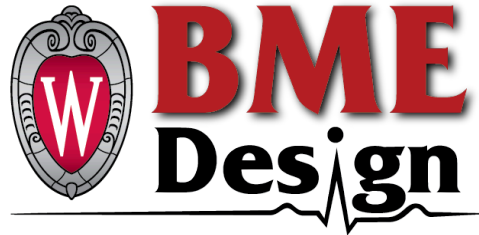


## Progress Report: February 2nd - February 8th



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

**Client:** Dr. Giuseppe Toia [gtoia@uwhealth.org](mailto:gtoia@uwhealth.org)

**Advisor:** Prof. John Puccinelli [john.puccinelli@wisc.edu](mailto:john.puccinelli@wisc.edu)

### Team:

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Shriya Kaushik (BPAG) [skaushik6@wisc.edu](mailto:skaushik6@wisc.edu)

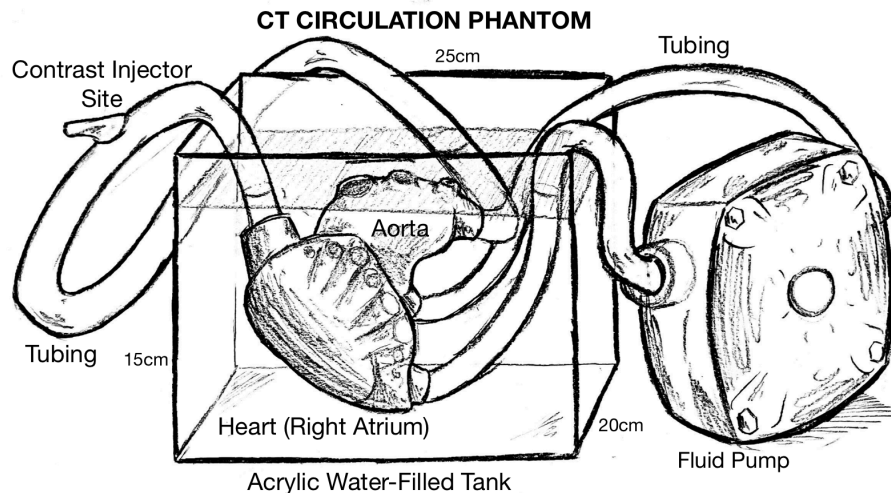
## Problem statement

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.

