Laparodome: A Low-Cost Laparoscopic Skills Trainer for Use in Developing Nations

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Background

Laparoscopic surgery represents the new standard of care for surgeries as it produces faster recovery times and better patient outcomes compared to traditional open surgeries. Based on literature and interviews with physicians in various countries, educational efforts developed to train the next generation of physicians on basic laparoscopic techniques are critical as more procedures are converted from open surgeries to laparoscopic operations both in the US and in low-middle income countries (LMICs).[1,2]

Laparoscopic Training in the US:

- Fundamentals of Laparoscopic Surgery (FLS) Certification[3]
- Approximately 300+ Hours of Training

Laparoscopic Training in LMICs (i.e. Costa Rica):

- No Standardized Certification
- Minimal Training[4]
- Must Import Expensive Trainers ($4000)

Unmet Need:

A low-cost and robust laparoscopic training device for physicians to gain exposure to basic laparoscopic techniques.

Three Part Solution

2D Laser Cut Cardboard Template:
Dome, Base, Peg board, Phone Holder

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3D Assembled Laparoscopic Training Device with Assembled Modules (Total Cost $5)

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Smartphone App:
Module Instructions, Timed Recorded Video, Self-Evaluation Checklist, Remote Proctoring

Laparodome Design

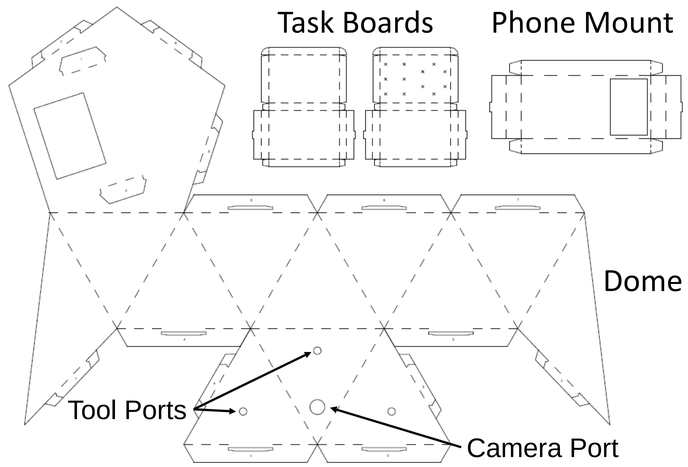
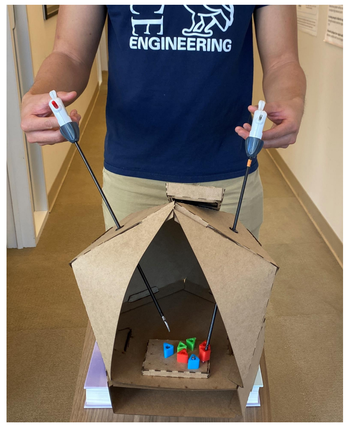


Figure 1. 2D Laser Cut Template Layout of Components



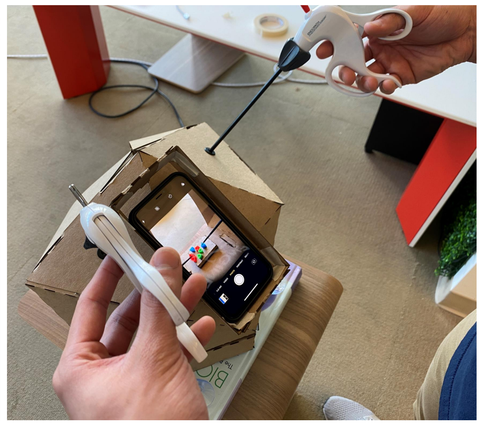


Figure 2. Assembled Laparodome with Peg Transfer Task

Features

Easily Assembled Foldable Cardboard Layout

- 2D Laser Cut Cardboard Template
- Perforated Lines for Foldability
- Easily Manufactured for Bulk Flat Shipping

3D Geodesic Dome and Storage Compartment

- FLS-equivalent Dimensions
- Simulated Abdominal Shape
- Multiple Ports for Multiple Tool Orientation
- Minimal Disposables for Task Modules
- Available Storage Space for Modules
- Compatible Smartphone Mount

Next Steps

- Implement Laparodome across medical school classes and simulation labs in Costa Rica and Brazil
- Obtain usability feedback and validation from medical students, residents, and experts in surgical training in global settings
- Improve design as needed based on validation
- Scale up manufacturing to a Die-Cut cardboard template
- Expand to other laparoscopic techniques specific to common procedures
- Seek out other partnerships in low-resource settings to expand our impact on laparoscopic training

Long-Term Goals

- **Increase exposure** of medical students and residents to basic laparoscopic skills
- **Effectively educate** the next generations of physicians in LMICs

Conclusion

Feedback from experts in the field will be used to incorporate additional functionality into the design to deliver a FLS-equivalent trainer. With the clear benefits that laparoscopic procedures afford over traditional open procedures, physicians everywhere have been moving towards this standard of care. **Laparodome serves to provide high-quality yet low-cost standardized laparoscopic skills training compliant with US standards to bridge the gap in developing areas**.

Acknowledgments

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