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Interprofessional Development and Evaluation of a Virtual Reality Haptic Surgical Training System for Retropubic Midurethral Slings

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U.S. Department of Veterans Affairs

Introduction

Procedures performed without open visual or camera access rely on the surgeon's spatial orientation of anatomical landmarks and haptic sensation. The "Blind" nature of this technique can result in serious complications.

Training is suboptimal: apprenticeship on live patients, static models, or, cadaver labs carrying higher risk, expense and are distorted after multiple uses.

We formed a transdisciplinary team to develop an innovative, low-risk, cost-effective method to teach operations that require "learning by feel"

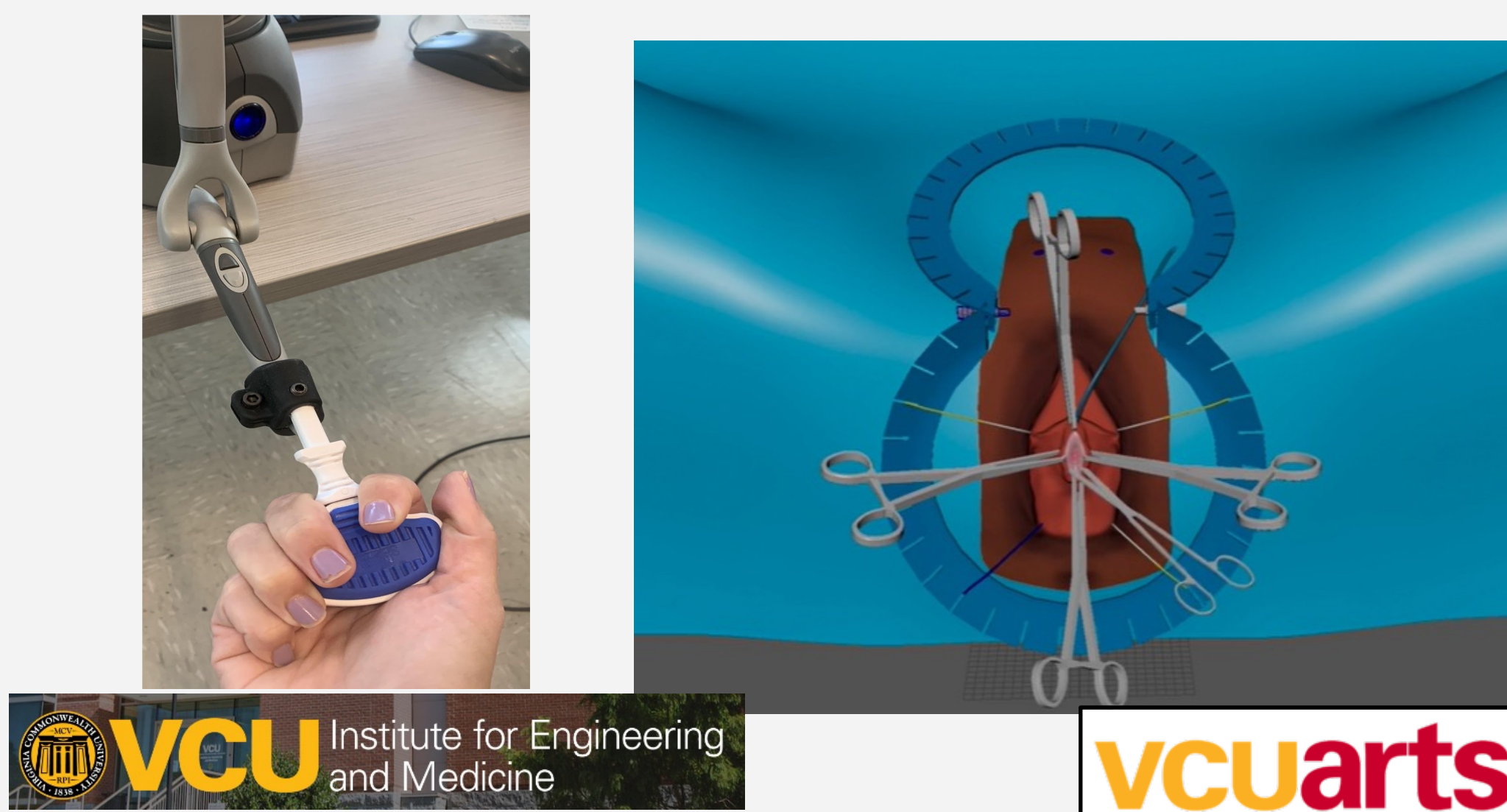
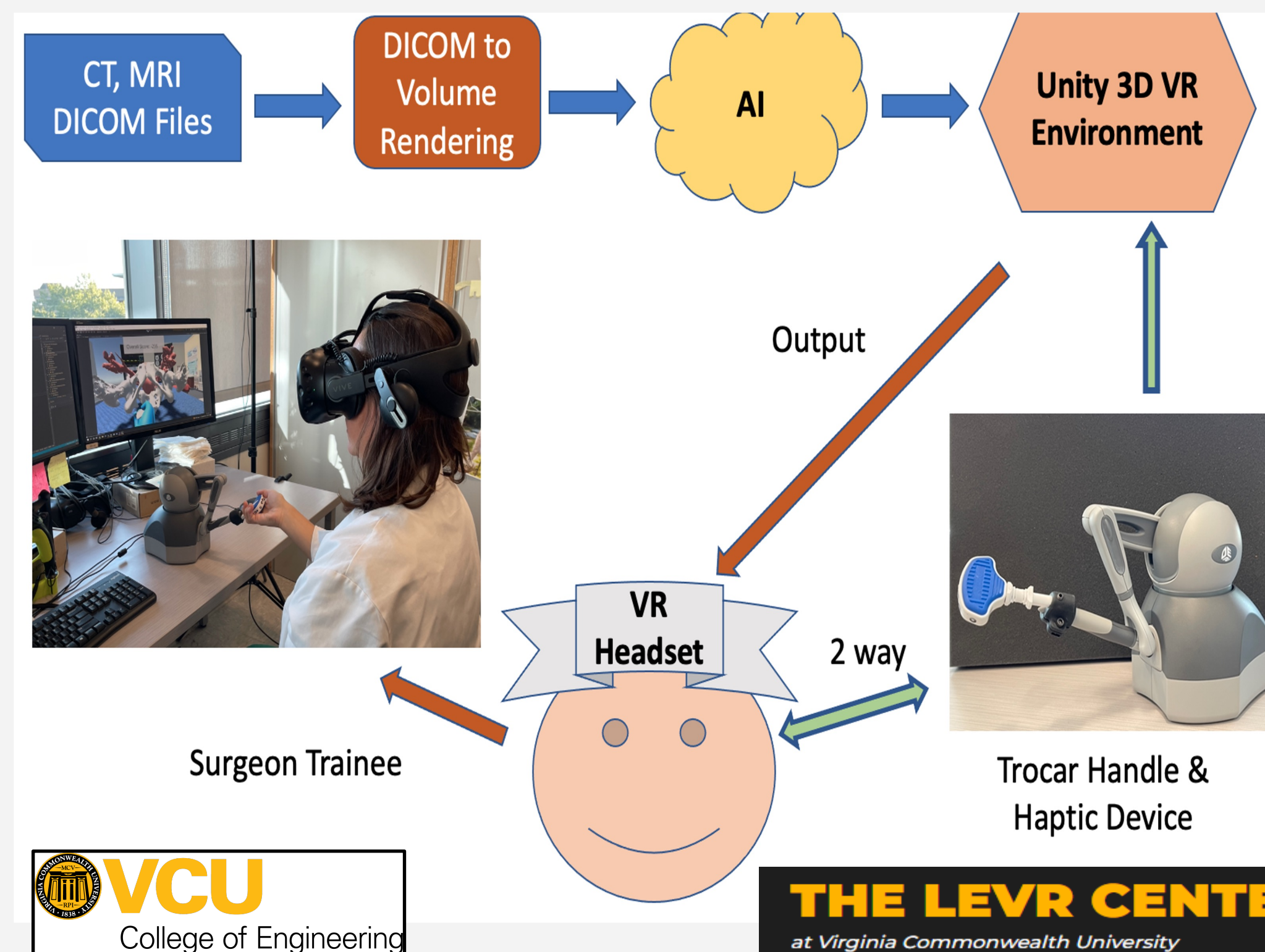
Objective

