A Virtual Reality Curriculum for Pediatric Residents Decreases Rates of Influenza Vaccine Refusal

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ABSTRACT

OBJECTIVE: Influenza vaccine hesitancy is common in the primary care setting. Though physicians can affect caregivers' attitudes toward vaccination, physicians report uneasiness discussing vaccine hesitancy. Few studies have targeted physician–patient communication training as a means to decrease vaccination refusal.

METHODS: An immersive virtual reality (VR) curriculum was created to teach pediatric residents communication skills when discussing influenza vaccine hesitancy. This pilot curriculum consisted of 3 VR simulations during which residents counseled graphical character representatives (avatars) who expressed vaccine hesitancy. Participants were randomized to the intervention (n = 24) or control (n = 21) group. Only residents in the intervention group underwent the VR curriculum. Impact of the curriculum was assessed through difference in influenza vaccine refusal rates between the intervention and control groups in the 3 months after the VR curriculum.

RESULTS: Participants included postgraduate level (PL) 2 and PL3 pediatric residents. All eligible residents (n = 45) participated; the survey response rate was 100%. In patients aged 6 to 59 months, residents in the intervention group had a decreased rate of influenza vaccination refusal in the postcurriculum period compared to the control group (27.8% vs 37.1%; $P = .03$).

CONCLUSIONS: Immersive VR may be an effective modality to teach communication skills to medical trainees. Next steps include evaluation of the curriculum in a larger, multisite trial.

KEYWORDS: influenza; medical education; simulation; vaccine hesitancy; virtual reality

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WHAT'S NEW

Immersive virtual reality (VR) might be relevant in medical education as an innovative method to train physicians in communication skills. This study demonstrated the impact of a VR curriculum on rates of influenza vaccine refusal at a primary care clinic.

INFLUENZA VACCINATION IS an important public health goal, as influenza contributes to a substantial number of outpatient visits and hospitalizations.[1] Despite recommendations regarding influenza vaccination from the Centers for Disease Control and Prevention,[2] "vaccine hesitancy" among caregivers in the primary care setting remains common.[3,4] Studies exploring parental attitudes toward vaccination suggest that safety and efficacy concerns are driving factors behind this reluctance.[3,5–7] Research has shown that physicians can have a significant influence on parental attitudes and beliefs regarding vaccination.[3,5,8,9] However, evidence also suggests that physicians, especially trainees, feel uneasy when interacting with caregivers who express vaccine hesitancy.[10] Despite this uneasiness, few studies have targeted physicians, and specifically physician–patient communication, as a means to decrease vaccination refusal.[11,12] As a result, there is limited evidence to guide implementation of effective strategies to deal with the emerging threat of parental vaccine refusal.[11]

Evolving technologies such as immersive virtual reality (VR) may represent an innovative method to enhance physician communication skills.[13–15] VR uses a "virtual world"—a 3-dimensional, computer-generated environment in which users interact with graphical characters known as avatars. Simulation-based medical education, of which VR is one type, has become an essential component of medical training because of its demonstrated efficacy in teaching a wide variety of medical skills.[16] Avatar-mediated training has previously been investigated as an educational tactic through the use of Second Life, an online virtual world that allows for interactions among avatars. Medical trainees on hospice teams reported more effective communication training when using the Second Life modality than role-playing.[17] Similarly, the Second Life platform was determined to be an effective and enjoyable

tool to teach the delivery of bad news.[18] Unlike these previous VR curricula in which a computer screen was utilized to deliver the educational content, our curriculum was novel in its use of Oculus Rift,[19] a VR headset that fully immerses learners in the simulated environment. The effectiveness of this technology on physician communication training has not been studied. Given this knowledge gap, we sought to assess the impact of an immersive VR communication curriculum that focused on vaccine hesitancy on rates of influenza vaccine refusal.

