everything about the world we lived in in 2020. It has had obvious impacts on the way we teach and the way we learn. Monash University provides clinical health education to around 130 third, fourth and fifth year medical students each year in a rural setting. By mid-March 2020 it was clear that substantial changes in delivery methods would be required to ensure the continuation of both placements and clinical education. In particular, there was a need to provide continuity of education for the final year students who needed to be ready to graduate as Interns by the end of the year. A key component of the final year is a capstone unit in clinical skills which has a strong emphasis on simulation-based scenario teaching. This unit was already in the process of adapting to changes in the curriculum when the COVID-19 pandemic hit, presenting clinical educators with the additional challenge of teaching a new curriculum in new ways. What began as a reaction to an unforeseen disruptor resulted in innovations that ultimately were extremely well-received by the students and will likely become new ways of teaching final year students into the future. Additionally, these innovations offer important alternatives for how to ensure continuity of clinical education during systemic disruption caused by pandemic.

I INTRODUCTION

Monash Rural Health Bendigo provides clinical health education to a cohort of over 100 third, fourth and fifth year medical students in a rural setting. It is largely an 'apprentice-based' model of learning where the students get access to rural clinical sites and rural health experts as well as to a state-of-the-art Clinical Skills and Simulation Centre (CSSC) to undertake their clinical education. Monash Rural Health Bendigo was one of the few places in Victoria that managed to continue on-site medical education and clinical placements virtually uninterrupted during the coronavirus outbreak of 2020. Priority was given to the final year students who needed to complete their pre-intern year before graduating and becoming doctors in 2021. A main component of the fifth or final year program is the capstone clinical skills unit (CCSU) unit which is a capstone for the degree that focuses on patient safety and preparedness for practice. It runs for the whole of the final year of the medical degree and is designed to prepare students for internship through practical hands-on learning with a large focus on simulation scenarios. This unit was already in the process of adapting to changes in the curriculum when the COVID-19 pandemic hit, presenting clinical educators with the additional challenge of teaching a new curriculum in new ways. But in this case disruption has led to innovation and changes to the previous ways of doing simulation education which have been beneficial for the preparation of new doctors entering the field as interns.

II BACKGROUND

Final clinical year students at Monash Rural Health Bendigo are all required to complete a CCSU that focuses on patient safety and preparedness for practice. This unit has always contained a simulation component. Simulation scenarios in this unit were previously based around a Medical Emergency Team (MET) response (Jones et al., 2008) with all eight students playing a role in providing a clinical response to a simulated patient. In 2019 changes to the central (Institution) Medicine curriculum were made with a view to implementation in 2020. Anecdotal feedback from students in previous years indicated that they highly valued the simulation sessions, so it was decided to retain the same number of simulation sessions as well as increase the clinical skills component to meet the new curriculum requirements. What had not been factored into curriculum delivery in 2020 was a global pandemic. The final year students had completed one out of a total of six 9-week rotations in 2020 when the pandemic hit. COVID-19

A health pandemic impacts on medical and clinical education more significantly than many other higher education courses as it sits at the nexus between the university and health systems. The main implications of the COVID-19 pandemic on the Monash Rural Health Bendigo final year teaching and learning program were the following:

- Hospitals needed to plan for increased capacity of COVID-19 patients, including the establishment of special respiratory wards in the Emergency Department, which impacted on student placements;
- The need for initial surge workforce planning which may have required final year medical students to be recruited into active duty in hospitals earlier than expected (Victorian Department of Health and Human Services, 2020);
- The requirement for social distancing of 1.5m which impacted on both student placements in terms of access to patients and on the number of students able to be in the CSSC at one time;
- The reality that the clinical educators who teach the program are all critical care nurses who could be required to work clinically at any given time due to the pandemic, leaving no-one to do the teaching;
- The medical facilitators who teach into the final year program also work predominantly in the emergency department (ED), intensive care unit (ICU) and anaesthetics in the two local

hospitals and could similarly be required to work clinically at any given time due to the pandemic;

- University cessation of face-to-face teaching (ABC News, 2020);
- A number of staff members who would normally be on campus were required to work from home; and
- Students were completing all academic tutorial sessions online.

