

BME Design: Progress reports

Title: Milrinone alternative delivery system

Date: 9/17/2026

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

The team completed team role assignments on project selection day and began background research on congestive heart failure and Milrinone therapy. Yisi, the communicator, set up a client meeting for the team to introduce ourselves to the client, learn about the client's expectations, and ask crucial questions regarding the project logistics. The team has continued researching the background information of the project to prepare for an advisor meeting on Friday. No expense has been incurred this week. The progress is on track with the predicted timeline. Only difficulties experienced was the lack of overlap of team members' free time, making it difficult for the team to meet and discuss in person before the advisor meeting, but expected to be resolved in future weeks as campus events slow down.

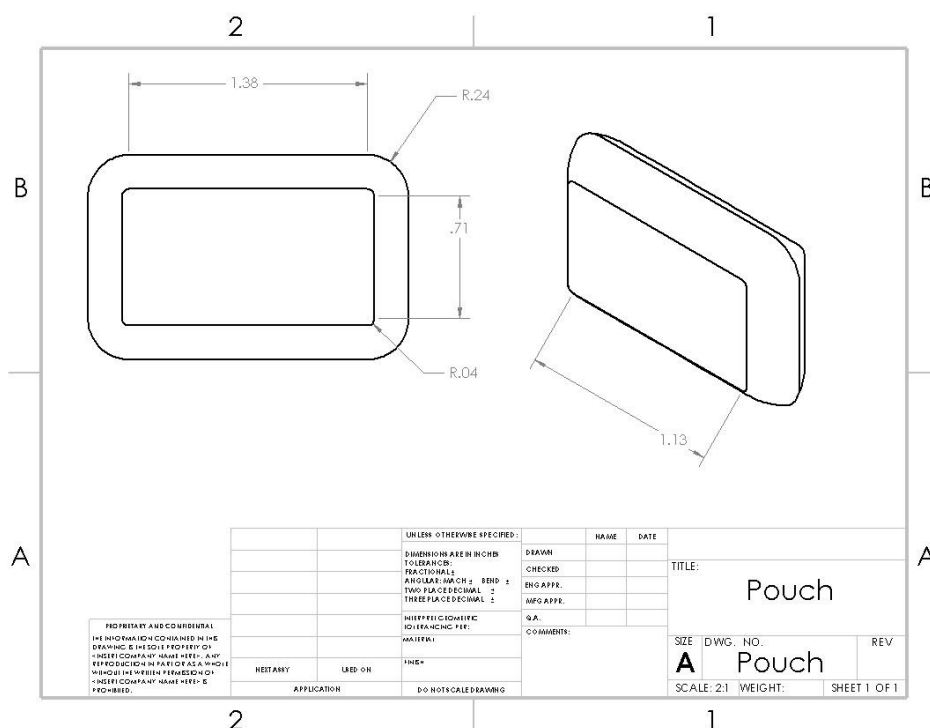
Difficulties/advice requests

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.

Following our first client meeting, the client suggested exploring a long-acting nasal spray for the night and a short-acting spray for the daytime, potentially incorporating a vasoconstrictor to prolong its effect. A key uncertainty is whether this approach could provide sustained, predictable milrinone absorption while remaining safe for patients with stage D/advanced heart failure. We need to distinguish between prolonged relief from existing nasal medications and sustained systemic delivery of milrinone.

Current design



The current model of the pouch is designed to be the standard size of any market sublingual diffusion pouch. The material is not yet distinguished although it will likely be some tea-bag like diffuser. The design is intended to remain sleek and subtle so as to not cause discomfort or irritation within the gums.

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.

Goals

Major team goals for the next week

1. Continue research on all three design concepts
 - Investigate the safety, dosing, limitations, positives, and feasibility of each idea
 - Try to find existing formulations or formulations of similar molecules
 - Research clinical studies associated with each design
2. Contact professionals and researchers
 - Reach out to people with expertise in cardiology and drug delivery
 - Ask them to review the feasibility of each design
3. Begin the design matrix
 - Evaluate each design based on criteria from the PDS
 - Start comparing concepts and get advice from experts, client, and advisor
4. Update the PDS

Next week's individual goals

- Samuel Glanville
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- Yisi Yang
 - Research about potential substitutes for milrinone testing if we cannot get the medicine itself.
 - Search for potential professors or MDs from the school of Pharmacy or UW Health to talk with about our design matrix.
 - Research about categories that might appear on our design matrix, for example, will the texture of pouches irritate the sublingual tissue.
 - Update our potential design matrix to the client
- Steve Lee
 - Setup meeting with potential collaborator at the Department of Cardiology
 - Continue to search for collaboration and resources from School of Medicine and School of Pharmacy
 - Continue researching on testing environment and draft bioreactor design

- Propose 3 design ideas and make design matrix with the team
- Katie Wright
 - Set up meeting with Professor Lamming, Vice President of Clinical and Translational Research, to discuss our three design ideas
 - Continue research on each of our three proposals
 - Start the design matrix
- Noelle Johnston
 - Further research on extended-release capsule options for design matrix.
 - Continue to research individuals to reach out to for information on cardiology and the School of Pharmacy.
 - Continue to update our website
- Leo Thayer
 - Compile detailed research into three solutions for a design matrix of preliminary design proposals.
 - Further research oral delivery pouches for milrinone.
 - Research side effects of similar molecules in pouch administration.

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...	x	x	x												
Prototyping															
Testings															
Deliverables															
Progress Reports	x	x	x												
Prelim presentation															
Final Poster															
Meetings	x	x	x												
Client		x	x												
Advisor		x	x												
Website	x														

Filled boxes = projected timeline

X = task was worked on or completed

Detailed accomplishments

Previous week's goals and accomplishments

- Samuel Glanville
 - Detailed CAD drawing of the sublingual pouch.
 - Background research on the use of a nasal spray
- Yisi Yang
 - Talk with the client again to determine which route we want to pursue for the alternative delivery system.
 - Summarize all possible alternatives before meeting with the advisor to check for possibility.
 - Continue researching the possibility of long-lasting nasal spray or nasal gel medication.
- Steve Lee
 - Attend the client meeting to understand the client's expectations.
 - Research on the pros and cons of different types of medication delivery systems, understand the effectiveness of all types of systems.
 - Contact potential collaborators at the Department of Cardiology
 - Conduct research on testing environment
- Katie Wright
 - Update website with status, weekly progress report, and PDS
 - Researched our client's past projects with UW and asked him follow up questions at our meeting
 - Researched the miscellaneous portion of the PDS which included standards, customer information, patient-related concerns, and existing competition with our designs
- Noelle Johnston
 - Updated our project website with the PDS and client information.
 - Researched and added to the PDS which included information on performance requirements, weight, materials, aesthetics, appearance, and finish.
 - Researched extended-release capsule types and previous oral milrinone studies.
- Leo Thayer
 - Compiled research on oral milrinone administration into a set of potential solution proposals.
 - Researched and completed aspects of the PDS pertaining to shelf life, life of service, and operating environment.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Samuel Glanville	9/9/2026	CAD	1	2	4
Samuel Glanville	9/18/2026	Research	2	2	3
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
Steve Lee	9/10/2026	Background Research	1	1	
Katie Wright	9/13/2026	Client research	.8	3.1	4.1
Katie Wright	9/13/2026	Common delivery methods research	.8	3.1	4.1
Katie Wright	9/16/2026	Miscellaneous section of the PDS	1.5	3.1	4.1
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
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