

## Laparodome: A low-cost laparoscopic skills trainer for use in developing nations

Laparoscopic surgery represents the new standard of care for surgeries due to faster recovery times and better patient outcomes. As a result, educational efforts developed to train the next generation of physicians on basic laparoscopic techniques are vital as more procedures are converted from open surgeries to laparoscopic operations. While training curriculums such as the Fundamentals of Laparoscopic Surgery (FLS) are in place and adequately assess abilities in the United States, these modules and certifications depend on large amounts of disposables and are prohibitively expensive, especially in low-middle income countries (LMICs). Rather than focusing on specific procedures or relying on expensive technology, this device aims to address this unmet need by creating a low-cost, durable, and portable platform to simulate the conditions of a standard laparoscopic setup and faithfully reproduce the training guidelines outlined by FLS.

In order to be more accessible when training physicians in LMICs, this project has been developed in conjunction with the simulation center directors of Baylor College of Medicine in Houston, Texas, Universidad de Ciencias Medicas in San Jose, Costa Rica, and Hospital de Amor in Barretos, Brazil. The technology consists of a base in which specific laparoscopic tasks, consisting of minimal disposables, can be inserted and exchanged. The dome portion of the trainer will have a partially exposed surface allowing for quick exchange of task platforms. In addition, there will be several slots for laparoscopic tools along the x, y, and z axes of the front and side surfaces. Lastly, there will be several camera slots across the top and sides of the dome to account for different fields of view. Even with these adjustments, Laparodome is still used similarly to the current FLS trainer in the US to comply with the existing standards.

Laparodome aims to address training by combining tasks together on fewer boards to simplify setup, providing real time feedback of progress to encourage self-assessment, and incorporating different features that more accurately simulate conditions during typical laparoscopic procedures. Specifically, Laparodome will allow for additional port and camera placements to simulate deviations in trocar placement that inevitably occur in surgery. This device will also be portable to allow it to be easily deployed and set up by learners and moved in a wide variety of settings as needed.

As this device is still in development, design iterations and feature setup are currently in progress. Further feedback from clinical experts in the field will be beneficial in incorporating additional functionality into the design to deliver an FLS-compliant trainer to areas that are not served by the current trainers. With the clear benefits that laparoscopic procedures afford over traditional open setups, countries, such as Costa Rica and Brazil, have been moving towards this standard of care. Laparodome serves to provide high-quality, standardized laparoscopic skills training compliant with US standards to bridge the gap in these developing areas.