

Development and Implementation of a 3D-Printed Pulmonary Artery Model for Vascular and Interventional Radiology Simulation Training

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BACKGROUND

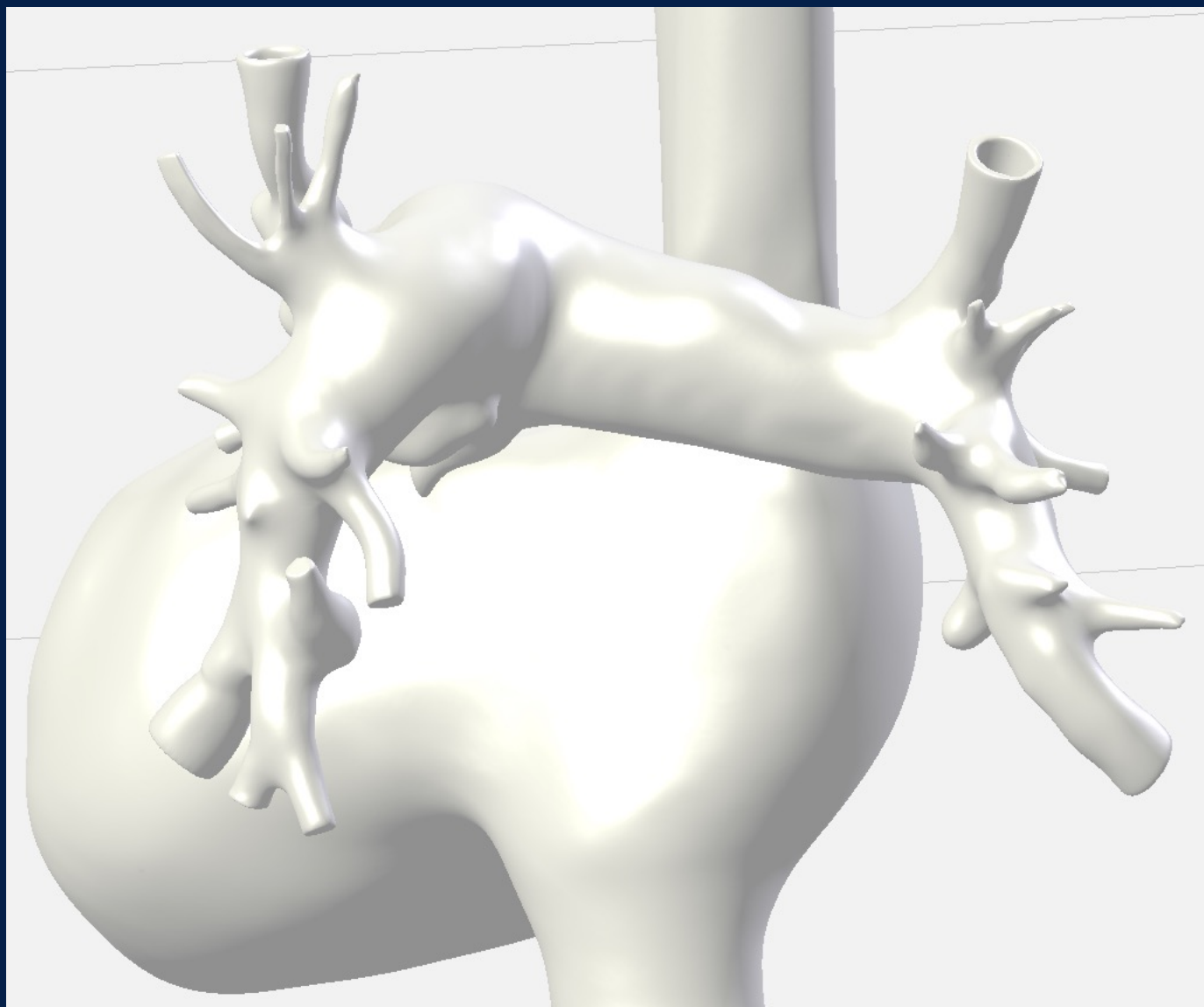
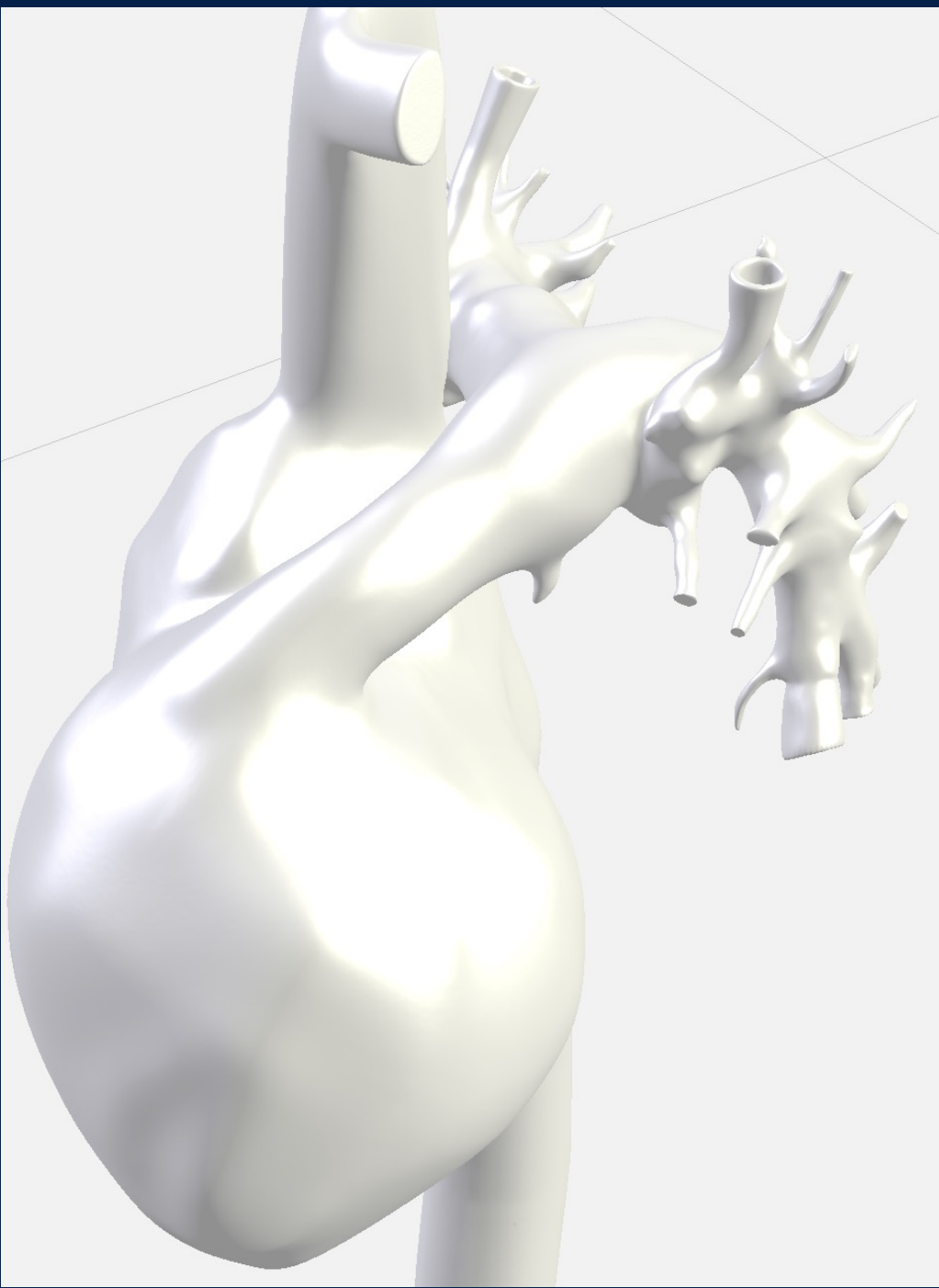
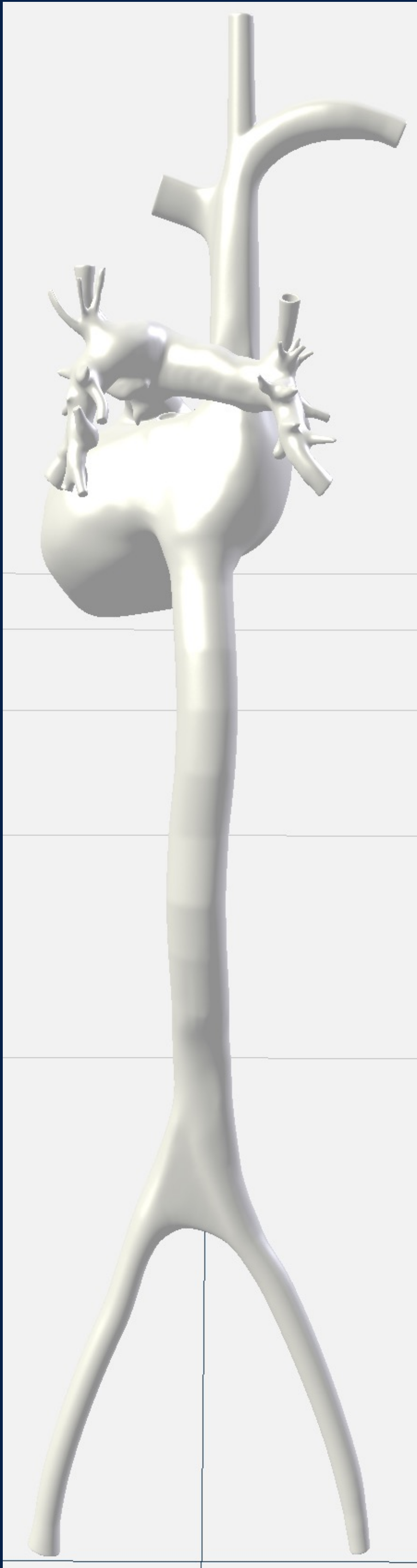
Endovascular PA curriculum is not standardized across IR fellowships nationwide, and procedural training is primarily taught through the Master-Apprentice model. This methodology invites the potential of patient harm. Simulation training eliminates patient risk in the learning process and has been shown across specialties to improve the speed and quality of skill acquisition. However, there are currently no prevalent modalities used for PA simulation.

