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# The Use of Interactive Holographic Technology to Teach Surgical Anatomy and Improve Self-Perceived Preparedness for Surgery in Urogynecology

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**VCU**Health™



The Use of Interactive  
Holographic Technology to  
Teach Surgical Anatomy and  
Improve Self-Perceived  
Preparedness for Surgery in  
Urogynecology

*Lauren Siff, MD; Neil Mehta, MD*

# Disclosures

- The authors have no financial disclosures to report.

# Learning Objectives

After this presentation, participants will...

1. Be able to list the benefits of augmented reality in medical education.
2. Be able to identify opportunities for use of this technology/curriculum in their program.
3. Be inspired to create other applications of this technology in surgical education.

# Background

- ACGME Milestones for OBGYN and FPMRS: “Vaginal Surgery” (knowledge of pelvic floor anatomy and POP, recognition and management of perioperative complications)
- N=205 PGY3-4 surveyed: rate of satisfaction with urogyn education in residency was 46.3%
  - 41% feel comfortable performing USLS
  - 13% feel comfortable performing SSLF

# Addressing Challenges

- Need to develop 3D understanding of the way pelvic floor musculature, ligamentous support and neurovasculature interact in space
- Created a curriculum using 3D anatomic models, surgical video and interactive activity
- Review the surgical anatomy, procedural steps and potential complications of USLS and SSLF

# Study Aims

- To determine if an interactive holographic curriculum will improve self-perceived preparedness, surgical knowledge and learner-satisfaction for urogynecologic surgery compared to usual self-study.

