

ACS 2022 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Promoting Technology and Collaboration

CrashSavers: Low-Cost Virtual Reality Hemorrhage Control Simulator

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Background: Hemorrhage is responsible for up to 40% of deaths after trauma. Hemorrhage control techniques consisting of pressure, packing, tourniquets, and foley catheter placement are among the most effective interventions in early trauma management. In many low- and middle-income countries (LMICs), there is no training in hemorrhage control for first-responders. Furthermore, many traumas occur in settings lacking trauma centers, blood banks, and extensive hospital transport times. In prior studies, untrained personnel were found to have high rates of tourniquet failure, leading to poor hemorrhage control and, likely, preventable deaths. We are designing a comprehensive training platform in hemorrhage control techniques for first-responders and healthcare personnel in low-resource settings, “CrashSavers”, that is low-cost and has built-in self-assessment, obviating the need for expensive, in-person instruction.

Technology Overview: The CrashSavers platform teaches hemorrhage control using both virtual and physical components. The virtual application presents didactic materials, administers knowledge checks, and embeds virtual reality case scenarios to teach and assess clinical decision-making. The physical model of a limb with a blood flow and pressure simulator is constructed with low-cost materials and is connected to the virtual application. Combined, learners experience integrated and engaging high-quality training.

Potential Application in Surgical Simulation and Education: We present an alternative that will have broad implications in reducing prehospital morbidity and mortality from traumatic hemorrhage that can be used for a wide variety of learners - from volunteers to first-responders and hospital-based healthcare personnel in LMICs. Our simulator uses a gamification algorithm to assess user learning based on answers given in each clinical case. Only the best scores can go further and practice in the simulator, ensuring quality of the training provided.

Potential Opportunities to Collaborate: The Crashsavers team consists of trauma surgeons and engineers in Latin and North America. There is significant opportunity to collaborate to improve low-cost simulation-based education for training in LMICs. We believe our simulator will be used by people around the world, which will help us strengthen our network, get feedback and innovative ideas.

