



# Rapid Transformation from Face to Face to Virtual Simulation During the SARS-CoV-2 Pandemic: Impact on the Simulation Process during “The Little Room of Horrors”

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## ABSTRACT

**Objective:** 1. To explore the feasibility of a rapid transformation from face to face to virtual simulation and its impact on the simulation process 2. To explore the efficacy of a rapid transformation from face to face to virtual simulation and its impact on the simulation process.

**Methods:** The simulation process (preparation, pre-briefing, simulation, and debriefing) was investigated for feasibility and efficacy from the perspective of the educators and students. This study took place very early in the pandemic, thus highlighting the speed at which it needed to be conducted and acknowledging the limitations of technology at the time. The faculty ( $n = 3$ ) involved in the virtual simulation experiment and year one medical students ( $n = 61$ ) were invited to participate in the study voluntarily. The module chosen for this study was the Introduction to the Practice of Medicine, where the students were introduced to the concept of patient safety using simulation-based education. The “Little Room of Horrors” – is a simulation based educational session emphasising the importance of patient safety. Students were taken into a simulated medical ward that demonstrated common hospital-based errors. The learners were timed and asked to identify and document as many patient safety hazards as possible. The semi structured questionnaire was analysed using descriptive statistics and thematic analysis.

**Results:** The Educator's perspective reflected that virtual simulation was technologically dependent and had limitations during debriefing but was also a sustainable and portable standardised process. The student's perspective revealed that the objectives were met, and the session helped them support the theory previously learned. The average rating was 4.09 on a 5-point scale.

**Innovation:** When resources of the simulation center like space, mannikins, and faculty cannot be accessed for reasons like social distancing during a pandemic, virtual simulation was developed and used as a feasible alternative for our students without impacting the learning objectives.

**Conclusion:** This study demonstrates the use of virtual simulation as a valuable option for teaching when face to face simulation is challenging or not possible.

## 1. Introduction

Pandemics, such as COVID-19, disrupt academic environments through limited access to physical learning environments and catalyses, therefore, a rapid transition to a virtual environment (1). The primary reason for such a transition is to reduce the spread of infectious diseases in the community by breaking the pandemic chains of transmission (2). The COVID-19 Pandemic had a critical impact on the education system,

which has forced Universities across the globe to adapt to a new normal. To maintain high-quality medical education, faculty and staff are already in the process of transitioning to online platforms and actively seeking innovative technologies (2). Moreover, they will need to use emerging technologies that impact how their institutions will provide medical education in the future (3).

The COVID-19 Pandemic had a critical impact on the education system, which has forced educational institutions across the globe to

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consider innovative technologies and quickly adapt to a context while experiencing limited access to physical learning spaces such as simulation centers. A real challenge is transforming simulation-based sessions involving undergraduate medical students, often delivered on campus, with learning objectives that need to be addressed as stated in the course plans while using the existing digital learning ecosystem.

### 1.1. Aim

To maintain high-quality medical education, faculty and staff are forced to look for innovative technologies and are already in the process of transitioning to online platforms. This study investigates the impact of rapid transformation from face to face to virtual simulation on the simulation process during the educational activity “The Little Room of Horrors”.

### 1.2. Objectives

1. To explore the feasibility of a rapid transformation from face to face to virtual simulation and its impact on the simulation process.
2. To explore the efficacy of a rapid transformation from face to face to virtual simulation and its impact on the simulation process.

## 2. Methods

### 2.1. Context of study

At Mohammed Bin Rashid University of Medicine and Health Sciences [MBRU], simulation-based education is spiralled into the curriculum from the first year of the MBBS program. One such module is the Introduction to the Practice of Medicine, where the students are introduced to the concept of patient safety using simulation-based education. The “Little Room of Horrors” – is a simulation based educational session for first year medical students emphasising the importance of patient safety. During this session, students were taken into a simulated medical ward, demonstrating common hospital-based errors. After entering the room and reviewing the surroundings, learners were timed and asked to identify and document as many patient safety hazards as possible.

Due to the COVID-19 Pandemic, many universities worldwide, including all universities in the UAE, have closed campuses and moved courses online (1). Experiential learning can be restored through finding innovative ways to connect students with clinical context (4). There was a need to quickly convert the patient safety simulation session from face to face to virtual to avoid disrupting the program's schedule.

The transformation was attempted by preparing and delivering the face-to-face simulation session through a virtual module due to the COVID-19 Pandemic. The simulated medical ward experience was replaced by a prerecorded video created especially for this session. The entire simulation session was conducted virtually.