# The Technology



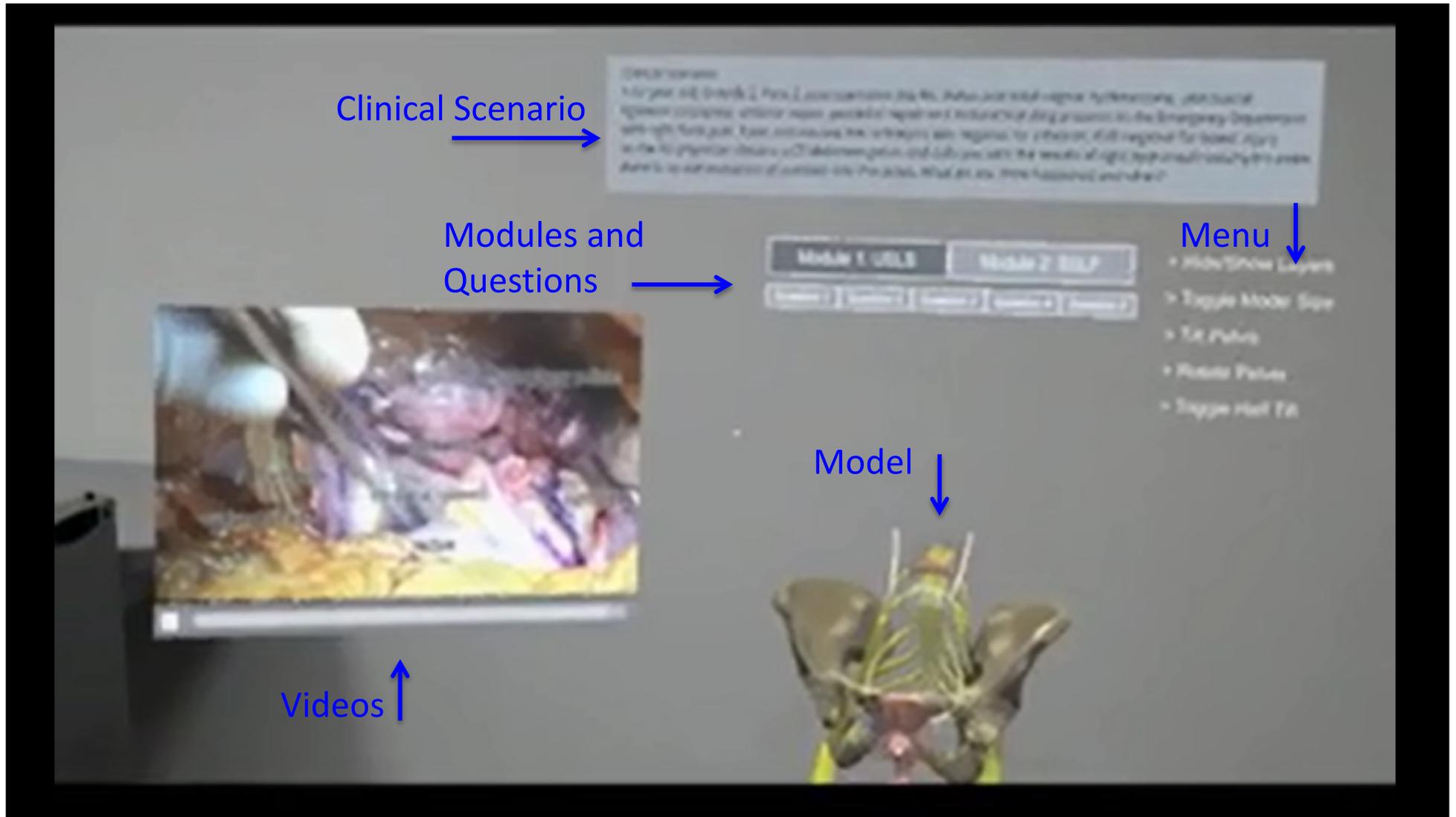
# Benefits of AR in medical education

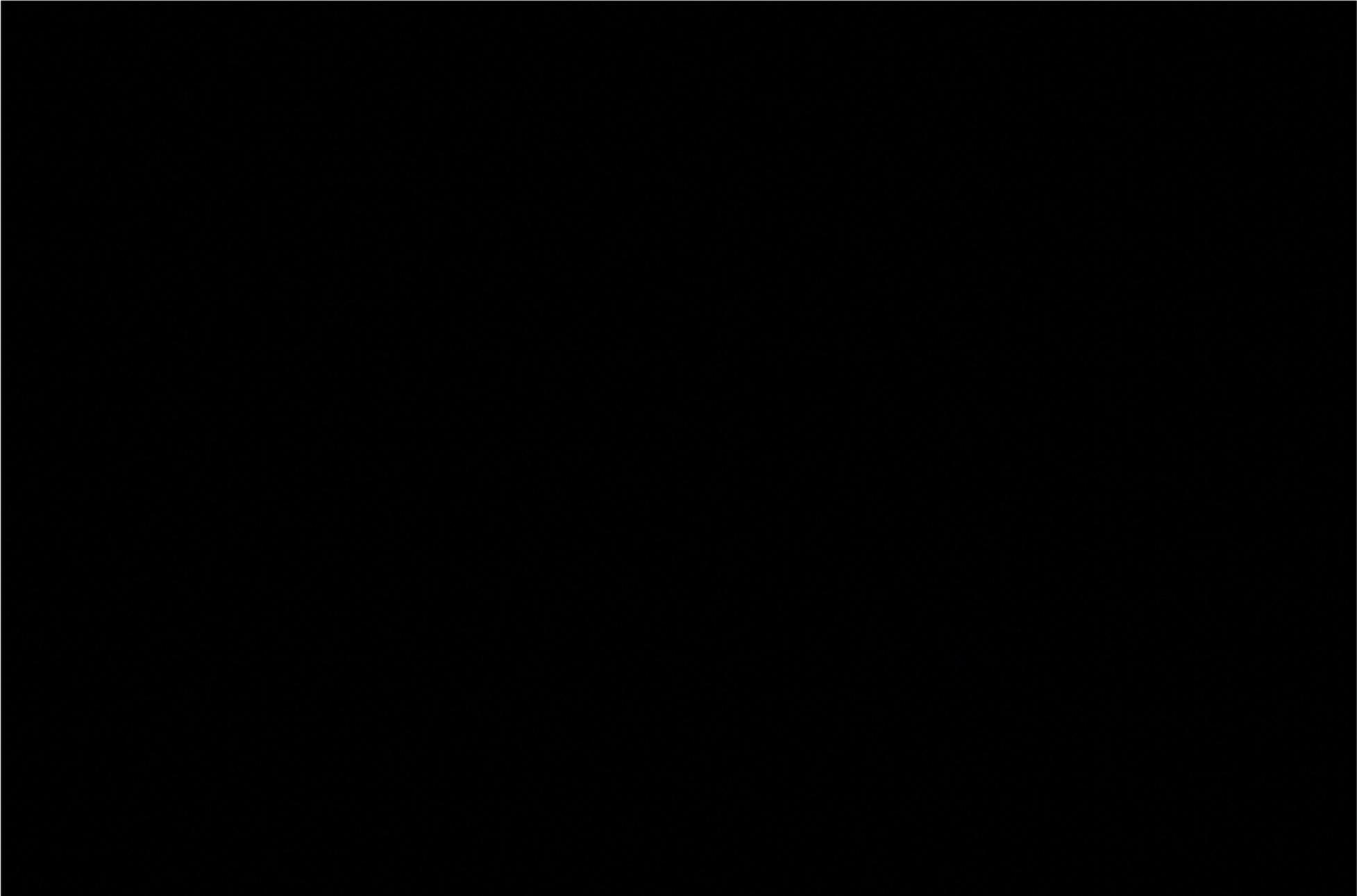
1. the physical training environment recreates the professional work environment
2. the learner may visualize the invisible and simulate relevant 3D and tactile aspects of the real world task
3. real time interaction with immediate learner feedback
4. trainee-lead and does not require instructor

