

## Computer-based Simulation and Online Teaching Netiquette in the Time of COVID 19

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### Abstract

COVID 19 posed multiple challenges in various domains of medical education. One of these was the inability to conduct face to face training and teaching, which had always been the norm and cornerstone of medical education. Utilizing the concepts of simulation-based learning, computer-based learning and simulation, the use of virtual patients with problem-based learning, we embarked on training the medical students who could not be physically posted to work in the clinical environment in view of the risks involved with the COVID pandemic.

In this paper, the author shares the concept of computer-based simulation to meet the set learning objectives, the administrative support, the roles and responsibilities of faculty and facilitators. The issue of fidelity as well as interfacing is also highlighted in maximizing the experience of the learners, who are part of a virtual team. Computer-based simulation can also be an effective tool to enhance critical thinking and clinical reasoning capabilities.

With the greater load of training being conducted online, it is also timely to remind faculty of the netiquette of online and virtual teaching. It refers to a set of core rules that outlines what should and should not be done online, in maintaining common courtesy.

**Keywords:** *Computer-Based Simulation; Virtual Patients; Equivalence Hypothesis; Fidelity; Simulation*

### Introduction

COVID 19 posed several challenges which affected healthcare workers, in particular frontline staff. The need for PPE (personal protective equipment) has become routine at the front line and in isolation wards in particular. There has been an increase in manpower requirements as well as the need for safe distancing [1]. During the early phases of the COVID 19 pandemic, medical students were not posted to the Emergency Department (ED) and their education and training were conducted virtually. Even as we realize the value of embedding students in the clinical teams and clinical environment, it was not possible to take the risk with COVID 19 then. There was essential online and e-learning conducted. Reading materials were sent by email to the students, as had previously been practiced, with the introduction of the 'flipped classroom model' [2]. Thematic tutorials were also uploaded on our password protected blackboard system. For the simulation components, as there was no face to face interaction allowed, computer-based simulation (CBS) was used.

Simulation in healthcare represents an instructional medium utilized for a multitude of purpose such as preparedness, planning, education, assessment, as well as research. It is applicable on a variety of platforms, from undergraduate to graduate education, faculty development and continuing education for practitioners [3,4]. The types of equipment and technology available today have also increased exponentially, from the simple task trainers and models, to low-fidelity, medium-fidelity and high-fidelity manikins. The use of virtual and augmented reality capabilities for training and education is also gaining traction [4]. Simulation-based educational activities and training mostly tap on the principle of experiential learning within an immersive environment. It focuses on two important factors [4]:

- Repeated practice for mastery of skills and.
- The principle of deliberate practice.

Computer-based simulation may not represent the replacement of the actual clinical exposure or the high fidelity simulation, as the students have been used to. However, it was deemed to be useful and relevant as an alternative option, as it can help inculcate clinical reasoning and clinical management skills [5-12].

CBS is the use of a computer for the imitation of a real world process, situation or system. This is where technology is used to enhance, augment or even at times, replace real life simulation. It can certainly acquaint learners and students with the prelude to their real life experiences. It can also provide the students with the opportunity to realize the areas for potential improvement [6,13]. CBS can also be integrated with the use of 2- or 3-dimensional objects and environment to create an immersive and engaging learning experience. It can also be a bridge towards manikin-based simulation or the actual clinical exposure and practice, which would likely be introduced once the COVID 19 pandemic stabilizes [2,6,14].

### Preparations and requirements in CBS

#### The learning objectives

The objectives for the simulation component for the medical students Emergency Medicine (EM) clerkship were set as:

- To demonstrate the ability to conduct focused history taking
- To demonstrate the ability to generate differential diagnoses based on the relevant information gathering
- To demonstrate the ability to prioritize investigations and execute management of patients in the ED
- To demonstrate the ability to communicate and work with team members
- To strengthen their clinical reasoning skills.

#### The administration support

Adequate conceptualization and planning of the framework is important. The roles and responsibilities of the administration staff would include:

- Scheduling the sessions by matching students' and faculty's time.
- Preparing the link and instructing students and faculty.

- Sending out instructions on the necessary steps, uploads and code of conduct. These may include steps to test audio and video. Everyone is encouraged to use their personal computers or laptops, as mobile phones will not be able to access all the required details and screens.
- Dividing students into the small break-out groups. During these CBS sessions, one group of 6 students will be active participants, whilst another group of 6 students will be observers. This will then be switched with the subsequent scenarios.
- Setting the confidentiality agreement. In view the session will share images and details of patients, their investigations, results and management, this is important. Even as anonymization may be used, this is still important to be carried out.