Evaluate the usability and potential of this VR + haptics training system

Methods

Multi-trial testing to collect perceptions from subject matter expert surgeons. A cognitive task analysis using a think aloud protocol was used to understand how design characteristics impacted learning and fidelity of the SlingVR system. Qualitative comments and investigator observations during the sessions were reviewed.

Results



N=3, 2 experts 1 PGY3. Experts are high-volume community surgeons trained at different programs with different approaches who used different devices. PGY3 has assisted and performed many RPS using the device and technique featured in the curriculum.

Results

6 main themes were identified:

Cognitive tasks, instruction, knowledge improvement

Break down steps for each level even further: like lighting the optimal pathway for novice to follow exactly"

System Feedback amount and type (ex. Continuous vs. intermittent, audio vs. visual)

"I like continuous visual and audio alerts but would save the scoring feedback until a final one at the end"

Scoring and Competency

"I would like to see a comparison of the perfect pathway vs. mine at the end"

Immersion and Realism

"I would like to feel with my nondominant hand too, I use that one more during a case"

Design elements and Aesthetics

"I am colorblind and can't read that shade of green well"

Gestalt/Impression

"This technology is great, the haptics add a lot, it could be used for hernias or trigger point injections too"

All 3 participants consense in the key elements of learning the procedure and the importance of realistic haptics

Conclusion

Our transdisciplinary team and diverse participants are key to evaluating usability and providing the blueprint for next steps in the iterative device development of SlingVR.