Synchronous Clinical Simulation: An Effective Teaching Modality in Medical Education During COVID-19 and Beyond

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Background

The spread of COVID-19 forced many countries including Malaysia to switch from on-campus learning to exclusively online learning. The modality of the synchronous session allows the learners to interact with the instructor and obtain instant feedback. The purpose of this study was to evaluate the effectiveness of synchronous simulation among medical students in clinical years in the absence of hospital-based clinical education.

Methods

This was a prospective observational study involving 54 clinical year students, conducted in the simulation lab at International Medical University. Scenarios for each session were built around clinical skills targeting specific learning outcomes. The perception of the simulation session was evaluated using a 5-point Likert Scale. Synchronous debriefing followed each simulated session allowing active participation by all students. Focus group discussion was conducted among 6 students who volunteered representing online participants to obtain feedback on their learning experience.

Results

The highest mean scores were obtained for the items referring to team communication (4.09±0.734), debriefing (4.06±0.811) and timetabling (3.92±1.007). Results from the focus group discussion revealed that: simulated sessions assisted in application of knowledge by observing their peers; the repetitive process of observing and performing was preferred over observing per se; observing the performance of peers from the same cohort was preferred, and critiques on technical logistics were reported.

Conclusion

The synchronous simulation sessions were well received by the students. It is believed that this will be a novel teaching modality to adopt even after the passing of the pandemic.

Keywords: *Clinical teaching, medical student, medical education, simulation, synchronous, teaching modality*

Introduction

COVID-19 led numerous governments to execute lockdown plans to contain the spread of the virus. As a result, on-campus learning was phased out in favour of online/distance learning.[1] Due to the cessation of hospital-based clinical training, students in the clinical year have been at a disadvantage in medical schools around the world. However, this does not imply that clinical exposure and experiential learning are no longer available. Since the pandemic lockdown began, researchers have been looking for ways to adapt to the new normal without jeopardising learning, particularly in medical education, which relies heavily on patient interaction for experiential learning.

Simulation is a method or technique to produce an experience without going through a real event. It is a useful modality to supplement training in real clinical situations and has an established role in the education and training of healthcare professionals. It has great potential to help alleviate the negative effects of the COVID-19 crisis.[2-4]

Synchronous learning is not new, and it includes online methods such as video conferencing, live-streaming lectures, teleconferencing, and live chatting. Synchronous simulated learning is simulated

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learning that is real-time where groups of students watch peers experiencing clinical simulation sessions and participate in the discussions after the sessions.[5,6]

Nothing, after all, beats face-to-face instruction. To maintain physical distancing and reduce over-crowding in the wards, in line with the guidelines by the Ministry of Health and Ministry of Higher Education, our medical school decided to permit clinical year students in year 4 and 5 to return to campus and the wards in small groups but with many limitations to ensure safety. This meant that many students were still marooned at home with an online tutorial, task-based learning (TBL), and case-based discussions.

Methods

To address this new challenge and to provide some clinical experience to those who could not get enough face-to-face time, we decided to run a synchronous simulation in which clinical year students observed their peers perform in a safe simulated environment in real-time. Thereafter, a synchronous post-simulation debriefing was conducted. We believed that by doing so, they would be able to improve their clinical knowledge and be more effective when they were permitted back into the wards once the pandemic ended.

Study Design

This was a prospective observational study involving 54 clinical 4th year students during the emergency posting which was conducted in October 2020 at the clinical skills and simulation lab on the clinical campus of International Medical University, Malaysia. The target groups were small groups of students timetabled and allowed on campus when COVID-19 restrictions were eased. Consecutive small groups of 9-10 students attending class were selected and invited to participate. All students were briefed on the process and were willing to allow live streaming of their sessions for their peers watching from outside campus due to the restriction of numbers allowed on campus. Written consent was obtained from students participating in the onsite simulation before the enrolment. All students invited from each small group consented. Students were from the same cohort, but not the entire cohort was recruited.

The conceptual framework of the Synchronous Simulation Learning Cycle was developed based on Kolb's Experiential Learning Cycle theoretical model.[7] Scenarios for each session were built around clinical skills targeting specific learning outcomes. Synchronous debriefing followed each simulated session allowing active participation by all students.

Clinical skills included in the scenario designs

The scenarios for each session were built around clinical skills targeting specific learning outcomes for the 4th year students. The clinical skills included psychomotor, communication, procedural, clinical reasoning, interpretation of data, teamwork, attitude, patient safety, ethics, and professionalism.

Resources Utilised

IT support was required to manage the internet platform, Microsoft Teams, and high-fidelity manikin (Laerdal 3G). Simulation Lab was equipped with essential medical equipment including defibrillator, resuscitation trolley, drip stand, intravenous fluid, syringes, personal protective equipment (PPE), airway, oxygen therapy devices, and simulated patient records.

