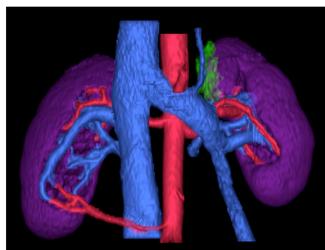


## INTRODUCTION

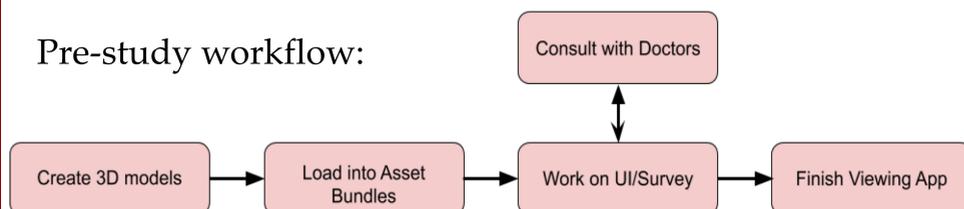
- Kidney shortages are a rampant issue. Over 100K patients remain on the waiting list with multiple people dying every day
- Patient cases have a wide range of anatomical differences with varying vein/artery structures which can lead to multiple complications
- Currently, transplant surgeons mainly utilize paper or computer screens to view patient data. Recently, 3D modeling has been explored as a potential alternative. Augmented reality may serve as a better viewing modality to save on printing costs and time.
- **GOAL: (1) Create a Hololens application for easy visualization of patient kidneys with simple interactions. (2) Test whether AR is on par or better than traditional viewing methods with study.**

## METHODS

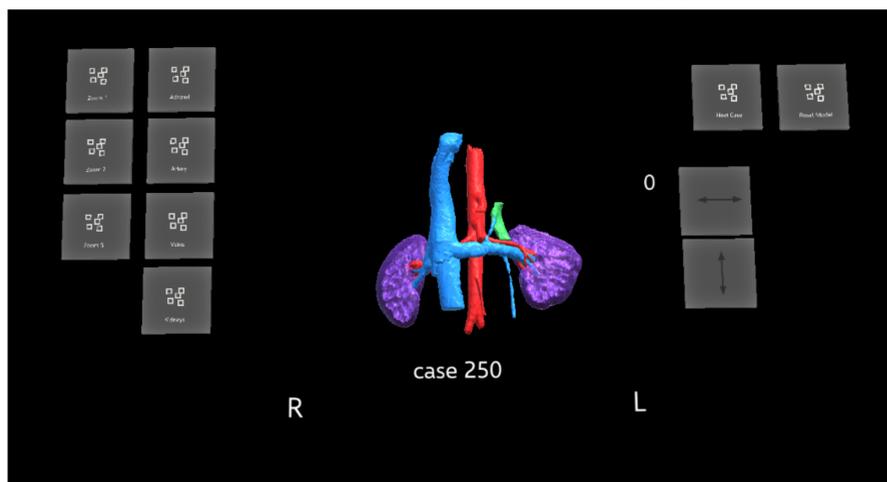
- Analyze 66 patient cases by hand and create 3D models of each structure (kidney, artery, adrenal gland, veins)
- Create a Hololens application to manipulate kidney models



Pre-study workflow:



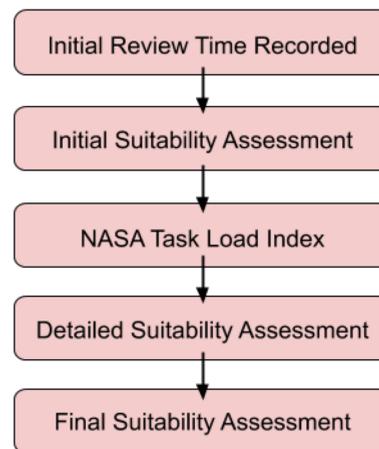
Screenshot of the Kidney Viewing Application



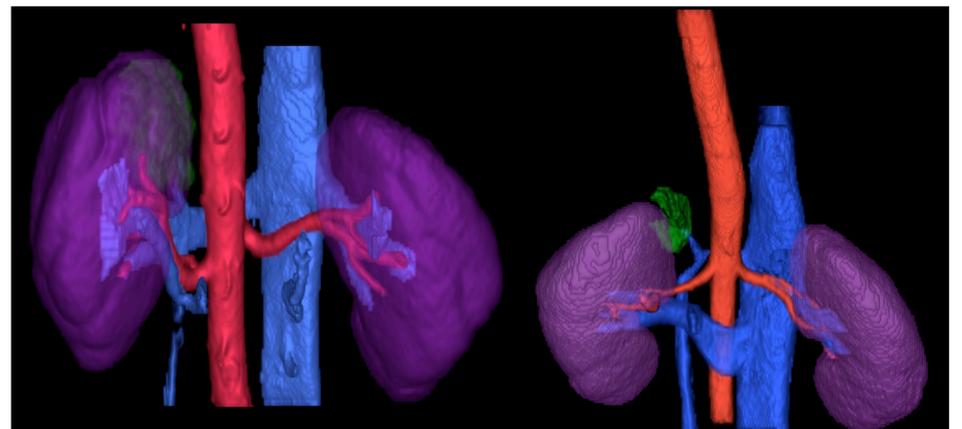
- Application includes voice commands and buttons
  - Toggle structures on/off
  - Zoom (2x, 5x)
  - Two rotation modes
  - Reset model and next case

## RESULTS & DISCUSSION

Survey Flowchart



- Randomized paired comparison study with AR and paper
- Make sure each doctor has read each case with each viewing method
- Collect data in multiple sessions to reduce learning
- Compare differences in kidney assessments and time to review
- Use donation history as gold standard



Case 193:

- Complex branching of the veins and arteries that are intertwined
- Doctor stated that 3D (AR) allows for the viewer to clearly see the anatomy

Case 209:

- On paper: Doctor unable to see cause of imprint
- With AR: Doctor able to clearly see lumbar coming directly at viewer

## CONCLUSION

- Future app improvements
  - Keyboard to locate specific case number
  - Streamline cases from redcap or online database
- Augmented reality may help doctors with complex cases
- Doctors might have frustrations with new tech
- Study may lead to discrepancies in kidney suitability assessments with different viewing modalities

**References:** National Kidney Foundation and Chandak, Pankaj & Byrne, Nicholas & Coleman, Andrew & Karunanithy, Narayan & Carmichael, Jim

& Marks, Stephen & Stojanovic, Jelena & Kessar, Nicos & Mamode, Nizam. (2018). Patient-specific 3D Printing: A Novel Technique for Complex Pediatric Renal

Transplantation. *Annals of surgery*. 269. 10.1097/SLA.0000000000003016.