

BME Design: Progress reports

Title: Milrinone alternative delivery system

Date: 10/2/2026

Client: Dr. Lenard Markman
Advisor: Prof. William Murphy
Team: Beyond the IV

Samuel Glanville - *Team Leader*

Yisi Yang - *Communicator*

Steve Lee - *BSAC*

Katie Wright - *Co-BWIG*

Noelle Johnston - *Co-BWIG*

Leo Thayer - *BPAG*

Problem statement

Congestive heart failure (CHF) patients use Milrinone therapy, but current delivery relies on IV administration, limiting outpatient use and long-term management. There is a need to develop and validate alternative, non-invasive delivery formulations of Milrinone, such as nebulized/inhaled, oral (tablet or liquid), or nasal spray for rapid daytime symptom control, paired with a longer-acting oral formulation for sustained nighttime dosing that achieve therapeutic equivalence to existing delivery methods while minimizing side effects and improving patient adherence and quality of life.

Brief status update

Our team met up on Wednesday to work on our preliminary design slideshow and we presented our designs to the advisor and other groups on Friday. We are still set on the extended release capsules as the final design and we are planning on meeting with our client in the near future to present our design to him and get feedback.

Difficulties/advice requests

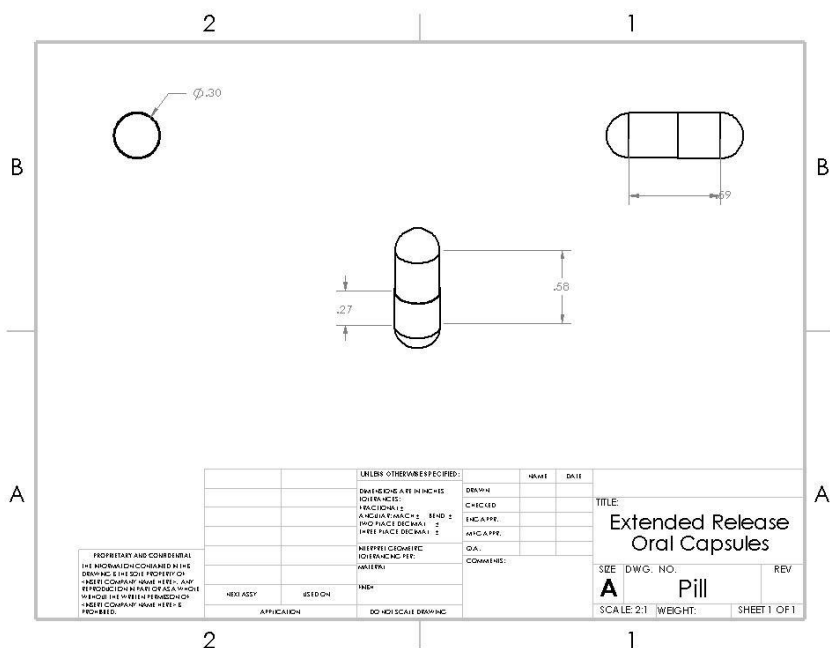
Our project focuses on patients with stage D heart failure who currently receive milrinone through a portable intravenous (IV) infusion pump. We aim to investigate a more convenient delivery method that reduces the burden of IV treatment while maintaining therapeutic support. The alternative should also address the needs of patients who have difficulty swallowing or cannot swallow oral tablets.

As a team and with use of the design matrix, the extended release capsule was selected to be the final design choice due to its ease of fabrication, ease of use, and lower dosage per day. A key uncertainty at this moment is figuring out a

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molecule that we can use for testing that is similar to milrinone, in terms of solubility and acidity. Furthermore, we are also hoping to meet with our client and determine how we can access our budget and any advice that he has on our design.

Current design



The current design consists of an extended release oral capsule. This design allows for the patient to only take medication once every twelve hours. The design also allows for a simple fabrication with little to no extraneous cost. The capsules are made of plant-base polymers delaying the medication delivery when it reaches the stomach for up to half an hour.

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	

- Starting budget of \$100 from our client
 - From there the university can provide medications that are needed or we could possibly receive soft funding from the American Heart Association if we explain our project to them.
- An additional budget of \$50 can be accessed for Design Innovation Lab specific purchases such as 3d printing.

Goals

Major team goals for the next week

1. Decide on final design
 - We have narrowed it down, but discuss with our client before moving forward
2. Create preliminary report
3. Continue research on our final design
 - Determine the material of the capsule, number of dosages per day, and concentration of milrinone in the capsule to achieve desired therapeutic concentration
4. Individually complete our feedback fruits peer evaluations

Next week's individual goals

- Samuel Glanville
 - Research testing methods
 - Meet with the client about budget and get design approval
 - Decide on and order extended release capsules (provided approval)
- Yisi Yang
 - Completed preliminary design presentation with the team.
 - Continue researching possible small-molecule that could be a good testing subject.
 - Schedule potential meetings in person with our client for interviews and collaboration on testing environments.
- Steve Lee
 - Finalize preliminary reports
 - Continue with testing research and draft testing environment
 - Check in with client on our design and prepare to order materials
 - Meet up with potential collaborator

- Katie Wright
 - Continue researching which material would be the most effective for the extended-release oral capsule design
 - Start preliminary design report
 - Complete feedback fruits peer evaluations
 - Prepare questions for our client to discuss our final design choice
- Noelle Johnston
 - Complete the feedback fruits peer evaluations.
 - Complete and work on the preliminary design report.
 - Plan to meet with our client to discuss the idea of an extended release capsule as the final design.
 - Further research on extended-release capsules and the studies that occurred with the milrinone capsules.
- Leo Thayer
 - Meet with the client to discuss all accounting needs of the team.
 - Begin design specific research for extended release capsules.
 - Collaborate with teammates on the preliminary report.