III THE RESPONSE

After a short initial lockdown, the decision was made at both the university and hospital levels to create some exemptions for final year medical students to continue with some face-to-face learning in both hospital placements and clinical skills and simulation education. The exemptions were contingent upon students and staff still adhering to social distancing, wearing masks, being generally well, and ensuring they were not travelling to hot spots. The teaching and learning spaces were also subject to extra cleaning and sanitising. These exemptions were made conscious of the fact that these students were previously on track to graduate and become interns by the end of 2020. The dual roles of the clinical educators and medical facilitators created time pressure to progress the students through the content and ensure competency in the skills before second and third waves of the pandemic potentially impacted on staff availability. Staff were also aware that students needed the content and would be examined on it at some stage, so completion of the full program was necessary if the students were to graduate at the end of the year. In the early stages of the pandemic there was discussion about the possibility of final year students being called on as part of a surge workforce, so having the majority of the final year students complete the full program within a tight timeframe was imperative for ensuring this surge workforce was as prepared as possible. Time became the biggest pressure in planning how to deliver the program. The priorities were:

1. To deliver the curriculum;
2. To get as many students through as quickly as possible due to the nature of the pandemic to rapidly change at any given moment and the potential for losing the educating workforce; and
3. To upskill students with the basics in case they were needed to contribute to the workforce.

Another key change was the decision that final year students would remain in one location for the entire year rather than moving between metro and rural areas. This meant that students had to decide to stay in Bendigo for the year rather than moving for rotations between Melbourne and Bendigo. The vast majority of final year students made the choice to stay in the rural location.

IV A MODIFIED PROGRAM

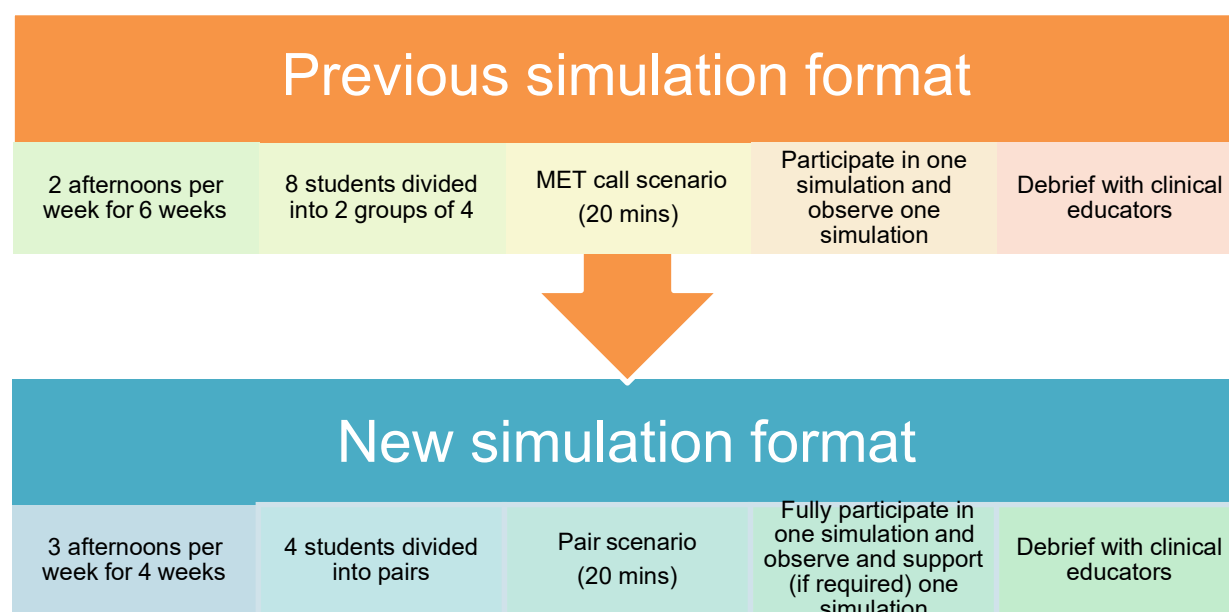
In the previous curriculum delivery model, the focus for the clinical skills and simulation component of the subject was to assess and manage a deteriorating patient using an A-E approach (Thim et al., 2012). It historically ran in the afternoon two days per week for six weeks, as this scheduling would fit with the students' hospital rotations. Students participated in groups of eight, with four students participating in the simulation while the other four observed, then the two groups of four swapped over after about 20 minutes. The simulation scenarios were based around a Medical Emergency Team (MET) model with each playing a role in providing a clinical response to a simulated patient. According to Barbetti and Lee (2008) '[a] medical emergency team (MET) comprises of a team of doctors and nurses with advanced life support skills, which are hospital based, who respond to emergency calls following a deterioration in a patient's clinical condition.'