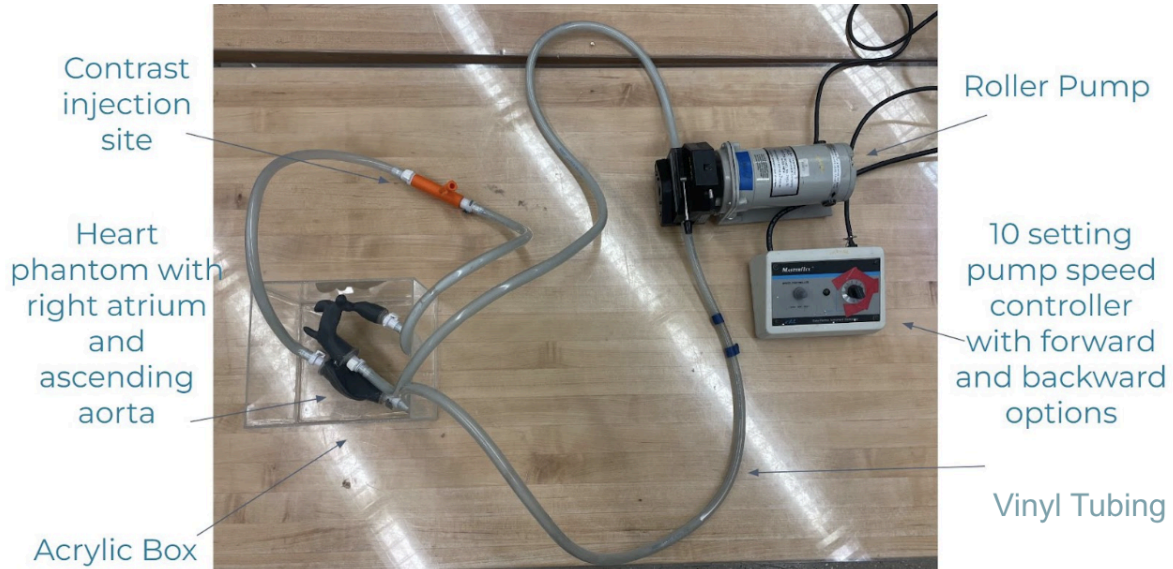
## Brief status update

## 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
<b>Category 1</b>										
									\$0.00	
									\$0.00	
<b>Category 2</b>										
									\$0.00	
									\$0.00	
								<b>TOTAL</b>	<b>\$0.00</b>	
								:		

## Major team goals for the next week

1. Decide on a final design

## Next week's individual goals

- Lucy O'Cull
  - Develop better mathematical models for future deliverables
  - Pick out a pump to present to client in the case that recommendations are not coming in as expected
  - Reach out to CT techs to see when we can come in to look at PACS data
- Emma Flemmer
  - Contact Stratasys to determine if TangoPlus is a realistic phantom material option
  - Continue research on TangoPlus, pump prices, and pump operation to complete the design matrix
- Sophie Speece
  - Determine what areas of the heart will be modeled and printed for the phantom.
  - Using either CT data or existing files, begin modeling phantom to be printed
- Lizzie Maly
  - Look further into material options for 3D printing our phantom. Research and fully explain content for design matrix with both pump and material rankings
- Shriya Kaushik
  - Complete design matrix and the descriptions and explanations associated
  - Come up with final design of both the pump and material and present ideas to the client

## Timeline

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

Filled boxes = projected timeline

X = task was worked on or completed

## Previous week's goals and accomplishments

- Lucy O'Cull
  - Contributed to the abstract requested by the client
  - Researched methods for reducing air in circuit
  - Researched pumps for purchasing
  - Researched patient sizing for purchasing tubing
- Emma Flemmer
  - Contributed to the abstract requested by the client
  - Communicated with the client to create the abstract
  - Researched 3D printing material options for the phantom and one way valves
- Sophie Speece
  - Performed research about 3D printing material options that would work well for the heart phantom.
  - Used this research to discuss with team about the design matrices
- Lizzie Maly
  - Performed research on pumps and how they play a role in the circuit.
  - Brainstormed design ideas with the team regarding pump and material options.
- Shriya Kaushik

- Met with team to discuss Design matrices and decide criteria
- Researched about centrifugal pump and TangoPlus soft material to make the heart

## *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
Shriya Kaushik	02/08/2024	Researching and reading old reports	1.5	1.5	4
Lucy O’Cull	02/12/2024	Worked on abstract	0.5	0.5	4.5
Lucy O’Cull	02/13/2024	Group design matrix discussion	1	1.5	6
Lucy O’Cull	02/15/2024	Literature research	1	2.5	7
Emma Flemmer	02/13/2024	Contributed to abstract	0.5	0.5	4.5
Emma Flemmer	02/14/2024	Team meeting to discuss designs	1	1.5	5.5
Emma Flemmer	02/15/2024	Materials research	1.5	3	7

<b>Name</b>	<b>Date</b>	<b>Activity</b>	<b>Time (h)</b>	<b>Week Total (h)</b>	<b>Sem. Total (h)</b>
Sophie Speece	02/14/2024	Met with team and researched potential 3D printing materials	2.5	2.5	6.5
Lizzie Maly	2/14/2024	Team Meeting to Discuss	1	2	5
Lizzie Maly	2/14/2024	Pump Research and Material Research	1	2	6
Shriya Kaushik	2/14/2024	team meeting	1	1	5
Shriya Kaushik	2/14/2024	Researched pumps and materials	2	2	7