

Virtual ACS 2021 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Research In-Progress

Building Blocks Towards a Laparotomy Trainer

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Introduction: Designing and building a laparotomy trainer that allows a surgical team to practice as a *team*, challenge all participants and provide meaningful feedback is a daunting task: it needs to bring together technical, decision making and team performance skills together in a unified platform. The Center for Research in Education and Simulation Technologies (CREST), under contract #W81XWH-14-C-0101 has developed a "Distributed, Modular, Interoperable" platform for health care simulation, called the Advanced Modular Manikin that supports all of these facets.

Methods: By working towards a System of Systems, following some basic design rules, we created a platform that allows for an almost open ended expansion and supports collaboration between many developers and researchers:- Key data traffic based on clinically relevant data- The "manikin" is a display for the state of the patient, regardless of instantiation: physical, virtual or hybrid- Local issues are resolved locally, events that cause a systemic response are communicated to the core- Core does not know the inner workings of modules- Modules are not aware of each other, but of patient.

Preliminary Results: The various building blocks that connect to the AMM platform made it possible to create a Laparotomy trainer that brings together technical, decision making and team performance skills. The Laparotomy insert allows team members to collaborate on technical skills. The various cues provided on the ventilator, patient monitor, as well as, controlled bleeding in the abdominal cavity elicits ongoing decision making and finally the interplay between patient management by the anesthesiologist and progress of the surgery via the physiology engine requires team interactions on an ongoing basis. All required modules have been built and the system will be evaluated in the field.

Next Steps: With the first release of the AMM platform as open source behind us, the team is looking forward to the next few projects, targeting modules specific to complex trauma cases on the military side, and training for recovery from iatrogenic injuries in rural hospitals on the civilian side.