In line with social distancing and space requirements in the simulation lab, the student numbers for the simulation program were reduced from eight per group to four per group. So, the simulation scenarios were revised to move away from a 'MET team', instead requiring the students to work

in pairs on 20-minute simulations. Each pair was observed by another pair from the briefing room, but in the new format the observing pair could be called on at any time to assist in the scenario if required by the initial pair. This happened quite often in the course of the students responding to a deteriorating patient. At the end of 20 minutes the pairs would then swap places. At the conclusion of both simulations all four students would debrief with the clinical educators.

The program also increased from two days a week to three days a week running for four weeks. The four-week program came about because the students were no longer rotating to other hospitals after six weeks, meaning they were able to move through the program more quickly. This had the added intent of upskilling the students more readily in the case of them being utilised as a surge workforce.

Figure 1
Changes to simulation format in response to COVID-19 restrictions



V METHOD

The findings contained in this paper come from the Monash Rural Health Bendigo COVID-19 Educational Evaluation Project conducted during 2020 (ethics approval 2020-24056-43000). The project was designed using an action research model (Stringer & Aragon, 2021). There are some examples of action research in health disciplines such as nursing (McDonnell & McNiff, 2016; Munten et al., 2010) and allied health (Bennett et al., 2016; Delany & Golding, 2014) but use of this methodology is less prevalent and viewed with some scepticism in medical education settings (Edler, 2009). Action research was chosen for this study as the rapidly evolving pandemic response required a research methodology that involved a feedback loop to ensure that what was learned from the project could be implemented quickly and effectively. The project was designed to be rolled out in three phases:

1. Orientation to a new reality, adaptation and ensuring continuity;
2. Refinement of new ways of working through the use of a feedback loop and reflective practice; and
3. Program evaluation.

The feedback loop in the second phase of the project provided staff with an opportunity to understand what was working and what needed further refinement as staff continued to evolve their response and provide immediate benefits to students. The results of the full evaluation would then benefit future cohorts of rural health students as new processes were documented and adapted based on what was learned in 2020.

In Phase 1, students completed a short (five minute) online survey using the Qualtrics platform to evaluate the initial educational response. Separate surveys were designed for each of the clinical year levels as each year level has differing educational activities. Questions were designed using both 'fixed response' and 'text write in' modes. At the end of the Phase 1, online survey students were asked to self-select into a follow-up one-to-one interview via Zoom. The purpose of these interviews was to further explore some of the findings from the survey responses. These interviews included an additional consent process seeking permission to record the interview. They were transcribed and analysed thematically along with the survey results. The findings from Phase 1 were reported to the faculty and staff with a view to discovering what, if anything, the faculty and staff could change or improve for Semester 2, 2020. These changes were implemented as Phase 2 of the project. Phase 3 then took place between September and October 2020 with individually designed end-of-year evaluation surveys being sent out to students in each of the three clinical year levels, again via the Qualtrics platform and again using both 'fixed response' and 'text write in' questions. Relevant year level staff were involved in developing suitable questions to elicit feedback on the program unique to each year level and based on the responses to Phase 2.

The results outlined below focus on the responses from final year students specifically with regard to their clinical skills and simulation education in 2020.

VI RESULTS

Final year students were surveyed twice during 2020 as part of the Monash Rural Health Bendigo COVID-19 Educational Evaluation (ethics approval 2020-24056-43000). The Phase 1 surveys were sent out in May 2020. Of those respondents who clicked on the survey link, 100% consented to participate. There was a 46% response rate to the Phase 1 survey from final year students. Students were asked about their experience adapting to the educational changes that were necessary in response to the global pandemic, after which students were able to self-select if they were willing to undertake a follow-up one-to-one interview over Zoom as part of Phase 1. Three final year students participated in follow-up interviews. End-of-year surveys were distributed to final year students in October 2020 to capture their experience across the full academic year. The final year student response rate to the end of year surveys was 67%, as shown in Table 1.