### The role of faculty

The faculty are the Emergency Physicians (EPs) in the department who are used to training and mentoring students. They would have been trained as simulation instructors. Their responsibilities included:

- Preparing the scenarios, gathering the data related to the cases as well as the investigations, results and images. Presenting realistic and good scenarios is important. Some faculty prefer to segment the scenarios into smaller bite-size parts, like telling a story in several chapters. Each “chapter” has its own objectives, learning goals and competencies to be achieved. This can be one of the methods to ensure an active learning process as some learners may lose focus and be unable to concentrate if the cognitive load is high, as with a very long or complex scenario.
- They have to conduct the pre-brief to the students. Instructions pertaining to their participation will be shared. For example, when one group of 6 students are actively participating in the scenario, the other group of 6 will have their microphones “off” as they will only be involved during the debrief phase. This will then be reversed so that all groups will have their turn “on the hot seat”. Instructional methodology can be critical in determining the experience of the learners during the CBS.
- Conduct the debrief session and share other necessary observations and learning points.
- Faculty also will have to decide whether there will be any assessment done and if so, what kind of assessment will be conducted. It can range from an experiential learning session with qualitative feedback during debrief to formal individual skills or team based performance scores.

In the end, serendipity can add to the excitement of teaching, with the hope of keeping the learners excited about knowledge and skills acquisition as well as nurturing the appropriate behavior [5,13,15].

### Pre-brief

The students must be given adequate prior information and instructions in order for them to maximally benefit from the CBS sessions. Each group of 6 students will be instructed to allocate the roles as below when they function together as one team [14-16]:

- The Team Leader, who is responsible in leading the team, taking the focused history, asking for significant examination findings and vitals signs, ordering the investigations and getting the results, arranging the bed for admission etc.
- The ‘Airway Person’, who assess and manages all issues related to the airway.
- The ‘Procedure Person’, who is responsible for procedures, cannulation, venipuncture, defibrillation, insertion of chest tube etc.

- The ‘Circulation Nurse’ who takes the vital signs, perform chest compressions, communicates important information to the team.
- The ‘Medication Person’ who administers all the relevant drugs, infusion etc.
- The ‘Nurse co-lead’ who assist with documentation, recording, time-stamping and communicating important information to the team.

The students will have to be instructed to be clear in their communications and as they will not be actually “performing” the procedures, they will have to describe and state this succinctly. Other factors such as their active participation, suspending disbelief, maintaining confidentiality and the proper etiquette will also be covered [3]. As some students may be participating in this activity for the first time, they will be encouraged to ask questions in order to clarify their doubts. If a virtual patient is used, they will represent the interactive digital simulation components of the clinical scenarios for the purpose of educating [10,11].

### The stages of computer-based simulation

The stages of the CBS comprises of similar steps as in manikin-based simulation [3,6,7]:

1. Pre-brief (as above), whereby the relevant instructions and information is shared, assignment of roles is done and familiarization takes place.
2. The Simulation: This is where the student-centric simulation takes place. There will be tasks involved: patient assessment, appropriate decision making and interventions, ordering investigations and interpreting their results, administration of relevant medication and reviewing the list of differential diagnoses.
3. Debrief: This is similar to manikin-based simulation but conducted virtually through the computer screens. As it is not face to face, some familiarization and getting use to by the faculty is necessary. This is also a critical phase whereby learning and reflection will take place. Any debrief model, comfortable with the faculty can be adopted. It is also possible to have a co-debriefer, but coordination between them is important so as not to confuse the learners.

### Fidelity, interfacing and outcomes

Fidelity refers to how close to reality a situation or element is. With manikin such as the 3G Simman, the fidelity of manikin-based simulation based training has been taken up one more notch. For CBS and simulation in the virtual environment, fidelity also refers to how learners interact with the set objectives, characters/people in the scenarios, as well as their (virtual) team-mate [16-18]. Technology can be used to vary the fidelity. In planning the sessions, faculty must always bear in mind the fine balance between the use of technological advancement and their educational effectiveness. This may be varied according to the objectives of each teaching session as well as the specialty involved. For example, the higher fidelity setting is usually more valuable for assessing teams training and dynamics, communications as well as the handling of complex clinical scenarios [19-21].