The session was conducted in three parts:

Part I

1. Online instructions with details of the flow of the session.

2. The sessions were scheduled in the timetable.

3. Scenarios were prepared, programmed, and tested before the teaching session.

4. Staff were informed in advance of the required resources for the day and type of moulage.

5. We identified and ensured that the fidelity of the learning environment was appropriate to the scenario.

6. A short pre-briefing was carried out before the synchronous simulated session for the learner onsite and those online to ensure they were on the same page.

7. The interactive features of the manikin and system in the simulated setting were introduced and informed to the students.

8. As with any simulated session, we created a safe psychological environment, reinforcing the need for respect, confidentiality, and trust among all onsite and online students who participated in the session.

9. Consent for recording was obtained from students.

10. Safety of onsite participants was ensured by following the school's pandemic safety guidelines.

11. Finally, students were given the scenarios and sessions were carried out.

Part II - Synchronous Simulation session

The session on average, lasted for 15 minutes and the flow was controlled by the faculty in charge. At the end of that experience, there was a synchronous debriefing followed by a questions and answers session with the students. The Kolb Cycle[7] was used to create a conceptual framework to understand and describe the Synchronous Simulated experience. (Figure I & II)
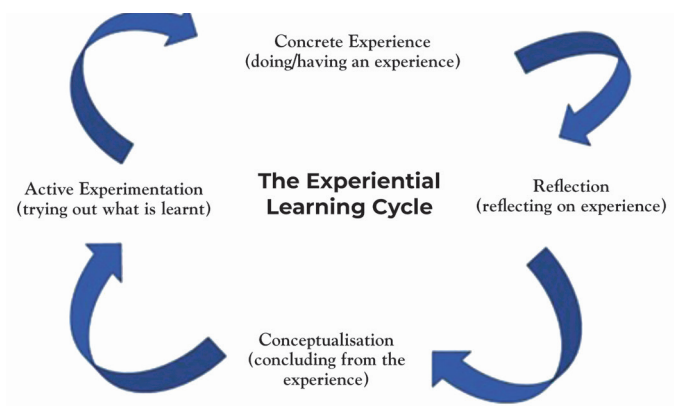

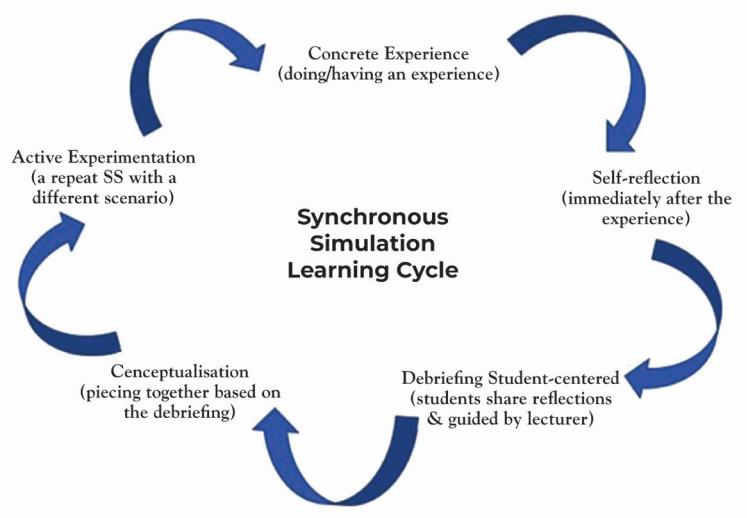*Figure I: The experiential learning cycle*

Figure II: Synchronous simulation learning cycle

Part III - Evaluation of Synchronous Simulation session

A focus group discussion was carried out with 6 students who volunteered when an invitation for session to obtain feedback on the learning experience was sent out to represent the online participants. Data were analysed using SPSS Version 25.

Data Collection: The simulation session was evaluated using a 5-point Likert Scale.

Focus group discussion was conducted among six students representing online participants to obtain feedback on their learning experience.

Results

Statistical Analysis

This 5-point Likert questionnaire was used to measure the students' perception on simulated session. The frequency was collapsed into Agree, Neutral and Disagree. The mean, standard deviation and the median were calculated using 5-point Likert scale.

The highest mean scores of 4.09 (SD = 0.734), 4.06 (SD = 0.811) and 3.92 (SD = 1.007), respectively, were obtained for the items referring to understanding team communication, debriefing discussions, and the need for a timetabled session. However, the synchronous sessions should be timetabled so that all the students will be able to participate in the debriefing discussions from home. (Table I)

Table I – Students' perception on the simulation experience (n=54)

NO	ITEMS	RESPONSE	FREQ (%)	MEDIAN	MEAN (SD)
1	These sessions built my confidence to face the actual clinical situations	Agree	34 (62.94)	4.00	3.56 (0.945)
		Neutral	11 (20.4)		
		Disagree	9 (16.66)		
2	I believe that these simulated sessions prepare me for the actual clinical environment	Agree	37 (68.52)	4.00	3.61 (0.979)
		Neutral	7 (12.96)		
		Disagree	10 (18.52)		
3	I will learn faster (shortened learning time) when I start in the actual environment after the simulated session	Agree	39 (72.22)	4.00	3.85 (0.899)
		Neutral	11 (20.37)		
		Disagree	4 (7.41)		
4	I now understand closed loop communication in a team	Agree	44 (81.48)	4.00	4.09 (0.734)
		Neutral	9 (16.67)		
		Disagree	1 (1.85)		

