# Content Validity Evidence for a Novel Mixed Reality Percutaneous Nephrolithotomy Simulator

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## Background

Advances in simulation technology continue to push the field of surgical education forward. Coupling immersive virtual reality (VR) simulation with a physical console allows the incorporation of haptic feedback into a virtual operating room, to more accurately simulate the technical steps of advanced surgical procedures. The Marion K181 PCNL Simulator is a mixed-reality percutaneous nephrolithotomy (PCNL) platform, designed to train users to navigate the pelvicalyceal system.

## Objective

Provide initial *content* validity evidence for novel, immersive simulation platform for PCNL, by eliciting feedback from trainee and faculty surgeons experiencing the device.

## Methods

- o Three endourology centers in Canada and the United States
- o Platform consists of
  1. HTC 'VIVE' virtual reality headset (Taipei, Taiwan)
  2. Nephroscope and grasper connected to two 6-degrees of freedom (DOF) haptic robots
- o Feedback collected via questionnaire (7-point Likert-scales)
  - o Responses stratified to understand differences in opinion/perception between participant-types
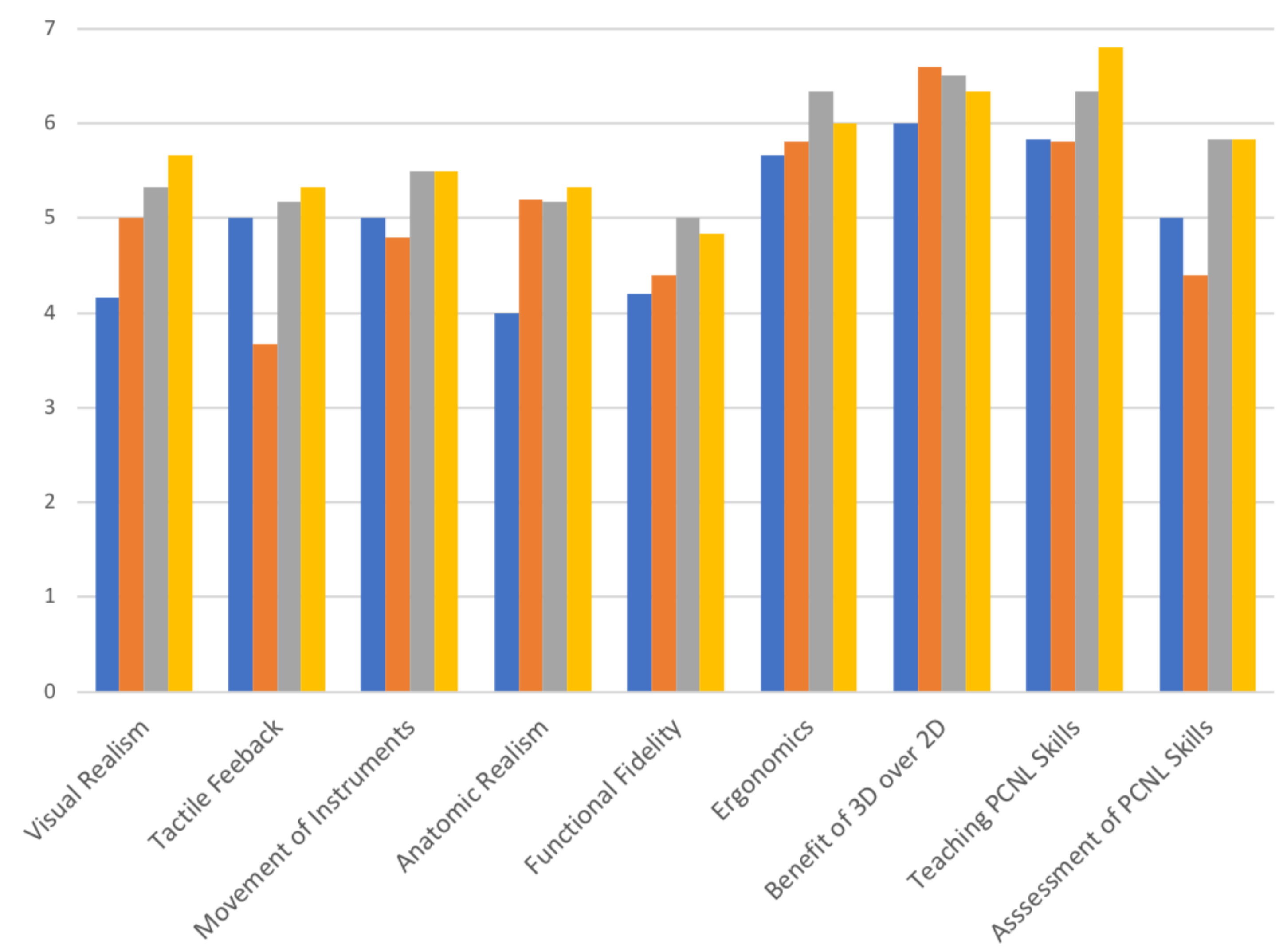


