Proposal ID: 808980

Use of Immersive Environments to Address the Challenge of Entrustability in Recognition of the Critically-ill Patient

Teresa Riech[1, 2,3], MD, MPH; Matthew Mischler[1,3], MD, FAAP, FACP; Matthew Bramlet[2,3], MD; William Bond, MD, MS, FACEP [1,2,3]; Kimberly Cooley, RN, CCRC[1,2]; Jeremy McGarvey, MSN[1,2]

[1] OSF Healthcare [2] Jump Simulation, an OSF Healthcare and UICOMP Collaboration [3] University of Illinois College of Medicine at Peoria

PURPOSE

- One of the most challenging core Entrustable Professional Activities (EPA) to assess is: **"Recognize a Patient Requiring Urgent or Emergent Care and Initiate Evaluation and Management (EPA10)"**[1].
- Learners need time to practice decision-making before more senior clinicians intervene in real cases, and to understand what drives clinician decisions and actions [2].
- Learner exposure to valuable experience is variable and limited.
- We developed a reproducible virtual reality (VR) case template allowing learners to practice early recognition and decision-making for acutely ill patients, while assessing feasibility and learner perception.

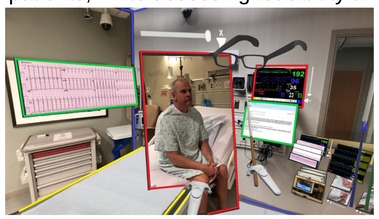


Image 1

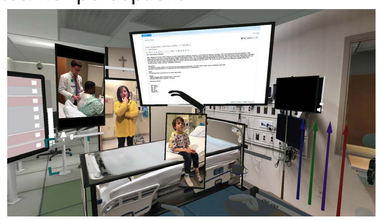


Image 2

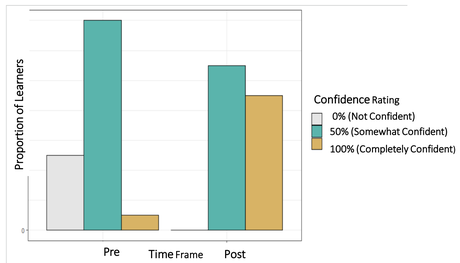
METHODS / APPROACH

- Data was collected from a convenience sample of beginning third year medical students at VR laboratories within the University of Illinois College of Medicine, Peoria.
- The VR experience combined didactic instruction with interactive elements. Long term programmatic goal is behavior change. The modules incorporated elements of immediate feedback, visible learning and teaching, learning by examples, self-exploration effect, problem-based learning, and multimedia instruction[3].
- Didactic recordings on evaluation of critically ill patients were done in a 3D VR HMD software environment (Enduvo©) and HTC Vive© hardware, followed by learner practice in patient assessment and MCQs.
- Video cineloops shared in window-like projections in 3D space allowed learners to evaluate patients' appearance, monitor output, ECGs, x-rays, and lab results in 24-minute modules, (adult with dysrhythmia, Image 1, and pediatric asthma exacerbation, Image 2).
- Cases followed a template progressing through stages from mild to severe. Assessment tasks followed each objective, with explanations for correct answers given within the modules.
- Observers measured time spent in the module and captured if the HMD was removed; after the modules, learners completed a survey including ratings of pre-post confidence.

RESULTS / OUTCOMES

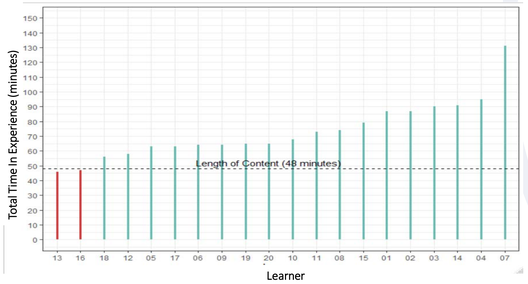
We present data from 20 learners. (Figures 1-.6) Median correct response rate for assessment questions was 82.5% for the pediatrics case (range 40% to 100%) and 90% in the adult case (range 65% to 100%). Forty-five percent of participants rated the VR experience equal to lecture, and 55% rated VR superior.

Figure 1 (Confidence)



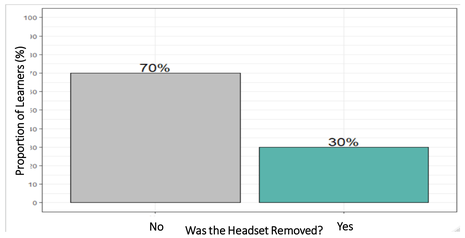
Prior to completing the simulation only 5% of learners rated themselves as completely confident, which increased significantly to 45% after the simulation, $c^2(1, N = 20) = 8.33$, $p = 0.004$.