5	These sessions helped me understand clinical reasoning	Agree	41 (75.93)	4.00	3.87 (0.848)
		Neutral	8 (14.81)		
		Disagree	5 (9.26)		
6	I was able to see the students' performance clearly	Agree	24 (44.44)	3.00	3.22 (1.269)
		Neutral	14 (25.93)		
		Disagree	16 (29.63)		
7	The debriefing discussion was helpful for my learning	Agree	46 (85.20)	4.00	4.06 (0.811)
		Neutral	4 (7.40)		
		Disagree	4 (7.40)		
8	The session should be timetabled	Agree	37 (68.52)	4.00	3.92 (1.007)
		Neutral	11 (20.37)		
		Disagree	6 (11.11)		

Discussion from the focus group revealed that: simulated sessions assisted in the application of knowledge by observing their peers; preference for the repetitive process of observing and performing than observing per se; observing the performance of peers from the same cohort was preferred, and critique on technical logistics were reported.

Reliability Analysis

Internal consistency of the eight items was measured using Cronbach's alpha index which estimated a value of 0.878. This value was generated without discarding any items, which is considered very good for a test based on Kaplan and Saccuzzo's threshold.[8] All corrected item-total correlations (CITC) were above .30. The lowest CITC is .521 for Item 4 which revealed a squared multiple correlation as 50.9%.

Discussion

Synchronous simulation is not new but was not the first choice for teaching and learning as face-to-face simulation was the preferred choice. Nevertheless, it has been utilised and found useful for remote teaching and learning. The pandemic has made us rethink how to innovate and optimise teaching and learning to ensure that the clinical training of medical students is not compromised.[1] Our students, being accustomed to face-to-face learning have had to adapt to this change unwillingly. Students stated that they still preferred to be in the real environment as they felt their learning would be more meaningful. (Table II)

Table II – Focus group discussion and feedback from students who participated online

No.	COMMENTS
1	**Theme 1: Clinical learning** • The simulated sessions help revise what has been learnt • Watching in itself may not help but getting to perform and then watching again would be better (repetitive) • I prefer going to ED and watching in the real environment • Unable to see certain actions by participants because the view is blocked by them. • I think watching a peer from the same cohort would be better than watching seniors because we may not have the knowledge the seniors have • I suggest that we replay the video recording during the debriefing so that we can see what we missed
2	**Theme 2: Logistics** • Audio occasionally echoing • Maybe each student in the simulation room should have a microphone on them • I used earphones (with muffs) while watching so I was able to hear well • During the debriefing, we could not see the comments written by the group watching their peers perform

The questionnaire showed good internal consistency thus underpinning the data obtained from students. For the item on confidence, 62.94% (n=34) said the workshops helped them feel more prepared to tackle real-life clinical scenarios when they got to the simulation lab. Following these sessions, they believed they had a better understanding of clinical reasoning (75.93%, n=41) and closed-loop communication (81.48%, n=44) when they got to go to the ward. It is possible that comparing true face-to-face learning to synchronous learning is not fair. It is more meaningful to review and identify the gaps after one begins synchronous learning to make the sessions meaningful and feasible given the current situation. Given that most teaching fraternity believe that learning in an actual setting is the gold standard for being clinically competent, it is no surprise that students believe the same. Their expectations have been pre-set and conditioned by traditional teaching practices and they enter medical school expecting to become competent doctors only if the teaching is such. Little wonder that almost all the respondents felt they would need to be in an actual environment to learn effectively and gain confidence. (Table II) Setting up a pre-session briefing, setting ground rules with the students, and making clear the expectations of the synchronous simulation sessions before the sessions has been found to mitigate negative perceptions

among students and promote better participation.[9]

The challenges were the technical issues, individual student expectations, faculty buy-in and changing availability of on-campus learning. Others seem to have had similar challenges with the synchronous sessions.[6] To overcome the issues with the audio and visuals of the simulated sessions during the debriefing, students suggested recording and replaying of the simulated sessions during the debriefing session.

Conclusion

This evaluation that we conducted after initiating the synchronous simulation has been very useful, as it has helped us identify areas that need improvement. It has also given us an insight into the students' perspectives and opinions as being the recipients of these sessions. We have begun to make changes and intend to, after a period, re-evaluate to ensure that the synchronous sessions at the very least be adjuncts to actual clinical learning since the restrictions led by the pandemic are most likely going to stay indefinitely.

The students were receptive to the sessions as these were the closest to the actual experiences at the peak of the pandemic. These sessions can still be conducted synchronously to support the face-to-face sessions that are also still limited after the pandemic.

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