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Piloting Virtual Surgical Patient Cases with 3rd-year medical students during the surgery rotation

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Abstract

BACKGROUND: Surgical education programs are increasingly challenged to make medical students' learning experiences in their surgery rotation meaningful while making the most of limited faculty resources and maximizing patient safety. Simulations and virtual environments are potential resources for providing meaningful clinical learning experiences.

METHODS: Ninety-eight 3rd-year medical students used the Virtual Surgical Patient Cases software as a part of their surgery clerkship. We used a mixed-methods approach to data collection and analyses to investigate how students and faculty engaged with cases as teaching and learning tools.

RESULTS: Students improved their clinical reasoning skills significantly at each case attempt, but made some errors consistently across attempts. Faculty used the information provided about students' decisions during the cases to guide their teaching during case discussions.

CONCLUSIONS: Including more cases in the surgical clerkship could allow students additional practice with making diagnoses and facilitate an interactive role in discussing cases with faculty.

In medicine, and surgery in particular, the opportunities to make mistakes and learn from them are increasingly limited.[1] More stringent patient care guidelines and the fact that most situations affect patients' health and well being, and often times, their lives are contributing factors to the limits placed on the functions that medical students are able to perform. Moreover, when medical students are able to engage in meaningful patient care tasks, there are often barriers to providing these students immediate feedback on performance to allow them to reflect on their decision-making, to adjust their strategies or behaviors, and to reflect on the outcomes of their adjustments.[2] One of these barriers includes difficulties attending faculty may have with observing and interacting with medical students. Meaningful teaching interactions with students may be impeded because of the lack of training on giving

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productive feedback or lack of time to observe and provide critique to students.[3] Consequently, surgical education programs are increasingly challenged to make medical students' learning experiences in their surgery rotation meaningful in a way that makes the most of limited faculty resources and maximizes patient safety.

Simulations and virtual environments are being increasingly used as resources to provide meaningful learning experiences in medical education. In particular, these tools can be used to allow students to engage in problem-based learning in a manner that requires them to actively consider a patient's medical issues and independently make decisions about the best course of treatment.[4] This kind of active learning based on authentic problems can be thought of from the perspective of situated cognition. Situated cognition is a theoretical perspective of learning that argues that knowledge is embedded in the activity, context, and culture in which it is learned.[5] Thus, learning is the process of developing the skills of and learning to think like more expert members of a culture, ideally in settings that are relevant to the way these practices will be used as part of learners' lives and work.[6]

An extension of situated cognition that can be applied to surgical education and learning in virtual environments is the idea of cognitive apprenticeship. The goal of cognitive apprenticeship is "to enculturate students into authentic practices through activity and social interaction" by helping learners to understand and practice the skills and ways of thinking used by experts in a domain.[7] In sum, when students are engaged in a cognitive apprenticeship with the experts, the expert supports the learner by providing insight into the ways in which practitioners use the tools of their field to examine and solve problems. By supporting students to think like practicing physicians, virtual patient scenarios can be successful at helping students learn clinical reasoning and decision-making skills used by practitioners.[8–10]

One such platform to engage in simulated patient scenarios is the Virtual Surgical Patient Cases (VSPCs), developed by discourse LLC. In this software, medical students take on the primary role of practitioner in a setting that allows for feedback and low-risk failure that can aid in the learning process.[11] This study seeks to understand how 3rd-year medical students used VSPCs as a low-risk environment for learning that simulates decisions that they will have to make in practice and provides immediate feedback. Individualized practice through attempting something on one's own and struggling through the process allows learners to practice the skills used by practitioners in an environment that is safe for making mistakes. However, additional work is needed that investigates how best to integrate these platforms into the surgical curriculum,[12] particularly to enhance the experiences of medical students.

Although there have been studies that look at learners' performance over time using VSPC (Close A, Goldberg A, Helenowski I, et al, presented at the Surgical Education Week 2015) research is lacking that investigates both students' and surgical faculty's perceptions and uses of the case as teaching and learning tools. When addressing this issue for our study, the following questions were investigated:

1. How are students performing in the cases across multiple attempts? Do their scores improve significantly and what clinical decisions are they making?
2. What are students' perceptions of using VSPC as part of their surgery rotation learning experience?
3. How are instructors using the feedback from the system to do their case discussion and what are their perceptions of the VSPC software as a teaching and learning tool?

The study used a mixed-methods approach of both quantitative and qualitative data collection and analyses to explore these questions.

Methods

Institutional review board approval was obtained for this study.

Setting and participants

This study took place as part of the surgery core clerkship course required of 3rd-year medical students at the University of Wisconsin School of Medicine and Public Health. VSPCs were incorporated as part of the didactic curriculum that students participate in during the 8 weeks of their clerkship. The VSPCs platform, developed by discourse LLC is a set of Internet-based modules designed to develop clinical decision-making and diagnostic skills using simulated patient scenarios. The cases are practice-based scenarios in which users can order laboratory tests, procedures, and imaging, just as they would in a real clinical setting. Text, images, and videos are used to present the cases to impart information that allows the student to make diagnostic and therapeutic decisions. The VSPC software tracks choices that students make in terms of diagnosis and treatment and also assigns them either a positive or negative score (maximum 100) based on their decisions in the case. Students lose points for making incorrect decisions of commission or omission. For example, a user would lose points both for ordering unnecessary imaging and for failure to order needed laboratory tests.

Ninety-eight 3rd-year medical students used the VSPC software as a required part of their surgery clerkship. Students completed 2 different cases to prepare for a discussion with a surgery faculty member related to these cases. One of the cases, performed near the middle of the clerkship, was on the topic of acute diverticulitis and portrayed a 64-year old female who presents to the emergency room with left lower quadrant pain and fever. The other case that students used was an upper gastrointestinal bleeding case, performed near the end of the clerkship. In this scenario, a 40-year old male presents to