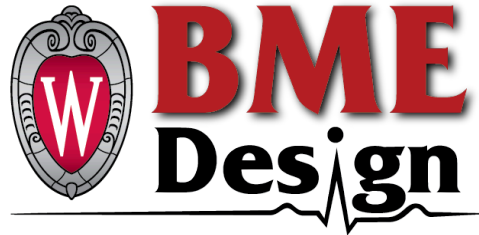


Progress Report: February 2nd - February 8th



Computed Tomography (CT) Circulation Phantom to Assess Hyperdynamic Contrast Flow Rates

Client: Dr. Giuseppe Toia gtoia@uwhealth.org

Advisor: Prof. John Puccinelli john.puccinelli@wisc.edu

Team:

Lucy O'Cull (Leader) ocull@wisc.edu

Emma Flemmer (Communicator) eflemmer@wisc.edu

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Problem statement

A CT phantom is a device used to calibrate Computed Tomography machines by acting as a “stand in” for human tissues [1]. Most phantoms currently in use are static; they do not allow for dynamic flow. Some patients obtaining a CT scan may need a circulatory support device, such as a VA-ECMO (veno-arterial extracorporeal membrane oxygenation) [2] device. There is a clinical need for a CT phantom with dynamic flow capabilities to study the correct ways to conduct CT vascular imaging for patients on ECMO devices. This phantom should model the inflow and outflow of an ECMO patient and have capabilities to simulate the addition of contrast media into the vascular system. Ultimately, this device will help medical personnel to better understand the flow of CT contrast through a patient on an ECMO machine, as the circulation flow rate of an ECMO patient differs from a patient not on ECMO.

Brief status update

Difficulties / advice requests

Current design

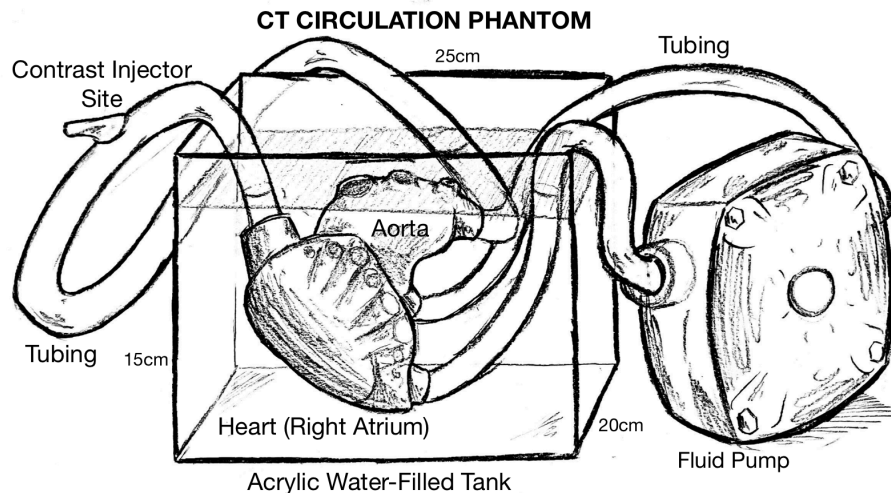


Figure 1: Final design sketch.

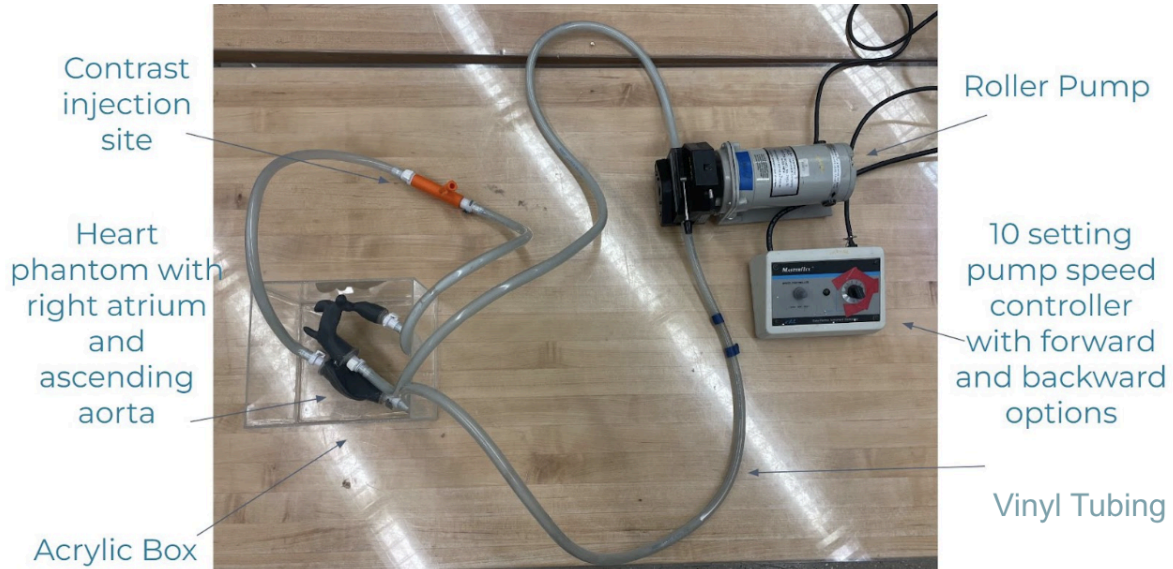


Figure 2: Final fabricated circulation phantom prototype with acrylic box, heart phantom, injection site, roller pump, speed controller, tubing, and connectors