METHODS

1. Model was digitally constructed via segmentation in 3D Slicer and then sculpted in Blender.
2. Final prototype to yield an encased vascular skeleton using StrataSys’s TissueMatrix, mimicking organ tissue. Model will utilize a pulsatile pump to simulate blood flow.
3. IR fellows will undergo a structured simulation program, timing access to the left main PA via multiple techniques and deployment of a coil in a select segment. Data will be recorded at the start and end of the program and will include access time, fluoroscopy time, and kerma area product.
4. Trainees will then be sent a survey elicit feedback on educational effectiveness

CONCLUSION

We hope to improve the safety and competency of PA interventions and disseminate understanding of how to utilize 3D printing to enable endovascular procedure planning and curriculum development.



Digital Rendering of the Pulmonary Artery Model

Post-Test Survey to be sent to IR trainees following a structured simulation program with the model

Subjective Rating Items Likert Survey and Open-ended Response

Rate your confidence in PA anatomy prior to your participation in this study
Rate 1-5, with 1 being "zero confidence" and 5 being "completely confident"

1 2 3 4 5

Rate your confidence in conducting PA procedures prior to your participation in this study
Rate 1-5, with 1 being "zero confidence" and 5 being "completely confident"

1 2 3 4 5

"Angiographic anatomy in the 3D-printed model appeared similar to human anatomy"
Rate 1-5, with 1 being "completely disagree" with the statement and 5 being "completely agree and endorse" the statement