### 2.2. Participants

The faculty and staff ( $n = 3$ ) involved in the preparation of the virtual simulation experiment were invited to participate in the study to investigate the impact of this transformation on the simulation process in a patient safety simulation session when the time for transformation was limited and learning objectives unaltered.

Course participants comprised first year medical students ( $n = 61$ ) from the Mohammed Bin Rashid University of Medicine and Health Sciences [MBRU] in the United Arab Emirates. The students were invited to participate in the study voluntarily. They had previously experienced face to face simulation sessions in the Principles of Bioethics course conducted four months prior.

The students were divided into two batches to be attended on two consecutive days. The batch for the day was again further divided into two batches so that each group consisted of at most fifteen participants

per session. The pre brief, virtual simulation and debrief were conducted for one hour per group of fifteen students.

### 2.3. Study design

The study design is exploratory, focussing on the feasibility and efficacy of an intervention, which is changing a face to face simulation experience to a virtual session. The data for feasibility is collected at two levels. The first level is from the simulation team and the faculty involved in the session, and the second level is from the students, both collected through a questionnaire after the virtual simulation session.

#### 2.3.1. Intervention

A face to face simulation session was transformed into a virtual simulation using existing digital learning solutions (Microsoft Teams) in seven days. The approach adopted was to design a simulation process that could retain the authenticity of the experience in face to face simulations. This study took place very early in the pandemic, thus highlighting the speed at which it needed to be conducted and acknowledging the limitations of technology at the time. Table 1 outlines the virtual simulation session that was conducted for the students. (See Figs. 1 and 2.)

The impact on the process while converting the face to face simulation to the virtual mode was documented and analysed. The comparison (see Table 2, which describes the simulation process comparing face to face with virtual simulation) of both modalities presents key findings on how the simulation process was modified during the transformation to virtual simulation.

### 2.4. Data collection

We collected data at two levels.

We gathered feasibility data from faculty and the simulation team ( $n = 3$ ).

We collected data for efficacy from first-year medical students ( $n = 61$ ).

The data collected for feasibility from the simulation team was primarily qualitative and process focused. We collected it through focus groups and emails from the faculty and simulation team members who participated in the session. The areas discussed were the same as the simulation process in preparation, pre brief, simulation and debrief.

We collected efficacy data from the students, who were requested to complete a learner satisfaction survey through Microsoft Forms within a week of attending the session. After a week, the link was made inactive.

The study was approved by the MBRU ethical committee (Approval MBRU-IRB-2020-029).

## 3. Results

One can unravel the results in the context of feasibility and efficacy. We consolidated the feasibility data collected from the faculty and the simulation team into a table describing the benefits and limitations of the transformation. (see Table 3, Supplemental Digital Content 3, which

**Table 1**  
Outline of the virtual simulation session.

Duration (minutes)	Activity
5	<ul style="list-style-type: none"> <li>• Orientation to the group by facilitator and introductions</li> <li>• Explain house rules</li> </ul>
5	<ul style="list-style-type: none"> <li>• List objectives</li> <li>• Discuss Synopsis</li> </ul>
5	<ul style="list-style-type: none"> <li>• Play a video on patient safety</li> </ul>
15	<ul style="list-style-type: none"> <li>• Debrief the students on their observation</li> </ul>
5	<ul style="list-style-type: none"> <li>• Replay video on patient safety</li> </ul>
15	<ul style="list-style-type: none"> <li>• Time allocated to students for assignment review</li> </ul>
5	<ul style="list-style-type: none"> <li>• Wrap up and conclusion</li> </ul>