Table 1
Student response rates from Monash University final year students

	Phase 1 responses	End of year responses
Surveys sent out	37	36
Surveys completed	17	24
Response rate	46%	67%
'Yes' to follow up interview	7	NA
Follow up interview conducted	3	NA

A Phase One responses

The results of the Phase 1 surveys and interviews were analysed around six themes:

- Online teaching and learning;
- Clinical placements;
- Clinical skills and simulation;
- Being part of a rural cohort;
- Perceptions of assessment, academic and clinical progress; and

- Perceptions of safety.

This paper focuses on the results from the final year students in relation to the theme of clinical skills and simulation.

In Phase 1 there was overwhelming support from the final year students for the effectiveness of the changes made in the simulation centre in response to COVID-19. In fact, more than 80% of students who responded in May felt the changes had been moderately effective or an improvement. The smaller group sizes in simulation sessions was singled out by final year students surveyed as the most effective change that they experienced in the program:

The smaller group sizes are very effective and powerful in letting us immerse in the clinical environment (Survey Response 3)

We now do simulations with 4 students (vs. 8). This is a lot better and more realistic to the size of teams we actually work in (Survey Response 8)

Smaller groups allows (sic) more focused teaching and hands on training (Survey Response 1)

In the Phase 1 interviews, the fifth-year students responded unanimously that the changes to the simulation program had been extremely beneficial. One final year student made the following observations:

The clinical skills and sim (sic) lab, what we have done in there has been fantastic... because there are fewer people you have to take on more responsibilities at once ... There is more feedback for each person because of more time but also because you've been noticed a bit more by the clinician. You get the opportunity to run through it twice if you need to and swap roles. I think it's been really positive...the sim lab is definitely one of my favourite parts about 5th year teaching and I think it has shifted my thought process and my confidence to be able to respond.... I know it's not always practical (to keep changes like this) because of budgeting and staffing requirements but the smaller the groups the better! (Interview 1)

Another student offered the following reflection about the importance of the 'safe space' of simulation in the pre-intern year:

They (the simulation sessions) were probably the best teaching I've ever had. I think part of it was that we had very small groups because of the restrictions on people. They used to have 8 people at a time and this time we only had two people going in... It felt like the real thing... getting thrown in the deep end with a patient who rapidly deteriorates on you and it's a safe space ...and you go back and have debriefs afterwards... it's safe to talk about what happened. (Interview 2)

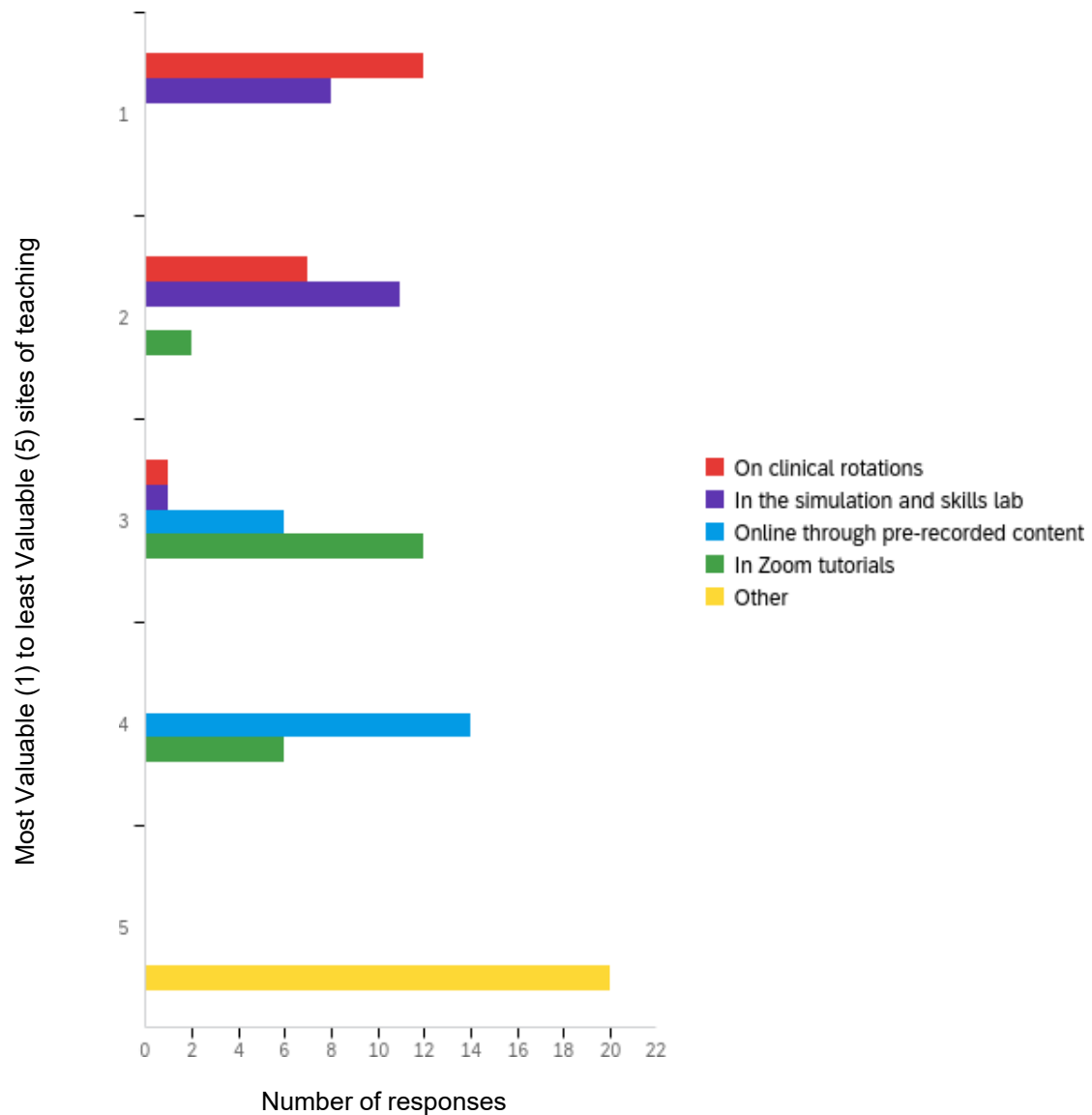
Another student reflected on the smaller sized simulation groups being much stronger preparation for the realities of being an intern:

Simulation sessions have gone ahead in person albeit with smaller groups and the smaller groups of 4 are actually better than the groups of 8 which is what we (are) used to do. So previously groups used to be 8 people and you would go in to assess a patient in groups of 4... Now the idea of sims (sic) is to get us used to responding to a clinical issue and learning how to put our knowledge into practice. In a hospital as a junior doctor you'll commonly get called in to a patient with low blood pressure but you won't walk in there with four colleagues, that doesn't happen. You walk in there with yourself and maybe a colleague will come with you like another intern or a resident from your team, but often it's just one person. So, I felt like we were actually simulating what we do as an internal resident ... I felt like I was actually simulating what I would do, not just a big room full of doctors, people pretending to be doctors. Also, a big group allows the quiet people to really drift away, sit in the corner, put a canular in the arm. But with a group of two there's no real hiding there...I loved it. I'd be really disappointed if they went back to larger groups. (Interview 3)

B End of year feedback

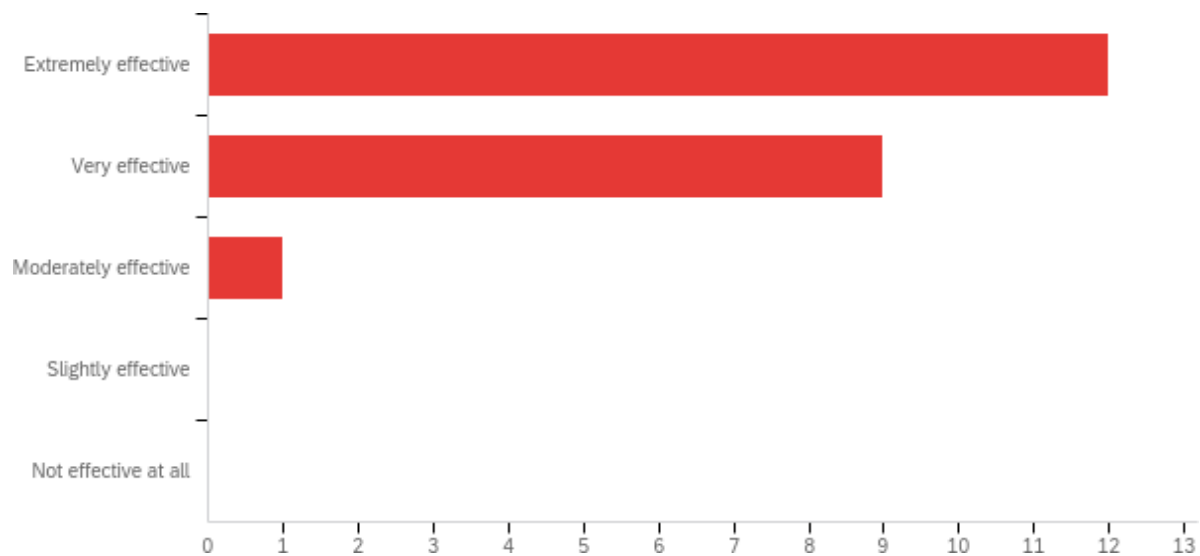
When the students were surveyed in October 2020, the majority of final year students identified the simulation and skills lab as being in the top two of the most valuable sites of teaching for them, alongside clinical placements, shown in Figure 2.