# Using the device



# The Modules





# Traditional Preparation

- Reminder email 48 hours prior to the study
- Instructed to “prepare for the session as if they are preparing to scrub into a case of uterosacral ligament colpopexy and sacrospinous ligament fixation.”

# Self-Preparedness Survey

- One for USLS and for SSLF
- Reflects the preparedness achieved by usual self-study
- Valid and reliable as a predictor of readiness to successfully pass a cadaveric motor skills test of carpal tunnel release surgery in orthopedic residents

# Knowledge Test

- Pelvic anatomy, surgical landmarks
- Procedural steps (ideal suture placement)
- Recognition and management of intraoperative complications
- The answers were not given until the end of the session.

# Running the Curriculum



# Results: Demographics

Variable	Outcome
Age (years)	29.5 (26-32)
Gender n (%)	16/18 (89%) female 2/18 (11%) male
Postgraduate Year of training	3 (1-6)
Residents pursuing fellowship n (%)	12/15 (80%)
Plans after graduation	
MIGS	3/15
REI	5/15
FPMRS	2/15
GYN ONC	1/15
Fellowship (undecided)	1/15
Generalist OBGYN	3/15

# Results: Experience

Variable	Median (range), n
Weeks of Urogynecology experience	9.5 (0-116)
# of TVH surgeon*	23.5 (0-96)
# of TVH assistant	10 (3-40)
# of USLS surgeon*	0 (0-100)
# of USLS assist	10 (0-50)
# of SSLF surgeon*	0 (0-52)
# of SSLF assist	6.5 (0-25)

TVH; total vaginal hysterectomy, USLS; uterosacral ligament suspension, SSLF; Sacrospinous Ligament Fixation

\*As primary surgeon meaning performed >50% of the procedure

# Results

- **Self-perceived preparedness:**
  - Baseline: USLS=22, SSLF= 20.5
  - Post-Curriculum: USLS=26 , SSLF= 25
  - Mean difference(95%CI): USLS 3.6 (2.0-5.2)  $p=.0003$ ,  
SSLF 3.7(1.0-5.9)  $p=.003$
- **Knowledge Test:**
  - Baseline: median 42.5% (range 25-85%)
  - Post-Curriculum: 82.5% (55-100%)
  - Mean difference(95%CI): 35% (25.2%-44.8%)  $p<.0001$ .

# Results

- **Global Satisfaction:** 88% (14/16) preferred over traditional preparation
  - “better” (5/16), “much better” (6/16), “very much better” (3/16)
- **Likelihood of use:** 81% (13/16) “likely” or “very likely”

# Narrative Feedback

- Learning Curve:
  - “pretty hard to use at first”
  - initial difficulty with the hand gestures
- Device:
  - Headache/ “head-set fatigue”
  - “a little clunky”
- Content:
  - “the actual content is amazing”
  - “integration (layering) of (an anatomic) model and surgical videos was very helpful!”

# Limitations

- The device was learned and the curriculum trialed in a single session. Thus, the learning curve of the device may have influenced the impression of the content itself.
- We would like to test knowledge retention
- Participants had a focus on surgical subspecialties and 9.5 weeks of urogynecology exposure.
- Cost-effectiveness

# Strengths

- Novelty use of holographic technology, which elucidates concepts often not visible, even intraoperatively
- High acceptability to a wide range of residents PGY1-PGY6
- Self-guided curriculum, preparation without an instructor is feasible

# Conclusions

- This interactive holographic curriculum significantly improved self-perceived preparedness, surgical knowledge and trainee-satisfaction in urogynecologic surgery compared to usual self-study.
- We are indeed at the cutting edge of development and advancement in surgical education.

# Future Direction

- Integrate routine use of the curriculum while on the urogynecology rotation so that the learning curve of the device is no longer a barrier.
- Assess for retention of knowledge with a follow-up post-test as well as elicit reflective critique from participants after assisting in a case in the operating room.
- Tailor the software for intraoperative use and assess its impact on surgical outcomes.
- Film trainees performance and overlay on expert technique for feedback .

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