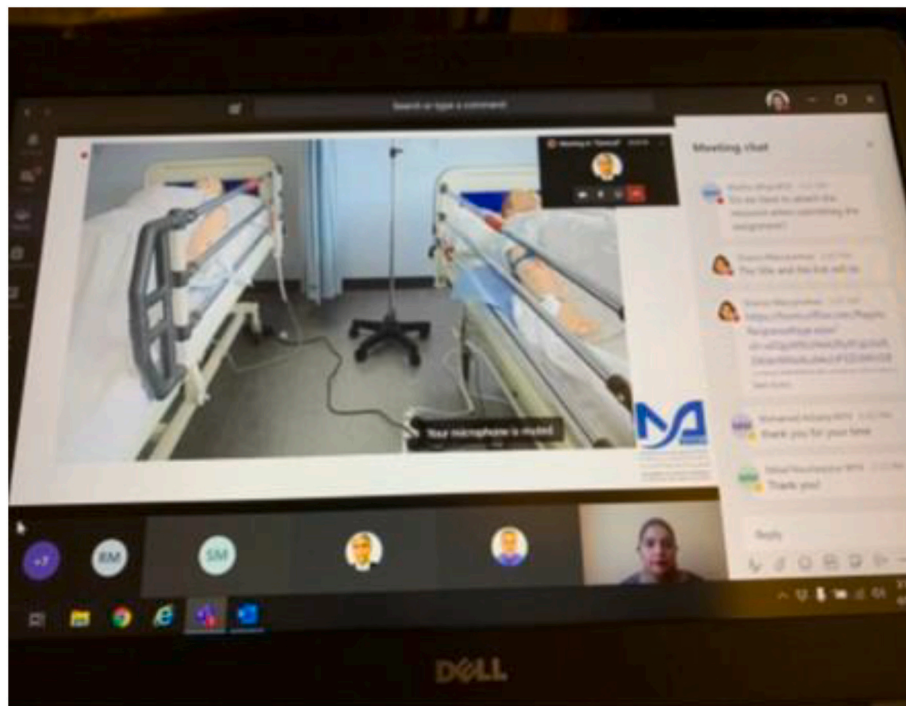


Figure 1. Screenshot Showcasing the virtual patient safety simulation session.

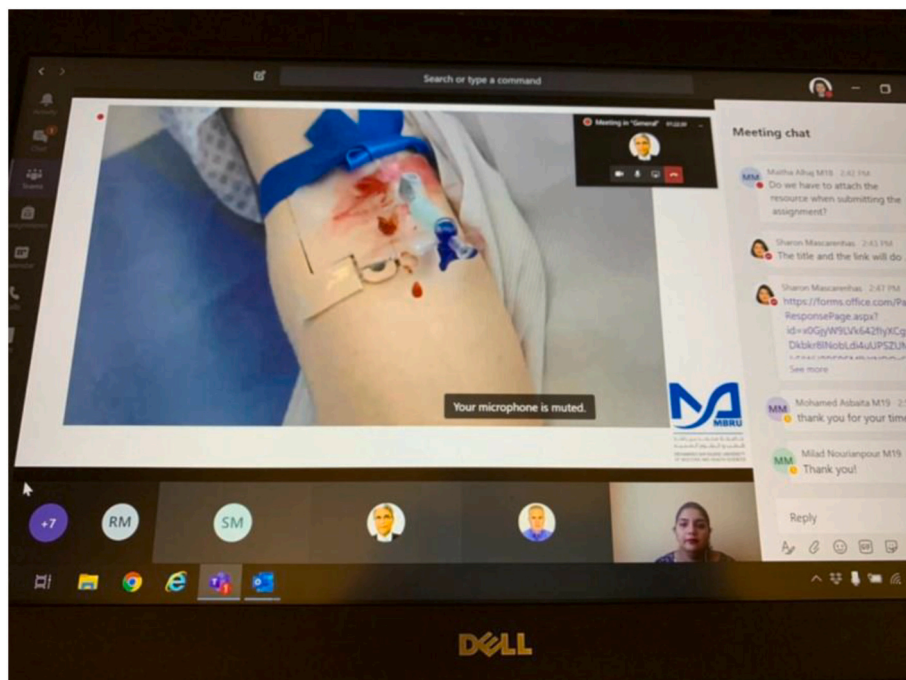


Figure 2. Screenshot showcasing the virtual patient safety simulation session.

describes the benefits and limitations of transforming a face to face simulation to a virtual simulation).

From the feasibility perspective, which included data collected from faculty and staff through focus groups, the preparation required less time than it would have taken for a face to face simulation, while dependency on other departments to create content increased. Although the prebrief went well virtually with exposure to minimum onsite risks, there were minimal cues available from students online. The simulation session ran smoothly, and the objectives were met, but no alternative

mode was available if the virtual system crashed. For the debrief, the students were engaged in the discussion, but the facilitator was unable to engage all the students. Another interesting point was that most of the students were speaking to the facilitator rather than with each other.