marion surgical

### Participant's Level of Training



7 23%
6 20%
6 20%
11 37%
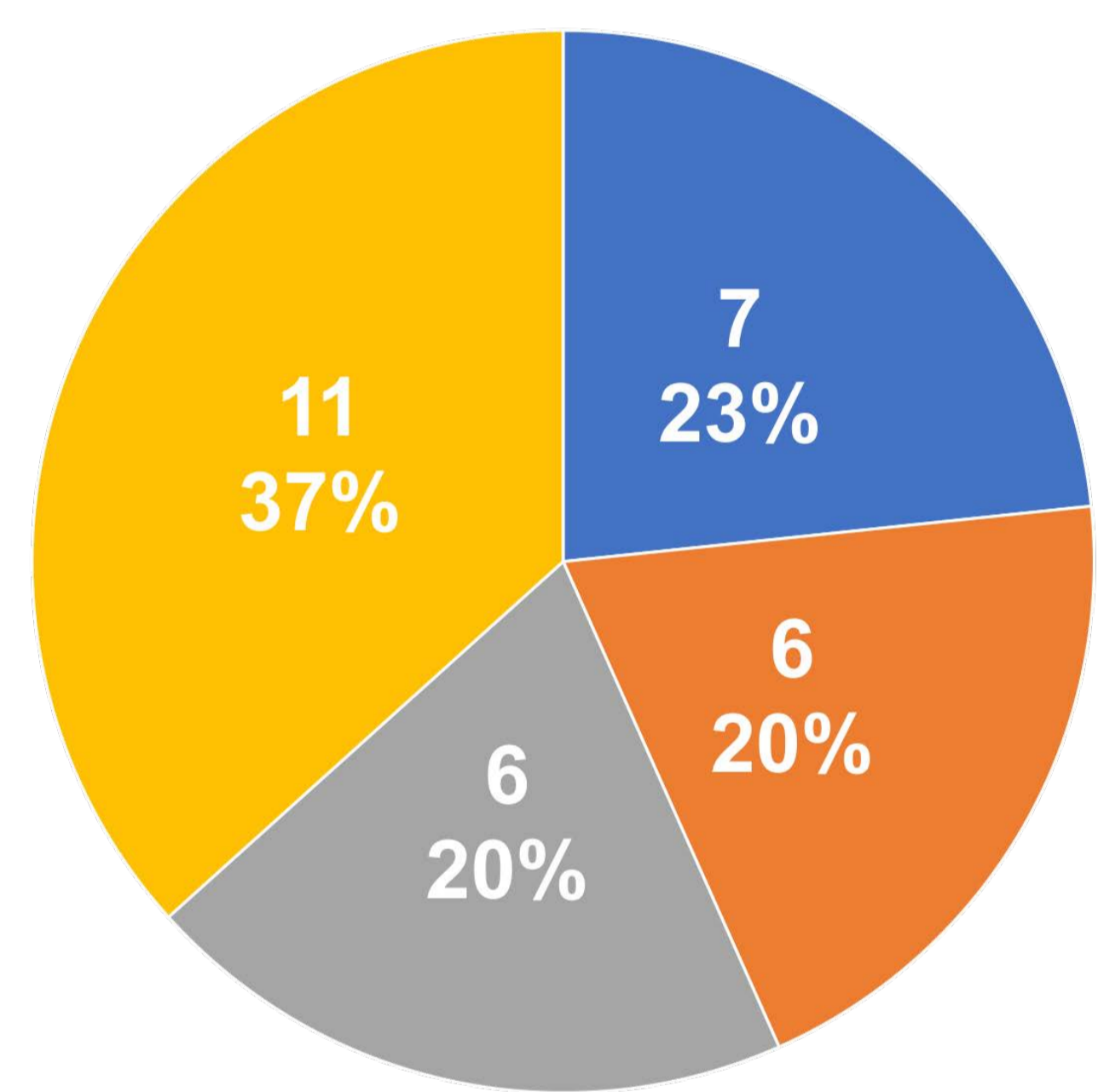
- Medical Students
- Residents
- Fellows
- Faculty Surgeons

### Participant Feedback on PCNL VR Simulator



Visual Realism, Tactile Feeback, Movement of Instruments, Anatomic Realism, Functional Fidelity, Ergonomics, Benefit of 3D over 2D, Teaching PCNL Skills, Assessment of PCNL Skills

## Conclusions

1. Novel combined VR and physical simulator among the first of its kind in PCNL
2. Incorporation of haptic feedback a significant step forward in procedural learning
3. Future work includes
   Incorporating percutaneous access into model
   Expanding platform to additional procedures

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