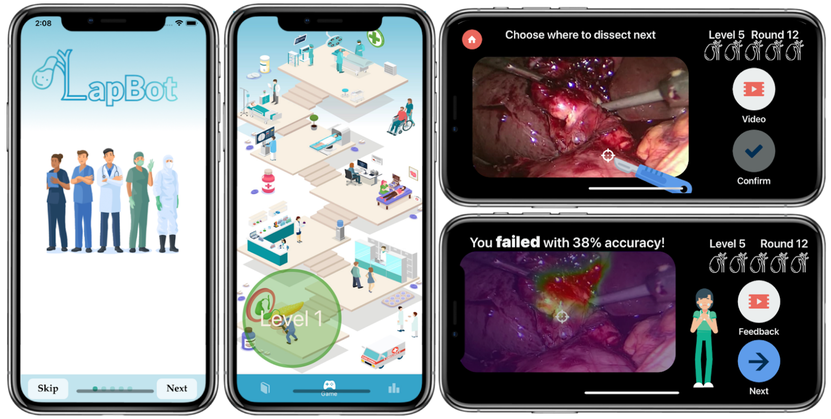
LapBot Safe Chole": An Artificial Intelligence-Powered Mobile Game App to Teach Safe Cholecystectomy Amongst Surgical Trainees

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Introduction

- Major bile duct injuries (BDIs) during laparoscopic cholecystectomy (LC) are a significant source of morbidity, mortality, disability, and healthcare costs.
- These injuries are primarily due to errors in surgical judgment and visual misperception of critical anatomy and tissue planes.
- Serious games have been shown to improve intraoperative skills and decision-making

To facilitate learning of safe LC we developed an engaging and educational mobile game "LapBot Safe Chole" that provides coaching and feedback from AI model to improve intraoperative decision-making during LC.



From left to right: level screen, leaderboard, and gameplay screens. On the gameplay screens the player chooses a location to dissect next (top right) and receives feedback on accuracy based on the AI model feedback (bottom right).

Methods

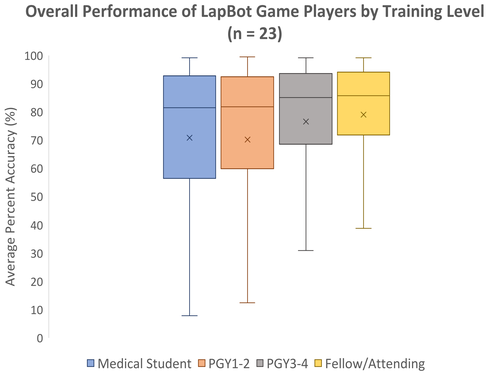
- LapBot Safe Chole was developed to be a cross platform game (iOS and Android).
- Users are presented with intraoperative LC scenarios (short video clips) and tasked with identifying the ideal target zone of dissection.
- After submitting a response, users are provided with an accuracy score according to the pre-annotated safe and unsafe zones of dissection.
- Annotations come from a pre-trained and validated AI algorithm that provides real-time scoring and feedback overlay on the video clips.
- There are 5 levels in the game, with increasing difficulty based on the Parkland grading scale for cholecystitis.

Preliminary Results

- Beta-testing (n = 23) results indicate improvement in game scores with each round, with attendings and senior trainees reaching top-scores earlier than junior residents per level.
- Candidates can be distinguished by their learning curves and learning progression which can facilitate a competency-based curriculum.
- Qualitative feedback from our end-users was highly positive; 80% of users reported LapBot was easy to use (20% were neutral), 60% agreed it was easy to navigate (40% strongly agreed), and 100% of users reported LapBot was a very fun way to learn about safe LC.

"I can imagine myself playing this while the patient is being prepped and I'm waiting to scrub in."

There is a positive and statistically significant association between the level of user and the accuracy of their scores (p=0.003). Specifically, the more advanced users tend to achieve higher scores on average



Conclusion

- Initial beta-testing suggests validity evidence in the assessment score and that this has a high likelihood of adoption and engagement by surgical trainees.
- Future directions include additional validation with a larger sample size and incorporation of additional modules for safe LC (e.g. critical view of safety).

LapBot Safe Chole is a new and innovative mobile application game that integrates safe LC principles into an educational, accessible and free game using AI-generated feedback.

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