The efficacy of transforming a face to face simulation to a virtual simulation was explored by presenting year one MBBS students ( $n = 61$ ) who experienced the virtual simulation with a questionnaire. Thirty-two participants responded to the questionnaire that addressed the learner experience, ability to achieve learning outcomes and the benefits and

**Table 2**  
Describes the simulation process comparing face to face with virtual simulation.

Face to Face Simulation(A)	Simulation Process	Virtual simulation (B)
<ul style="list-style-type: none"> <li>• A dry run for the session was conducted at the simulation centre</li> <li>• It was dependent on resources like the availability of simulation space, simulation technologist and set up</li> <li>• Physical space must be reset after each interaction should there be any discrepancy in the setup</li> <li>• Less anxiety as the facilitator was familiar with the process</li> <li>• Was given just before the session by orienting the participants to the simulation centre</li> <li>• Points of orientation included:                             <ul style="list-style-type: none"> <li>➢ Discussion of objectives</li> <li>➢ Ensuring psychological safety</li> <li>➢ Importance of maintaining confidentiality and the process</li> <li>➢ Informing on the recording of the simulation session</li> <li>➢ Physical environment</li> <li>➢ Facilitators and peers</li> </ul> </li> <li>• Was held at the simulated hospital facility in person [face to face]</li> <li>• There was direct interaction with the simulated environment, and everyone involved</li> <li>• Debrief conducted face to face at a simulation facility</li> <li>• Could view all faces in the group</li> <li>• Students engaged better in person</li> <li>• They interacted equally with each other and the facilitator</li> <li>• There is less time for debriefing because of movement from the simulation space to the debrief room and time to settle down physically</li> </ul>	<p><b>Preparation</b></p> <p><b>Prebriefing</b></p> <p><b>Simulation</b></p> <p><b>Debriefing</b></p>	<ul style="list-style-type: none"> <li>• The dry run for the session was done virtually</li> <li>• It depended on resources like solid internet connection, reliable computers, high-quality video creation and interdepartmental staff involvement.</li> <li>• More time spent on recording the video</li> <li>• The video can be used multiple times</li> <li>• More anxiety as the facilitator was not familiar with the process</li> <li>• An email introducing the concept of virtual simulation was sent to all the participants well before the course</li> <li>• A virtual pre briefing was given just before the session by orienting the participants to the process of the virtual simulation</li> <li>• Points of orientation included:                             <ul style="list-style-type: none"> <li>➢ Discussion of objectives</li> <li>➢ Ensuring psychological safety</li> <li>➢ It is essential to maintain confidentiality. The process includes keeping microphones on mute and only unmuting them when speaking to enhance session quality.</li> <li>➢ To mute devices like cell phones and minimise disturbance around</li> <li>➢ Not to take any photos or record the session.</li> <li>➢ They are informing the participants that the facilitator will record the session.</li> </ul> </li> <li>• Was conducted virtually on Teams</li> <li>• There was virtual interaction with the created video</li> <li>• Debrief conducted on the online platform</li> <li>• Not able to view all faces in the group (the maximum view was four at the time of the study)</li> <li>• Students were mainly on mute and unwilling to engage unless called out by name.</li> <li>• They mostly interacted with the facilitator and less with each other</li> <li>• More time to debrief as there was less time consumed to shift from simulation space to debrief room</li> </ul>

challenges in context with the virtual simulation. The students were asked to rate their experience on a scale of 1 to 5, where 1 is the lowest and 5 is the highest. The average score received was 4.09. Most (97%) students stated that the session's objectives were met, while 3% felt otherwise. Most students (97%) felt that the session helped them support theory already learnt in class, while 3% of the respondents felt that the session did not support them entirely as "it was more focused on common sense situations".

Students listed statements like "the effort behind trying to implement a virtual type class during times like this" and "engaging on a different platform and gaining knowledge in an interesting method" further endorsed the feasibility of a virtual simulation mode.

It was analysed that most students were content using a virtual simulation mode. The positive results of this study demonstrate the use of virtual simulation as a valuable option of advanced teaching methods available when face to face simulation is challenging or not recommended.

#### 4. Discussion and conclusion

##### 4.1. Discussion

Our objective was to explore the feasibility and efficacy of a rapid transformation from face to face to virtual simulation and investigate the impact of this transformation on the simulation process process, which is preparation, pre briefing, simulation and debriefing.