Figure 2
Final Year students ranking of most valuable (1) to least valuable (5) teaching in 2020



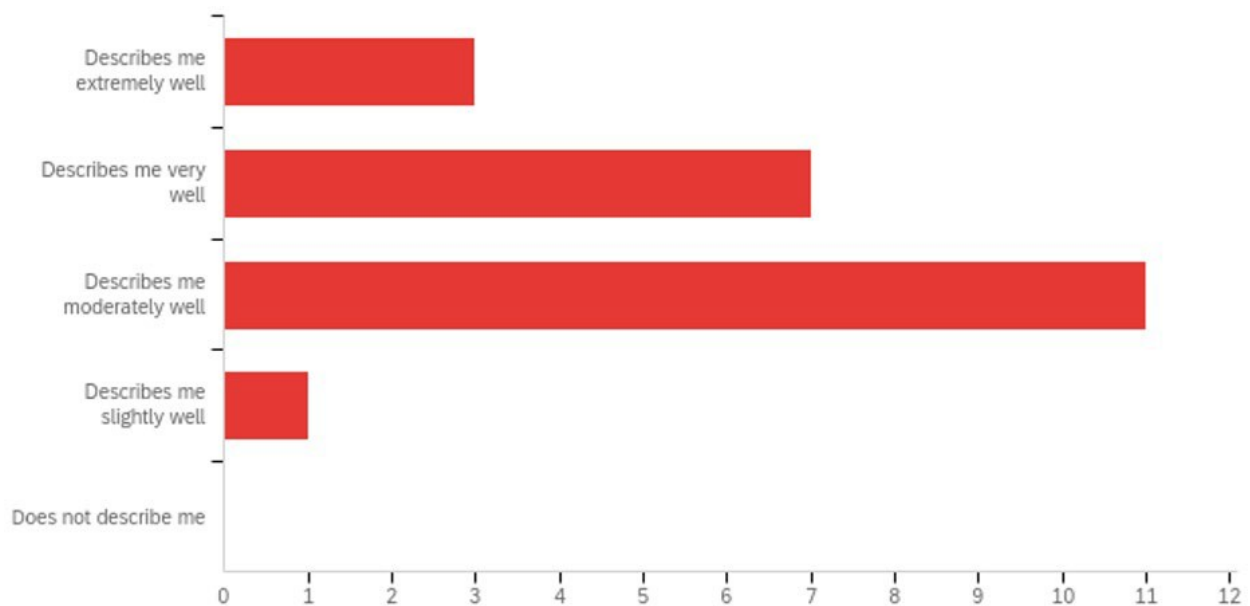
More than 90% of respondents to the end of year survey rated the learning in that setting as very effective or extremely effective as shown in Figure 3.

Figure 3
Final year students' opinion of the effectiveness of clinical skills and simulation teaching in 2020.



When asked to respond to the statement 'I feel ready to be a doctor', all final year students who responded to the end of year survey said that statement described them well to some degree. More than 40% of respondents said that statement described them very well or extremely well. The majority of the other respondents said it described them moderately well.

Figure 4
Final year student readiness to be a doctor



When asked what other clinical support students would like to see added in Bendigo for future students, final year respondents universally said that more simulations would be the most useful addition.

VII CONSOLIDATION IN 2021

In 2021 this teaching model has continued in part due to the ongoing restrictions related to the pandemic. Final year students are once again mostly based in one location, instead of moving between metro and rural campuses. Social distancing requirements are also still in place, and this enables the model to continue and allows for student learning in this environment to continue uninterrupted.