1 2 3 4 5

"Pulmonary Artery (PA) vascular access was realistic in the 3D-printed model"
Rate 1-5, with 1 being "completely disagree" with the statement and 5 being "completely agree and endorse" the statement

1 2 3 4 5

"Manipulation of the catheters within the lumen was realistic in the 3D-printed model"
Rate 1-5, with 1 being "completely disagree" with the statement and 5 being "completely agree and endorse" the statement

1 2 3 4 5

"I believe the 3D-printed model is a useful tool for training basic interventional skills"
Rate 1-5, with 1 being "completely disagree" with the statement and 5 being "completely agree and endorse" the statement

1 2 3 4 5

What is the strength of the 3D-printed PA model?

How could the 3D-printed PA model be improved?

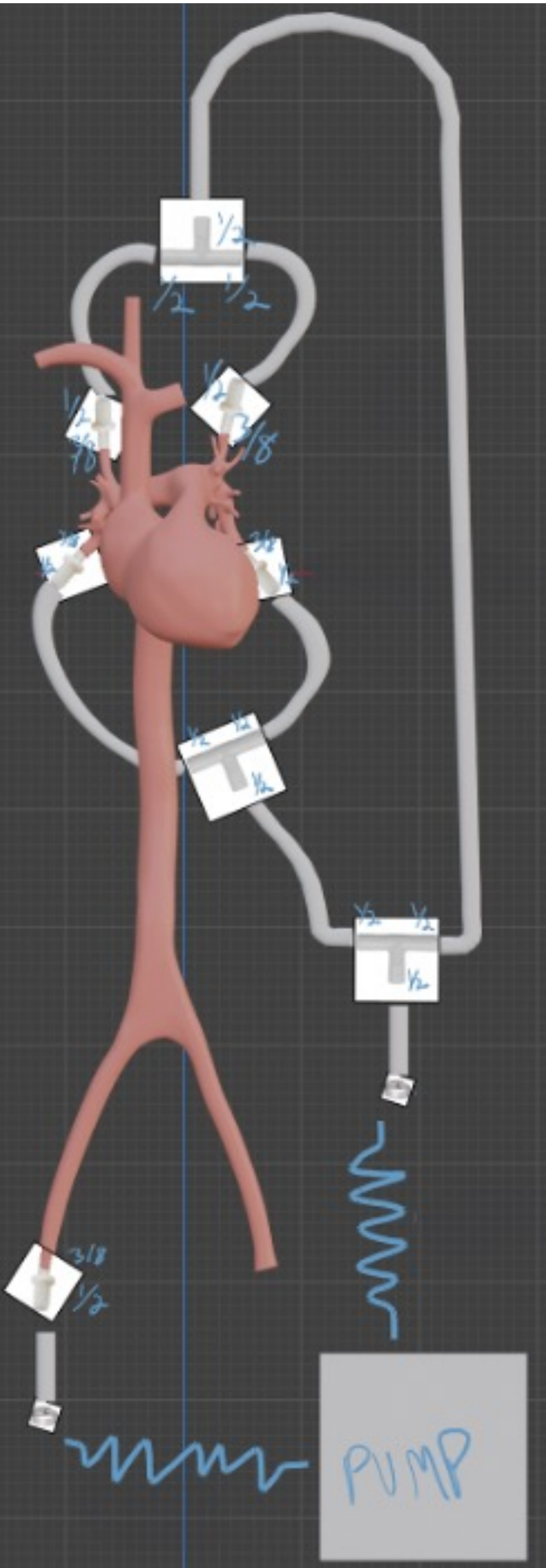
Describe how training with the 3D-printed model has affected your self-confidence in conducting PA procedures, if at all



United Biologics FlowTek 125 Pulsatile Pump to be used to simulate blood flow within the model



University of California
San Francisco



Visual representation of how the model will be connected to the pump for high-fidelity flow dynamics

ACKNOWLEDGEMENTS

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