Democratizing Placement of Endoluminal Negative Pressure Devices for Gastrointestinal Leaks

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Advisor: Prof. John Puccinelli

Team: Simon Fetherston (Leader)
Mariah Smeeding (Communicator)
Evelyn Mikkelson (BSAC)
Yeanne Hwang (BPAG, BWIG)

Date: February 6, 2026 - February 12, 2026

Problem statement

Currently, large defects in the GI tract (often caused by surgical complications) are treated with surgery. For external wounds, the use of negative pressure wound therapy has become widely used. This therapy, colloquially called VAC therapy, leads to improved healing of superficial wounds. For the past few years, some surgeons have been placing similar VAC devices into the GI tract through the mouth or anus to treat defects in the GI tract. The success of this therapy has been outstanding, with some studies finding that 90% of wounds that would have otherwise required surgery can be closed without making any additional incisions at all. The process of VAC placement is currently labor intensive and requires some skill in manipulating an endoscope, which has limited its widespread use. Development of a streamlined way to deploy VAC therapy into the GI tract would allow more surgeons to use this therapy to heal anastomotic leaks.

Brief status update

This week the team worked on creating a design matrix. Each team member developed their own design ideas and they were shared amongst the group. After meeting, the team picked three designs to focus the design matrix on. These designs were a balloon sponge-stent, degradable coating, and cap delivery system. Criteria was created to analyze the three designs and determine a path to continue toward the prototyping phase.

Difficulties / advice requests

The team is concerned about how some of the design ideas could be fabricated. During the advisor meeting, the team could use feedback regarding capabilities of the design lab equipment and what designs would be feasible to be fabricated within an ample timeframe. This feedback would help the team choose a design to begin prototyping.

Current design

The current design has been narrowed down to the balloon sponge-stent, degradable coating, and cap delivery system. The latter two designs were tied in the design matrix. After the advisor meeting, the team will have a better understanding of how prototyping could be conducted and what design to pursue.

Materials and expenses

Item	Description	Manufac-turer	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. Select a design to begin prototyping phase
2. Create preliminary presentation and present on Friday 02/20/2026
3. Research materials and equipment that will be used to fabricate the prototype

Next week's individual goals

- Simon Fetherston
    - Choose a final design after advisor meeting
    - Work on preliminary presentation and practice oral presentation skills
    - Research materials that will be used for the design
    - Research fabrication techniques that apply toward the design prototype
- Evelyn Mikkelson
    - Prepare for and work on preliminary presentation

    - Perform research relating to material choice
    - Meet with team and client to choose a final design
- Mariah Smeeding
    - Prepare preliminary presentation
    - Meet with client and discuss our direction of design
    - Meet with Dr. P to discuss our three design concepts that made it to the design matrix and get his opinions on our tying two.
- Yeanne Hwang
    - Prepare for preliminary design presentation
    - Ask for an advice from Dr.P to set direction for design
    - Research biocompatible plastic material

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	X	X	X													
Background…	X	X	X													
Prototyping																
Testings																
Deliverables																
Progress Reports	X	X	X													
Prelim presentation																
Final Poster																
Meetings																
Client		X														
Advisor	X	X	X													
Website																
Update	x	X	X													

Filled boxes = projected timeline
X = task was worked on or completed

Previous week's goals and accomplishments

- Individual:
    - Evelyn Mikkelson
        - Brainstorm design ideas for design matrix
        - Perform research on self expanding metal stents and other current methods
    - Simon Fetherston
        - Develop design ideas that could be presented to the team
        - Research biodegradable materials that could be used to deliver drugs/therapies to the esophagus

    - Mariah Smeeding
        - Brainstorm design ideas
        - Meet with team to discuss our design concepts and create the design matrix
        - Research gold and silver nanoparticle integration into polyurethane
    - Yeanne Hwang
        - Research on sponge material and the limitation of current method
        - Specify problem statement
        - Brainstorm design ideas
- Team :
    - Completed design matrix and started evaluation of designs
    - Continued research on EndoVAC methods and current products that could be used in this application

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Evelyn M	02/11/2026	Work on designs and design matrix	2	2	6.5
Simon F	02/09/2026 02/09/2026 02/10/2026 02/12/2026	Picked up negative pressure sponge and tube from UW Hospital Met with team to organize goals for the week and discuss initial design ideas Brainstormed three design ideas and presented them to the team Researched biodegradable materials used within the esophagus	0.5 1 1.5 1	4	10
Yeanne H	02/08/26 02/09/26 02/09/26	Research on sponge material and the limitation of current method Specify problem statement Brainstorm and design 2 design ideas	2 1 2	5	9.5
Mariah S	02/08/26 02/09/26 02/11/26 02/12/26	Research antimicrobial properties of gold and silver and integration into polyurethane. Research stent mechanisms and current stent designs and brainstorm design ideas Meet with Simona and Evelyn to discuss initial design ideas and plan a meeting to make a matrix. Meet with the whole team to discuss design concepts and pick the top three options. Create the design matrix and rank all three designs based on our given criteria. Finalized my portions of the justifications for the ranking analysis of the design matrix.	2 45 min 1.5 1	5.15	11.15