In a mid-year evaluation conducted with the 2021 final year students at Bendigo (MUHREC ethics approval project ID 28853), the simulation sessions were ranked the most effective teaching and learning activity by students with a mean score of 14.54 (shown in Table 2).

Table 2

Responses to the question 'How effective have the following teaching and learning activities been for you in first semester?'

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance
1	Clinical rotations	13.00	15.00	14.31	0.72	0.52
2	Simulation sessions in the CSSC	14.00	15.00	14.54	0.50	0.25
3	Clinical Skills sessions in the CSSC	12.00	15.00	13.83	0.90	0.81
4	Content delivered online	11.00	15.00	12.85	0.95	0.90
5	HMO tutorials	13.00	15.00	14.15	0.53	0.28
6	Other tutorials	12.00	15.00	13.40	1.02	1.04
7	Other	14.00	14.00	14.00	0.00	0.00

In fact, simulation education has been deemed even more effective than the clinical rotations students have completed on hospital wards and other clinical settings in the first part of 2021. More than 46% of respondents to this survey rated the simulation sessions 'Very Effective' and more than 53% of respondents rated these sessions 'Extremely Effective'. Further, several students identified the simulation sessions as being the 'most valuable' teaching that had happened so far in 2021.

VIII

DISCUSSION

The benefits of the changes made in the Clinical Skills and Simulation space during 2020 in response to the disruption of COVID-19 were identified and obvious to students in the early stages of the evaluation. In both the survey responses and interviews conducted in Phase 1, students independently identified the changes made to simulations as being beneficial. In particular, students identified the benefits of the smaller groups, the requirement to 'do more' during the simulations, and the increased individual attention and feedback they were able to receive from the clinical educators. Students felt that this 'pair approach', as opposed to the larger 'MET' call model, more closely resembled what they had witnessed on hospital wards. They also noted that the simulation environment gave them a safe space to hone their skills and apply their knowledge in preparation for taking on the role on intern in 2021.

The fact that the simulation space was ranked alongside clinical placement as one of the two most valuable sites for teaching and learning in 2020 is a very strong endorsement for the work being done in the Clinical Skills and Simulation Centre and reinforces how central this experience is to clinical education in Bendigo. It also reflects that the changes and adaptations that needed to be made, first in response to the curriculum changes and then in response to the COVID-19 pandemic, were received very positively by the students.

The central curriculum changes that were scheduled for 2020 had to be adapted and modified again in response to the COVID-19 pandemic. Even though the same number of simulations were retained in the curriculum renewal, when asked what other clinical support students would like to see added for future students, 'more simulation' was universally identified as the most useful

addition. This response indicates that students view simulations as one of the most valued and valuable teaching tools available in medical education.

Indeed, it would appear that simulation education in 2020 was a key factor in ensuring that the 2020 cohort of final year students felt ready to become doctors at the end of that year. This is a remarkable achievement in a year in which so much higher education was disrupted or put on hold. This development in 2020 was consolidated in 2021 and has shown that in a time of prolonged interruption to clinical education, simulation education can prove to be a very effective substitute or supplement to ward-based teaching. This experience is significant due to the extra stress being placed on the hospital systems during the pandemic. Simulation education offers a very effective alternative that students rate just as highly as the learning they experience on the wards.

The challenge is how to make this more resource-intensive model sustainable into the future. The additional staffing requirements of the new model place an additional strain on the clinical educators under the current staffing allocation. These issues and requirements are being considered as part of a planning and restructure process currently underway in the Centre.

IX CONCLUSION

In summary, all educators and students were learning and responding on the run in 2020. In the case of teaching final year medical students at Monash Rural Health in Bendigo, the pandemic has led to innovation and improvement, according to the students, particularly in the simulation space. The main impact of this was a greater focus on smaller groups in simulation settings. The smaller groups and the shift away from the 'MET team' simulation left the students feeling better prepared for their impending intern year. Both staff and students are conscious that this model is more resource and time intensive, but the student experience and feedback indicate that it is worth the investment. The experience of the last two years indicates that simulation education in a clinical setting provides a very effective alternative to ward-based teaching if the latter becomes less possible due to the strain the COVID-19 pandemic puts on health system. If clinical education sites are able to rely on the continuity of simulation-based education, then it may enable the education of medical and other health science students to continue despite the interruptions of health pandemics. A possible next step would be additional follow-up with the 2021 and 2022 cohort of interns to measure the true value simulation education had in preparing them for what they had to do in their first year as doctors.

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