Telesimulation: Simulation at a Distance for Clerkship Students

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No Conflicts of Interest
Objectives

- Define simulation and telesimulation
- Describe the creation of a telesimulation platform
- Show an example of a telesimulation case
- Apply principles learned to upcoming Emergency Medicine clerkship telesimulation cases
The Challenge

How do you perform simulation in a clerkship when students are distributed across the state and don’t have access to simulation resources?
Introduction to Simulation

Simulation
• An artificial representation of a real world process to achieve educational goals through experiential learning

Simulation-Based Medical Education
• Any educational activity that utilizes simulation aides to replicate clinical scenarios

Four Purposes
• Education
• Assessment
• Research
• Health System Integration

Al-Elq, J Fam Comm Med, 2010
Introduction to Simulation

Simulation Technologies

• Full-body mannequins
• Partial task trainers
• Standardized patients
• Computer-generated simulation
  – Virtual reality
  – Augmented reality
• Hybrid simulators
What Types of Simulation are Used in Medical Education?

**Figure 20. Types of Simulation Used in Medical Education**

- **Medical School**
  - Standardized Patients: 94%
  - Full-scale Mannequins: 65%
  - Part or Full Task Trainers: 95%
  - Screen-Based Simulation: 93%

- **Teaching Hospitals**
  - Standardized Patients/Task Trainers: 88%
  - Full-scale Mannequins/Task Trainers: 84%
  - All Types: 90%

*Medical Simulation in Medical Education: Results of an AAMC Survey 2011*
How is Simulation Used in Medical Education?

- High acuity/low frequency events
- Clinical and procedural skills
- Performance assessment
- Process improvement
- Teamwork
- Communication skills

Med Educ 2010; 44: 50-63
Why Use Simulation-Based Education?

• Teaching and learning in clinical settings is opportunistic and unstructured
• Clinical scenarios and real patients can be complex
• SBE allows clinical skills to be deconstructed into their parts
  – Can vary based on stage of learning
  – Facilitate learner-appropriate cognitive load

MJA 2004;196 (9):1-5
Why Use Simulation-Based Education?

Learners can
• Rehearse in a risk-free environment
• Engage in deliberate practice
• Be assessed and receive timely feedback

Clinical events can be
• Scheduled
• Directly observed
• Standardized and repeated to consolidate learning

Enhances transfer of theoretical knowledge to the clinical context

*MJA* 2004;196 (9):1-5
Does Simulation-Based Medical Education Work?

- Research shows there is a correlation between SBE and learning outcomes
- Positive results in participant satisfaction, self-reported knowledge increases, and improved performance
- SBE features and best practices should be incorporated to achieve maximum impact
- Simulation does not always need to be high-fidelity
  - Can obtain equal outcomes with low-fidelity, low-cost training models

Med Teach. 2013;35:e844-e875
How do you perform simulation in a clerkship when students are distributed across the state and don’t have access to simulation resources?
The Solution

A Telesimulation Platform
Telesimulation – What is it?

**Telesimulation**

- A process by which telecommunication and simulation resources are utilized to provide education, training, and/or assessment to learners at an off-site location.

**“Off-site location”**

- Refers to a distant site that would preclude the education, training, and/or assessment without the use of telecommunication resources.

McCoy et al., AEM Education and Training, 2017
Telesimulation - Facilitator Location

Remotely facilitated
- Synchronous distance education
- Mannequins operated by remote control
- Instructors facilitate in real time
  - Web or video conferencing

Locally facilitated
- Face to face
- Facilitators and mannequins on site

Christensen, et al. Sim in Healthcare 2015
Telesimulation – When to use it?

• Distance limitations that preclude effective/efficient instruction
• Time constraints that make travel to learner or instructor site impractical
• Lack of available educators with specific content expertise
• Assessment of learners at an off-site location

McCoy, AEM Education and Training, 2017
Telesimulation – How has it been used?

Regions of the world with limited resources
- Varies – facilitators, type of simulation, resources

Procedural task training
- FLS for surgery
- IO training
- Ultrasound

Critical care medicine
- Emergency medicine
- Pediatric anesthesia
- Neonatal resuscitation

McCoy et al., AEM Education and Training, 2017
Neonatal Resuscitation Training

Figure 2. Telesimulation at University of California, Davis Children’s Hospital. (a) Remote participants resuscitating a neonatal patient simulator; (b) Instructor viewing the resuscitation over a telemedicine connection.