In terms of feasibility, on comparing face to face with virtual simulation, it was noticed that the facilitators were more familiar with preparing for face to face simulation than virtual simulation. In the prebrief phase, the instructions were emailed to the students, and then the students were briefed extensively online just before the course. One of the biggest hindrances was the hesitancy of students to put on their cameras and the inability of the facilitator to see more than 4 faces at a time on Teams (which was a limitation at that time). During the simulation phase, the virtual simulation was conducted during a live Teams interaction while watching the video and immersing yourself in the situation as a student. The experience was 2 dimensional instead of being there in person. For debriefing, the conversations were usually between the students and the facilitators and not between the students themselves. You sometimes had to call out student's names to get them engaged. On the positive side, the virtual simulation was a standardised process which could be played from any part of the world, engaging the students in learning.

Virtual simulation can also be used to scale up numbers as the process requires minimal resources once in place. Virtual simulation was also a more sustainable mode of simulation-based education during the pandemic, keeping in mind the COVID-19 protocols and limited availability of personnel and resources.

The pandemic catalysed experimentation in live simulation-based education settings that should be further encouraged. Today's technology savvy students may be seeking more than traditional face-to-face interactions during simulation-based education.

The findings indicate that some aspects of simulation-based education, when using the existing information technology environment, are easier to transform without impacting the learning objectives.

Blends of teaching and technology can be used to aid future students rather than hinder them (4).

This study was conducted very early, after the pandemic was declared (April 2020). When asked about the disadvantages of virtual simulation, we did not receive any particular disadvantage from conducting simulation virtually with the students students. Many of them mentioned how the simulation "did the job". The only comment we received was about the lag that some students experienced while watching the prerecorded video. We acknowledge that many studies released after that have reported the same in detail.



**Table 3**

Describes the benefits and limitations of transforming a face to face simulation into a virtual simulation.

Simulation Process	What went well	What can be improved	Benefits	Limitations
Preparation	*The preparation for the session took less time than a face to face session		*Preparation can be from any part of the world *Dry run can be conducted virtually	*Dependency on other departments like information technology for video shoot and compilation *Change management
Pre brief	*Was conducted well online *The facilitator was evident with the objectives as well as the ground rules		*Safe space *Minimal exposure to physical onsite risks	*Important points can be missed as the facilitator has to concentrate on other IT related matters *Minimal visual cues available from students *Anyone with the link can join at any time and leave at any time if there is no administrator
Simulation	*The objectives were met *It was an exciting and creative session which had quite a lot of suspense element *The facilitator was able to share the PowerPoint as well as the video *The video covered the entire medical ward, floor, walls and even washroom *The video had enough time for students to look around *The presentation ran smoothly	*Need to ensure that the videos can be played without technological glitches	*Standardised experience *Minimal interference from peers or facilitator *Can standardize the time required	*No alternative mode is available if the virtual system crashes *Not conducted in a physically simulated hospital environment
Debrief	*Students were able to engage in discussion *The debriefing ran smoothly	*It is essential to ensure all students have cameras during the debriefing session. If a student is not engaging in the session, it may be necessary to encourage them to participate.	*Safe space *Settling time will be less post simulation, which leads to an immediate transition into discussion	*Engagement of all students. The approach may not work for students experiencing simulation for the first time *Minimal nonverbal communication *The facilitator cannot control the interaction *Most of the students were communicating with the facilitator rather than with each other

#### 4.2. Innovation

The SARS-CoV-2 Pandemic caught us unaware in March 2020. There were so many questions and little or no answers. Along with everything else was the drive to complete the courses for the benefit of the students.

While many will remember the COVID-19 pandemic as a disruption source, it will likely be viewed as a catalyst for the transformation of medical education (5). The virtual simulation session at Mohammed Bin Rashid University of Medicine and Health Sciences is an example.

When resources of the simulation centre like space, mannikins and faculty could not be accessed for reasons like social distancing during the pandemic, the face to face simulation was transformed into a virtual simulation and used as a feasible alternative for the first year medical students, without impacting their learning objectives.

This transformation from face to face to a virtual simulation was the first of its kind during the pandemic to have transitioned in seven days using Microsoft Teams as a platform. Students completed the Patient Safety module from the safety of their homes, virtually attending and learning from the simulation session.

#### 4.3. Conclusion

The recent availability of online education has allowed the Internet to be used in ways that support sharing experiences and social interactivity (6). This can transform health professional education into a multi-user virtual environment for simulation-based learning. The pandemic has shifted attention towards digital learning modalities (7), and no doubt embracing these changes will enable training programs to rise to the challenges of COVID-19 and ensure the provision of high-

quality education for the future (8).

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#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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