

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

Research In-Progress

Review of the Range and Makeup of Simulators for Upper and Lower Limb Exploration Surgery

Leonie Heskin; Ciaran Simms; and Rose Galvin.

RCSI, Dublin, Ireland; TCD, Dublin, Ireland; UL, Limerick, Ireland

Introduction: Surgical training has undergone a paradigm shift where the traditional 'master-apprentice' model has been replaced with an increased focus on competency-based education. Simulation training provides a means for surgical trainees to practice technical tasks in a protected environment without putting patients at risk and it enhances the learning experience. This review aims to explore the totality of evidence with regard to the types of and make up of both full and part-task trainers to teach surgeons extremity exploration procedures.

Methods: A comprehensive literature review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. The data bases searched were PubMed, Web of Science, CINAHL and Embase. Studies were included if they reported the development and/or validation of synthetic or virtual task trainers. Studies were evaluated against a reference standard set of 14 criteria derived from existing literature to determine their derivation, usability and clinical utility.

Preliminary Results: A total of 583 citations were identified and 62 satisfied the inclusion criteria. Nine were full and 51 part-task trainers. Twenty-four papers addressed simulator validation and 36 addressed level of learning achieved with the use of the simulator. Two studies described a dedicated limb simulator. Simulators were developed to repair limb structures including Skin (n=15), Tendon (n=7), Nerve (n=1), Fascia (n=1), Muscle (n=1), Vascular (n=24), bone (n=10). All simulators composition varied using materials such as silicone, latex, rubber micro foam, ethylene-vinyl-acetate, polyvinyl alcohol (PVA) hydrogel, polytetrafluoroethylene (PTFE) and polyethylene.

Next Steps: There was no consensus across the studies on the optimal material makeup of the simulators used to teach the repair of structures in limb exploration surgery. The full limb simulators described were both virtual reality simulators. The next steps are to explore the features of amalgamating the findings for construction of a full synthetic limb simulator.