**ACS 2023 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting**

**Research Abstracts**

## Novel Method for Obtaining Clinical Measurements in a Virtual Environment

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**Introduction:** 3D modeling and virtual reality (VR) are useful in pre-surgical planning of complex cases. As VR use cases increase, need for more detailed analysis, including measurements, increases. We deployed a novel measurement method that allowed scaling in digital environments while preserving user confidence of measurement accuracy. Comparative values were Haller index measurements for ease of measurement and bone segmentation. We compare accuracy and precision of measurements made in VR to those in the medical record.

**Methods:** Pre-operative CT scans of 26 pediatric patients requiring Nuss procedure had; radiologist recorded Haller indices, then rendered into 3D models, and scaled to a scanned and 3D segmented 12 inch ruler DICOM model (control measuring tool) as well as a Solidworks created 3D ruler and yardstick (higher resolution for detailed measurements). All digital models were equally scaled and placed in the same VR environment. [FIGURE 1] The DICOM source of both the clinical model and physical ruler transferred confidence to the digital ruler. As scaling was applied to the clinical model in the digital environment, the same scaling applied to the digital ruler. The transverse and anterior-posterior values were measured in virtual reality using the ruler, and Haller indices were calculated and recorded. [FIGURE 2].

**Results:** Data was collected, and a t-tailed independent sample t-test compared the similarity of the two groups of indices measured. The average radiologist-measured Haller index (3.97) was compared to VR-measured Haller index (4.20). Statistical analysis demonstrated a p-value of 0.56, indicating that there was no significant difference between the measurements obtained via virtual reality from those measured by radiologist.

**Conclusions:** This novel method provides guidance for how to develop and deploy digital methodologies for measurement in a digital 3D space. Similar to the benefit of improved mental representations of 3D models in VR, adding the ability to acquire measurements in 3D may allow for more relevant measurements unencumbered by 2D formats. Further research can be conducted to analyze whether this capability decreases operative time, or decreases complication rates.

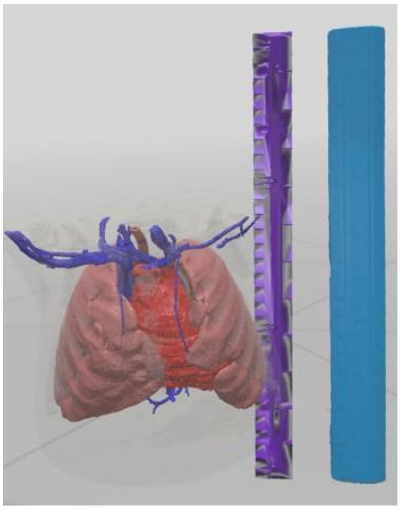

Figure 1

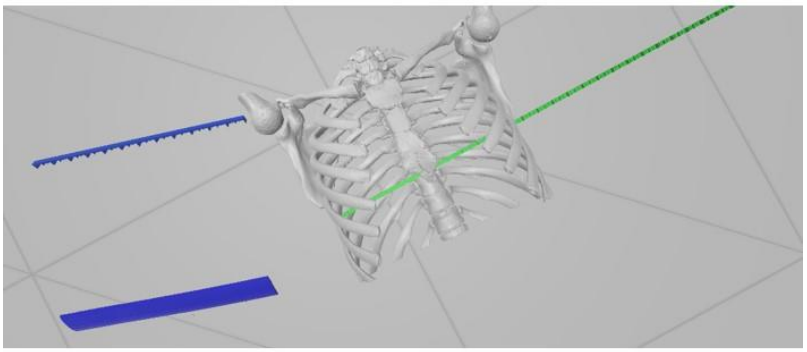

Figure 2