Figure 2 (Learner time)



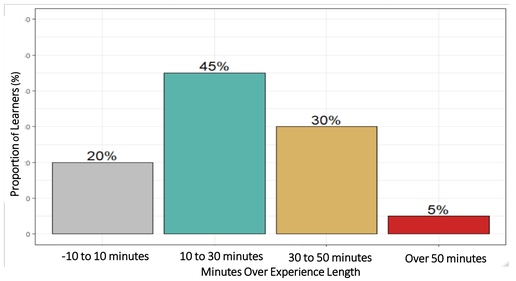
Learners spent a mean of 33.35 minutes +/- SD 15.03 for the adult and 39.95 minutes +/- SD 11.50 for the pediatric module

Figure 3 (Removal of Head-Mounted Display)



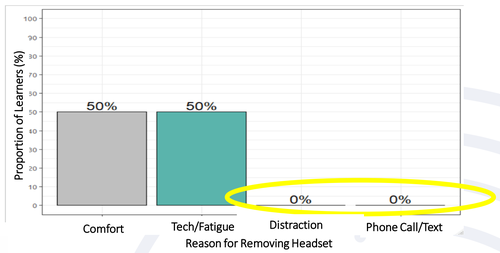
Only 30% of learners removed the headset.

Figure 4 (Learner Additional Time)



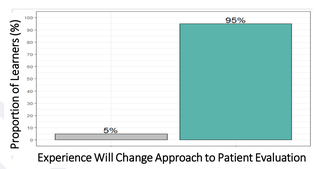
Eighteen of 20 participants spent longer than the recorded time reviewing content (range: 20% spent -10 to +10 min longer, 45% spent 10-30 min longer, 30% spent 30- 50 min longer, and 5% spent 50-84 min longer).

Figure 5 (Reasons for Removal)



Reasons for removal of head-mounted device.

Figure 6 (Change in practice)



95% of learners can identify a change in how they will approach patient evaluation.

DISCUSSION

Positive learner satisfaction, increased confidence, and extended time spent in the modules suggest learner engagement, facilitated by the limited distraction format of VR. Questions were automatically graded without extra faculty time. We demonstrated improved learner confidence in management of these exemplar cases, and suggest this promising programmatic evaluation(4, 5) warrants future exploration of changes in knowledge and performance.

SIGNIFICANCE

Advantages of this teaching method include: digital content scalability, asynchronous self-paced lessons, case standardization between learners, efficient use of faculty time, and no requirement for faculty to know software coding. The immersive background and case stimuli strive toward environmental fidelity, combines clinical and basic science learning, provides immediate feedback to learner relative to faculty consensus of correct answers, and minimizes distractions by nature of the HMD environment.

REFERENCES

1. Obeso V, Brown D, Aiyer M, Barron B, Bull J, Carter T, et al. Core EPAs for entering residency pilot program. Toolkits for the 13 core entrustable professional activities for entering residency. Washington DC: Association of American Medical Colleges; 2017.
2. Ericsson KA. Acquisition and maintenance of medical expertise: a perspective from the expert-performance approach with deliberate practice. Acad Med. 2015; 90(11):1471-1486.
3. Mayer RE. Instruction Based on Visualizations. In: Mayer RE, Alexander PA, eds. Handbook of Research on Learning and Instruction. New York, NY: Taylor & Francis; 2011:427-445.
4. Plant JL, van Schaik SM, Sliwka DC, Boscardin CK, O'Sullivan PS. Validation of a self-efficacy instrument and its relationship to performance of crisis resource management skills. Advances in Health Sciences Education. 2011;16(5):579-590.
5. Kapp, F., et al. (2015). "Distributing vs. Blocking Learning Questions in a Web-Based Learning Environment." Journal of Educational Computing Research 51(4): 397-416.

ACKNOWLEDGEMENTS

- Alexa Walsh for project management, case creation and technical assistance.
- Debby Tucker for VR room assistance and facilitation of learner scheduling.

jump | SIMULATION

AN OSF HEALTHCARE AND UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE AT PEORIA COLLABORATION

OSF HEALTHCARE

THE UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE PEORIA CHICAGO ROCKFORD URBANA