In the execution of these scenarios during CBS, there is active interaction between the interface and the learners or participants. This could be in the form of audio, visual or even touch capabilities. Some examples would be the use of touch screen, mouse clicks and even voice prompts [16]. With technology haptic feedback is getting more popular as a form of ‘hands-on’ practice. In some cases, virtual patients are used in CBS. This is also an active form of learning beneficial to meet objectives such as enhancing clinical reasoning skills. Thus, CBS does offer a spectrum of flexibility in terms of planning, execution and even assessment of learners. It is customizable to what competencies are being tested and assessed.

### Virtual teams

In our CBS sessions, the students worked in groups of 6, with the assigned roles and responsibilities (mentioned earlier). Team dynamics and communications is assessed. On other virtual platforms, the team members can be virtual characters, animation or avatars. These so called virtual teams perform in the virtual environment, which utilizes images of places such as wards, intensive care units and other views of the hospitals' rooms. Team members too may have an influence on fidelity depending on their behavior, personality, capabilities and performance. Feedback after the scenarios will be delivered to the teams and demonstration can even be conducted to showcase appropriate behavior and action as needed. With some systems, feedback on team performance can even be assessed by scores generated by program software which has been incorporated during the planning stages.

### Advantages of computer-based simulation

During the COVID 19 pandemic when face to face interactions have to be curbed, CBS offered an alternative as teaching must continue. We used it with a view as bridging towards manikin-based simulation and clinical embedding. It is with the hope that this can help improve confidence and deepen understanding in the interim period. CBS offered a lot of flexibility and convenience and can even be scheduled outside curriculum time. This was extremely help as many of our frontline faculty were busy working long hours at the hospitals. It could be slotted in relatively easily, even with team members at different locations. The cost of using CBS was reasonable and we were able to have unlimited repetitions at the learners' request [6,10,11,14]. The teams can be evaluated in real time, just like in the other forms of real life simulations. The range of cases can be from simple to more complex ones, planned to meet the objectives. Creativity and innovativeness can also be applied as relevant. Some of the learners preferred CBS as it reduced their performance anxiety [18,19].

### The equivalence hypothesis

The instructional methods used should cause learning to take place regardless of the medium utilized to deliver the instructional method. This is important for teachers to be aware of, especially with the expansion and growth of the virtual and computer-based learning techniques today. This original idea has been broadened to include the physical context of learning, e.g. computer-based learning at home versus in school, or virtual learning done at home and in school [22,23]. The underlying theory for this is that learning depends on the cognitive activity of the learner during learning, which is primed by the instructional methods, whether at home, in school, or anywhere else. It is said the positive learning and motivational outcomes should be equivalent, according to The Equivalence Theory [22]. It was useful for us to be enlightened on this point as we planned more computer-based and virtual sessions during the COVID 19 pandemic.

### Etiquette for online teaching

As faculty are all now doing more online and virtual teaching, it is an opportuned time to reinforce some of the internet etiquette for online teaching, also known as netiquette [24,25]. It refers to a set of core rules that outlines what should and should not be done online, in maintaining common courtesy [25-28]. For more professional level communications such as medical teaching, this is also important. Even as the faculty is not physically present, face to face with the learners, it is still important to engage and communicate effectively with them. Their active participation and buy in is important as we want to encourage an open exchange of ideas, dynamic discussions and questions. Some of the recommendations for online and virtual teaching are as follows [24,29-32]:

- Be organized and structured in the approach.
- Address people appropriately, use the correct title.
- Keep the points clear and concise so that it is easy to get the message across without misinterpretation

- Pace appropriately. This may be varied if there are doubts and queries.
- Show presence “virtually”. Do not “off” the video.
- Communications:
  - Choice of words,
  - Pronunciation, clear diction.
  - Congruency of verbal and non-verbal communications cues.
  - Closed loop communication to reduce errors and ensure tasks are executed.
- Be a role model to the learners.
- Technology literacy helps. Prepare and test before hand.
- Do not dominate discussion, give the learners opportunities to join in and share. Faculty are facilitators.
- Keep an open mind and remain compassionate.
- Ask for clarification if there are unclear points.
- Maintaining confidentiality. It is important for faculty to remind the learners.

### Conclusion

COVID 19 has enabled us to see some major transformation in the way we conduct medical education. It has opened up our mindset to more progressive, forward thinking about the use of technology in keeping medical education dynamic. There has, over the years, been a big trend in more educational activities online such as the availability of Massive Open Online Courses (MOOCs), which are readily available and accessible to large numbers of learners.

CBS brings together and integrate strategies such as problem-based learning and virtual simulation that encourages active and action-based learning. CBS can also be a learning modality whereby learners train their clinical reasoning and critical thinking processes even before bedside clinical learning takes place.

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