Timeline

Task	Sep				Oct					Nov				Dec	
	4	11	18	25	2	9	16	23	30	7	14	21	28	5	9
Project R&D															
Background Research	x	x	x	x											
Preliminary Design Work			x	x	x										
Design Specific Research					x										
Model and Simulate Design															
Purchase Materials															
Fabrication															
Testing															
Fabrication Adjustments															
Final Prototype															
Final Poster															
Task	Sep				Oct					Nov				Dec	

Filled boxes = projected timeline

X = task was worked on or completed

Detailed accomplishments

Previous week's goals and accomplishments

- Samuel Glanville
 - Preliminary deliverables
 - Nebulizer research
 - Team meeting on preliminary deliverables, and final design
- Yisi Yang
 - Find out the categories for the design matrix with the team
 - Finalize the preliminary designs and find out what type of alternatives we want to deliver for the preliminary design report.
 - Meet with a professor from the department of cardiology to discuss how to make our current design better.
- Steve Lee
 - Complete preliminary design slides
 - Present to fellow classmates on preliminary designs
 - Continue researching on milrinone properties and testing
- Katie Wright
 - Assisted the team with completing our preliminary design presentation slides
 - Specifically focused on the PDS portion
 - Researched more about the possible materials of the capsule design
 - Continued updating our website with the most current information
- Noelle Johnston
 - Continued to update our website and upload documents.
 - Worked on a portion of the preliminary design slides and presented on it.
- Leo Thayer
 - Created a purchasing organization spreadsheet for team expenses.
 - Completed a section of the preliminary design presentation slides.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Samuel Glanville	9/9/2026	CAD	1	2	6
Samuel Glanville	10/2/2026	Research	1	1	7
Samuel Glanville	10/2/2026	Preliminary Deliverables	1	1	1
Samuel Glanville	10/2/2026	Meetings	1	1	4
Yisi Yang	9/8/2026	Client Meeting	0.8	0.8	0.8
Yisi Yang	9/13/2026	Client Meeting	0.8	0.8	1.6
Yisi Yang	9/16/2026	Background Research	2	2.8	3.6
Yisi Yang	9/17/2026	Client requirement part of PDS	1	3.8	4.6
Yisi Yang	9/21/2026	Background Research	2	2	6.6
Yisi Yang	9/21/2026	Teams Meeting	1.5	3.5	8.1
Yisi Yang	9/28/2026	Research on previous studies	1.5	1.5	9.6
Yisi Yang	9/30/2026	Presentation Team meeting	1	2.5	10.6
Steve Lee	9/10/2026	Background Research	1	1	
Katie Wright	9/29/2026	PDS slides for preliminary design report	1	2	8.1
Katie Wright	9/28/2026	Research on the capsule material	1	2	8.1
Noelle Johnston	9/10/2026	Background Research	1	1	1
Noelle Johnston	9/15/2026	Capsule Type Research	1.75	1.75	2.75
Noelle Johnston	9/16/2026	Various Sections of PDS	1	2.75	3.75
Noelle Johnston	9/20/2026	Sublingual Pouch Research	2	2	5.75
Noelle Johnston	9/21/2026	Design Matrix Team Meeting	1.5	3.5	7.25
Noelle Johnston	10/30/2026	Presentation Team Meeting	1	1	8.25
Noelle Johnston	9/29/2026	Slideshow Work	.5	.5	8.75
Leo Thayer	9/8/2026	Background Research	1.5	1.5	1.5
Steve Lee	09/15/26	Client Meeting	1	1	2
Steve Lee	09/16/26	Contact potential collaborator	1	2	3
Steve Lee	09/17/26	Contact potential collaborator	0.5	2.5	3.5

Steve Lee	09/18/26	Research testing environment	1	3.5	4.5
Leo Thayer	9/16/26	Research oral milrinone and PDS	2	2	3.5
Leo Thayer	9/17/26	Pouch similar designs research	1	3	4.5
Steve Lee	09/21/26	Design Feasibility Research	1.5	1.5	6
Steve Lee	09/25/26	Potential Collaborator Meeting	2	3.5	8
Leo Thayer	9/25/26	BPAG and Team Meeting	1.5	1.5	6
Leo Thayer	9/22/26	Pouch side effect research	1.5	3	7.5
Steve lee	09/29/26	Contact potential collaborator	0.5	0.5	8.5
Steve Lee	09/30/26	Presentation slide and meetings	1.5	2	10
Steve Lee	10/01/26	Presentation slide	0.5	2.5	10.5
Leo Thayer	10/1/226	Presentation work and meetings	1.5	1.5	9