Donohue, et al. Children, 2019
Emergency Medical Services Course

• Mass Casualty Incident (MCI)
• Between University of California, Irvine Medical Simulation Center and Riyadh, Saudi Arabia
• Google Glass
• First person observation of a MCI
• Feasibility study for EMS course via telesimulation across seas

McCoy, et al. Sim Healthcare, 2019
Telesimulation – Challenges and Limitations

- Stability of internet connection
- Technical problems (audio, visual, etc)
- Local technical and simulation support
- Learner perception and stress
- Language barriers and time differences

Guzic, Clinical Simulation in Nursing, 2012
Telesimulation: Ideas and Direction

UCLA M4 Emergency Medicine Clerkship

- Prospective, crossover study of 32 M4 students
- Randomized standard sim or telesim
- Students observed sim remotely followed by shared group debriefing
- Students participated in one of each group
- No difference in mean eval scores between 2 groups
- No difference in teaching modality on post survey

McCoy, AEM Education and Training, 2017
Telesimulation: Ideas and Direction

Kanazawa University Hospital in Ishikawa, Japan

- M5 students – equivalent of M3 Pediatric Clerkship
- Looked at remote facilitation vs local facilitation
- Remote facilitation Children’s Hospital of Philadelphia
- 89 students remote and 47 locally
- Both groups improved performance between 1st and 2nd case
- Faculty evaluation equally high in both groups

Ohta, et al, 2017 Pediatr Emer Care
Integrating Telesimulation into Emergency Medicine Clerkship

Dr. Eric Zevallos
Emergency Medicine Clerkship Director
The First Step
Development Goals

• To create a simulation environment allowing students to learn critical EM topics that are better taught and learned through first hand experiences.

• To be able to integrate students from offsite campuses and have them participate directly in the simulation cases.

• Ability to teach, evaluate and provide feedback on students’ transition into the ‘manager’ position of clinical decision making.
Designing Multi-Center Simulation

**Case Design**

- 5 students; each with a predefined goal oriented task
- Allows participation for 1-2 off campus students, per case

**Off Campus Student**

- Role allowing adequate participation and communication
- Means of being able to visualize and communicate to team members in real-time.
Designing Multi-Center Simulation

- Team Leader: Onsite/Offsite Communication and Decision Making (not allowed to touch patient)

- Airway: Onsite Management and decision making pertaining to the airway.

- Procedure: Onsite Explains and performs and necessary procedures.

- Interpreter: Onsite/Offsite Evaluates, Interprets and relays information obtained from blood work, imaging and EKG’s.

- Pharmacist / Consultant: Onsite/Offsite Decides on medications given, dosages, and acts as consultants in making recommendation and ultimate dispositions.
The Challenges
Initial Challenges

- **Audio Communication**: Latency, Dropped Calls, Voice Echoing and Radio Interference / Static were all found to be potential issues during the cases.
- **Abundance of Off-Site students**: Occasionally, we would experience >10 off-site students during a single simulation day.
  - Scheduling: Free for all vs. Assigned Dates
- **Video Streaming**: WebEx vs. LearningSpace
- **Debriefing**: Inconsistent teaching points
Improvements

• **Audio Communication:** Switched to a conference call communication which prevented many of the initial challenges with communication. [WebEx conference call vs dialing into the room directly]

• **Abundance of Off-Site students:** Very difficult to have high volumes of students (both on-site and off-site) and be able to engage each student. Begin limiting the number of onsite and offsite students.

• **Video Streaming:** LearningSpace
Future Improvements & Goals (Short term)

• **High Student Volumes:** Developing an asynchronous, online simulation module.
  – Features a video simulation case performed by the students’ peers
  – Worksheet that requires the student to evaluate, critique and suggest improvements after watching the online video.

• **Debriefing:** Instituting a formal debriefing processes that will be consistent and similar for both live and asynchronous student groups.
Future Improvements & Goals (Long term)

• **Improved Technology**: Utilizing technology to enhance onsite and offsite student participation.
  – Improving Audio Communication between onsite and offsite students
  – 3D, 360 goggles

• **Multiple Campus Simulation**: Having simulations ran from various campus sites but allowing students from any site to be able to participate remotely.
Creating a Telesimulation Platform for EM Clerkship

Augusta University Interdisciplinary Simulation Center
Next Steps

• Build out the platform
  – Wide angle camera
  – Improved audio - microphones
• Work on ensuring stable connectivity
• Focus procedures and ultrasound during case
• Obtain feedback from students and faculty
• Expand platform between campuses
Questions?