METHODS

SETTING AND STUDY POPULATION

This educational study was conducted at the Cincinnati Children's Hospital Medical Center (CCHMC) pediatric primary care center (PPCC). The PPCC is a large academic clinic that serves as the continuity site for approximately 80 pediatric residents. Curriculum participants included postgraduate level (PL) 2 and PL3 categorical pediatric residents. Resident consent was obtained before enrollment. Residents were assigned to the intervention group ($n = 24$) or the control group ($n = 21$) on the basis of their previously assigned continuity clinic day. All residents received the standard preclinic didactic education regarding common reasons for influenza vaccine refusal and strategies to approach hesitancy. Residents in the intervention group underwent the VR curriculum in November 2015. This study was approved by the CCHMC institutional review board.

CURRICULUM DESIGN

The VR curriculum consisted of 3 simulated scenarios during which participants counseled caregiver avatars that endorsed vaccine hesitancy. These caregiver avatars were hesitant to accept the influenza vaccine for their 6- to 59-month-old child, who was at risk for influenza complications as a result of age.[1] The VR curriculum was designed using the gaming platform Unity.[20] An Oculus Rift[19] headset was used to deliver the educational content. The virtual environment was designed to replicate a PPCC examination room, and avatars were created based on common caregiver demographics. Avatars were able to assume a range of body positions to indicate different emotions, and audio was recorded and synchronized with the avatars' facial expressions and mouth movements to provide a realistic experience. During the scenarios, the resident counseled the avatar, and the avatar would respond appropriately. The avatar's verbal and nonverbal responses to the counseling were driven in real time by a single facilitator (FJR). Scenarios were developed in an iterative method as a collaborative effort between pediatricians and technologists. A medical assistant reviewed the avatar's dialogue for agreement. Each scenario followed a specific algorithm to standardize the experience between participants. Scenarios were piloted on 2 chief residents and 2 attending providers; they were amended accordingly before implementation.

Each scenario included a different set of reasons for influenza vaccine hesitancy commonly reported in the literature.[3,5] In the first scenario, the caregiver expressed feelings of the vaccine as ineffective. In the second scenario, the caregiver presented beliefs regarding the vaccine as unnecessary and injurious. In the third scenario, caregivers expressed spiritual objections to vaccination as well as misconceptions regarding contraindications. In order for the resident to succeed (vaccination accepted), the resident had to demonstrate several best-practice communication skills including open-ended questioning, exhibiting empathy, and providing education without medical jargon.[21,22] The 3-scenario curriculum was completed in approximately 15 minutes and was scheduled at a time convenient for the resident. After the scenarios, the facilitator (FJR) provided the resident with feedback about his or her use of best-practice communication skills based on a rubric to promote consistency. Feedback occurred in person immediately after completion of the scenarios and took approximately 5 minutes to complete. Feedback was audiorecorded and periodically assessed for consistent messaging by a physician author (FJR, DD, MDK).

SURVEY DESIGN

Demographic data including age, gender, race, and residency year were obtained at time of consent. All survey data were deidentified, coded, and entered by the research assistant into Research Electronic Data Capture (REDCap), a secure Web-based application.[23]

OUTCOME METRICS

The electronic medical record (EMR) was used to identify cases of influenza vaccine acceptance and refusal during the study period (September 1, 2015–February 26, 2016). The postcurriculum period was defined as the 3 months after completion of the VR curriculum (November 30, 2015–February 26, 2016). Our primary outcome was difference in rates of influenza vaccine refusal between the control and intervention groups during the postcurriculum period. We specifically assessed vaccine refusal in caregivers with children aged 6 to 59 months who presented for well-child care, as this was the target population of the curriculum. A best practice alert was embedded into the EMR to promote documentation of influenza vaccine refusal. Residents in the intervention and control groups were educated regarding the use of the alert before the data collection period. When vaccine eligible patients had neither vaccination nor documentation of refusal using the EMR alert, individual charts were reviewed for evidence of caregiver refusal. Cases without evidence of caregiver refusal upon chart review were excluded from the analysis, as it was unclear if a discussion regarding influenza vaccination had taken place. The binary outcome of refusal/acceptance of the influenza vaccination was modeled using logistical regression. Sensitivity analyses were performed incorporating a random-effect term for resident provider to assess the robustness of the results to the nesting of patients within providers, and a fixed-effect term for resident race (white/nonwhite) was incorporated to account for the modest baseline imbalance in provider race.