Materials and expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
									\$0.00	
									\$0.00	
Category 2										
									\$0.00	
									\$0.00	
								TOTAL	\$0.00	
								:		

Major team goals for the next week

1. Meet with the client on 2/9 to discuss expectations for the semester
2. Use client feedback to update Product Design Specifications and begin fabrication plans

Next week's individual goals

- Lucy O'Cull
 - Purchase tubing
 - Research pumps for simulating partial heart function and ECMO
 - Start sketching up some potential circuit designs
- Emma Flemmer
 - Sketch and plan a circuit design with simulated partial heart function
 - Update the PDS with any relevant information after the client meeting
- Sophie Speece
 - Put together a materials list and present it to the clients to give them ideas for budget, potential investments, and pre-existing devices. Whether or not the team is given permission to purchase these items will determine what kinds of improvements can be made to the current design
 - Using feedback from client meeting, begin 3D model extraction and manipulation from existing stl files or CT DICOM files
- Lizzie Maly
 - Use feedback from client meeting to brainstorm how we will make changes to our design
 - Do research on what may or may not need to be added for materials that should be considered for purchase now.
- Shriya Kaushik
 - After meeting with the client, use feedback from client and implement any appropriate changes to the design
 - Research and shortlist different materials to use in the preliminary design

Timeline

Task	Jan	Feb				March					April				May	
	26	2	9	16	23	1	8	15	22	29	5	12	19	26	3	10
Project R&D																
Empathize																
Background...	X	X														
Prototyping																
Testings																
Deliverables																
Progress Reports	X	X														
Prelim presentation																
Final Poster																
Meetings																
Client																
Advisor	X	X														
Website																
Update																

Filled boxes = projected timeline

X = task was worked on or completed

Previous week's goals and accomplishments

- Lucy O'Cull
 - Prepared PDS for this semester's updates
 - Prepared talking points for initial client meeting
 - Updated various sections of the PDS
- Emma Flemmer
 - Coordinated a meeting time with the client and their team
 - Continued background and materials research
 - Updated performance requirements, safety, and life in service sections of the PDS
- Sophie Speece
 - Continued background research on existing designs. Found multiple studies with circulatory phantoms, including one that specifically looks at CT imaging for patients on VA-ECMO
 - Updated and completed the "Function" and "Miscellaneous-Competition" portions of the Product Design Specifications
- Lizzie Maly
 - Learned more about the different types of pumps that could be used for our project and presented them to the team.

- Contributed to writing the Product Design Specifications by writing about material specifications and appearance specifications.
- Shriya Kaushik
 - Continued researching different pumps and read the previous semester's final report
 - Worked on sections 1 e-g. for the Preliminary Design Specifications document

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Lizzie Maly	01/31/2024	Literature Research	2	2	2
Shriya Kaushik	01/31/2024	Background and literature research	2	2	2
Sophie Speece	01/31/2024	Literature research	2	2	2
Lucy O'Cull	01/31/2024	Literature research	2	2	2
Emma Flemmer	02/01/2024	Literature research	2	2	2
Sophie Speece	02/02/2024	Literature research on VA-ECMO background information	2	2	2
Lucy O'Cull	02/05/2024	Group meeting planning and review PDS for delegation	0.5	0.5	2.5
Lucy O'Cull	02/08/2024	Contribution to PDS	1	1.5	4
Emma Flemmer	02/05/2024	Communication with client and advisor	0.5	0.5	2.5
Emma Flemmer	02/08/2024	Research and writing for the PDS	1.5	2	4
Sophie Speece	02/08/2024	Literature research focused on existing designs	2	2	4
Lizzie Maly	02/08/2024	Literature Research	1.5	2	4
Lizzie Maly	02/08/2024	Contribution to PDS	.5	2	4
Shriya Kaushik	02/08/2024	PDS sections	0.5	0.5	2.5

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Lizzie Maly	01/31/2024	Literature Research	2	2	2
Shriya Kaushik	01/31/2024	Background and literature research	2	2	2
Sophie Speece	01/31/2024	Literature research	2	2	2
Lucy O'Cull	01/31/2024	Literature research	2	2	2
Emma Flemmer	02/01/2024	Literature research	2	2	2
Sophie Speece	02/02/2024	Literature research on VA-ECMO background information	2	2	2
Lucy O'Cull	02/05/2024	Group meeting planning and review PDS for delegation	0.5	0.5	2.5
Shriya Kaushik	02/08/2024	Researching and reading old reports	1.5	1.5	4