

Development of a prototype persuasive virtual reality training to support the prevention of surgical site infections

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1 Background

A surgical site infection (SSI) is a serious nosocomial infection of a surgical wound that occurs within 30 days after surgery [1]. SSIs can cause unnecessary pain, fear and inconvenience for the patient and may lead to longer hospitalization, permanent disability or even death. To prevent SSIs and to maintain a patient's safety, guidelines are applied before, during and after surgery. These guidelines include hygiene measures (such as hand hygiene, wearing clothes correctly, limiting the number of door openings), antibiotic prophylaxis (administering antibiotics in the right dose at the right time), hair removal, and maintaining the patient's body temperature during surgery [2]. However, compliance with these guidelines seems to be problematic due to i.e. a lack of awareness about risky situations and difficulties in signaling mistakes within the hierarchical work environment [3]. Virtual reality (VR) as a training approach has the potential to address these determinants due to its focus on both cognitive (situation awareness) and affective components (mindset) [4]. Building upon earlier research [3], this study aimed to translate relevant determinants into an initial VR training prototype to support operating room (OR) staff in preventing SSIs by fostering situation awareness and reducing signaling fatigue.

2 Method

Following the design phase of the CeHRes Roadmap [5] for the holistic development of eHealth technology, a focus group (n=5) among OR staff was conducted in order to transform determinants into concrete and realistic situations that can be translated into VR-scenarios. Participants were instructed to 1) provide anecdotes about risky situations related to one of the determinants, 2) rank them according to prevalence and infection risk and 3) describe the highest ranked situations as detailed as possible ("*What do you see, do, say, hear, think and feel?*"). The meeting was audiotaped and transcribed verbatim. The in-depth information was then used to create a film script that contained different (risky) situations in the OR and served as the basis for VR-video production. Filming took place in a simulated OR starring an OR team consisting of an experienced surgeon, anesthesiologist and OR nurse, and two medical

students acting as OR nurse and anesthesia assistant. Finally, training instructions were built around the videos based on requirements resulting from earlier research [3].

3 Results

Findings resulted into an initial VR training prototype consisting of 1) a serious VR game centered around risk recognition to increase situation awareness, and 2) a module addressing signaling fatigue in the OR and promoting an open dialogue culture. The VR game contains five scenes distributed across the pre-, peri- and postoperative phase of a knee operation (preparing in changing room, handwashing and disinfection, time-out procedure, performing the operation and wound closure). While immersed into the OR environment, users are challenged to detect 18 risk situations in total, with a varying degree of difficulty. Scores on individual and group level are visualized in an improvement plot that should serve as input for team debriefings. Within the second module users can follow a surgeon unintentionally putting the patient at risk and different kinds of reactions (sub-assertive, assertive, aggressive) to a critical remark from an OR assistant. Different tailored follow-up questions are posed focused on self-reflection, correcting irrational thoughts and stimulating discussion within the team with the goal of fostering an open dialogue culture.

4 Conclusion

The follow-up focus group provided valuable and detailed scenarios regarding risky situations in the OR that could be translated into an initial VR training prototype. Future steps will be directed at iterative testing of the prototype among users in the Netherlands and Germany, improving persuasiveness and exploring how the training can be embedded into an eLearning platform aimed at increasing the compliance of OR staff with best practices for the prevention of surgical site infections.

References

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