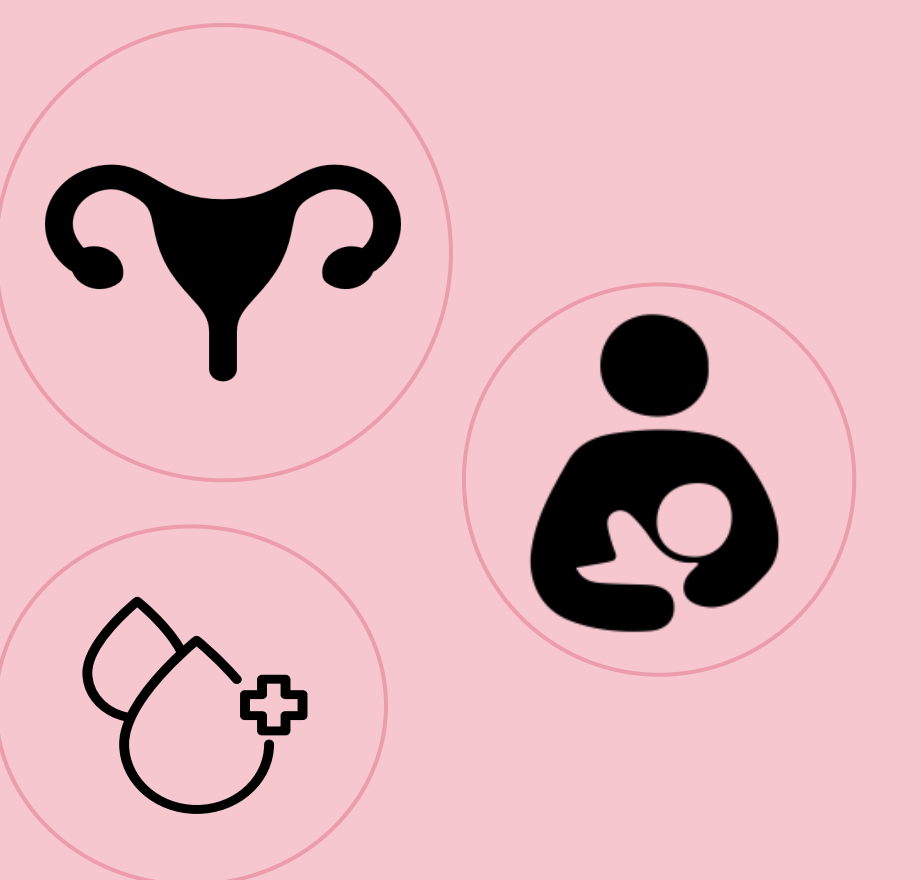


# Postpartum Hemorrhage Detection Device



## FemEng Health Solutions

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### Background

- **Postpartum hemorrhage (PPH):** excessive blood loss after birth; roughly >500mL for vaginal births and >1000mL for c-sections
- Leading cause of maternal mortality worldwide affecting nearly 1 in 5 women
- Standard of care: Visual blood loss estimations, manual measurement, vital monitoring
  - 35-50% misestimation
  - 70% of cases are preventable

### Mission Statement

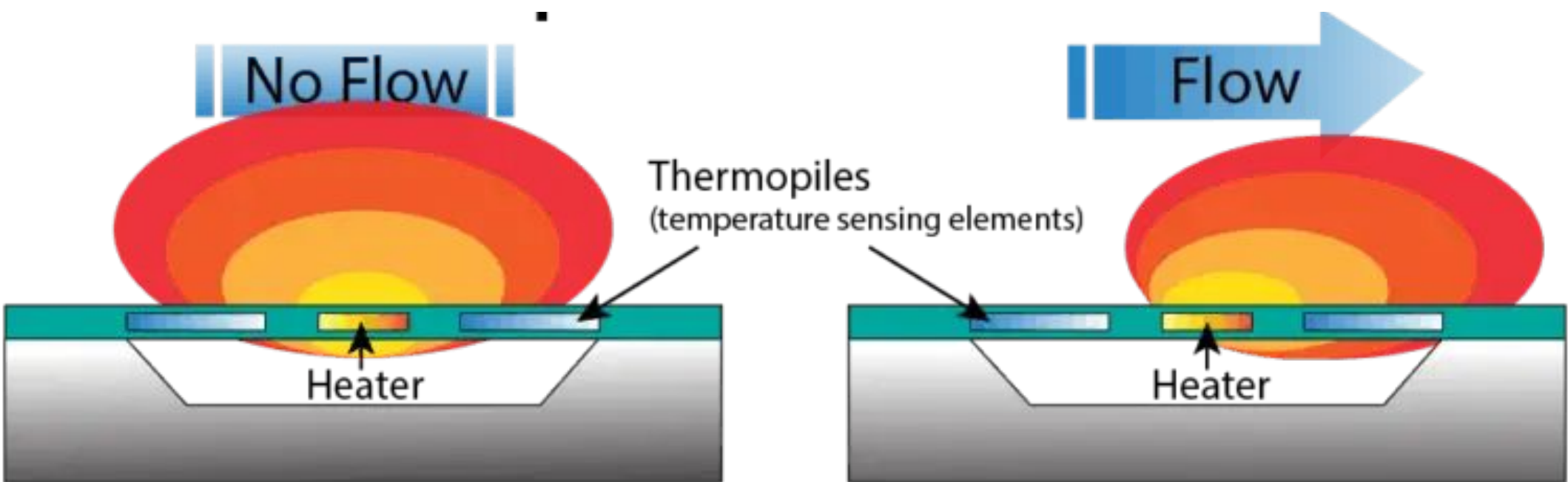
FemEng Health Solutions is dedicated to the advocacy of inclusion, acceptance, the pursuit of lifelong learning and innovation. We are committed to addressing the unique needs of women empowering them to live healthier lives through cutting-edge technology and compassionate care

### Final Product Specifications

Specification	Value
Product Material	Medical Grade Silicone
Upper Rim Outer Diameter	70 mm
Upper Rim Inner Diameter	64 mm
Lower Funnel Diameter	12.13 mm
Stem Height	85 mm
Stem Width	45 mm
Material Thickness	3 mm
Product Weight	<= 100 g
Sensor Diameter	20 mm
Sensor Thickness	0.4 mm
Angle of sensor relative to the barrel	20 degrees
Rigidity of Material	50 (Shore A scale)
Temperature resistance	5-45°C
Sterility	10 <sup>-6</sup> (directly out of sterilization)
Frequency	10 Hz
Accuracy	+/- 7%

### Final Technical Model

#### MEMS Calorimetric Sensing Principle



Heating Element: Induces heat to keep a constant temperature differential

Thermopiles: Two temperature sensing elements placed upstream and downstream of the heater

Flow detection:

- No Flow: sensor reads the same value
- Flow: heat is carried downstream, creating a **temperature difference** between sensors

#### Convective Heat Transfer

$$Q = mC_p\Delta T$$

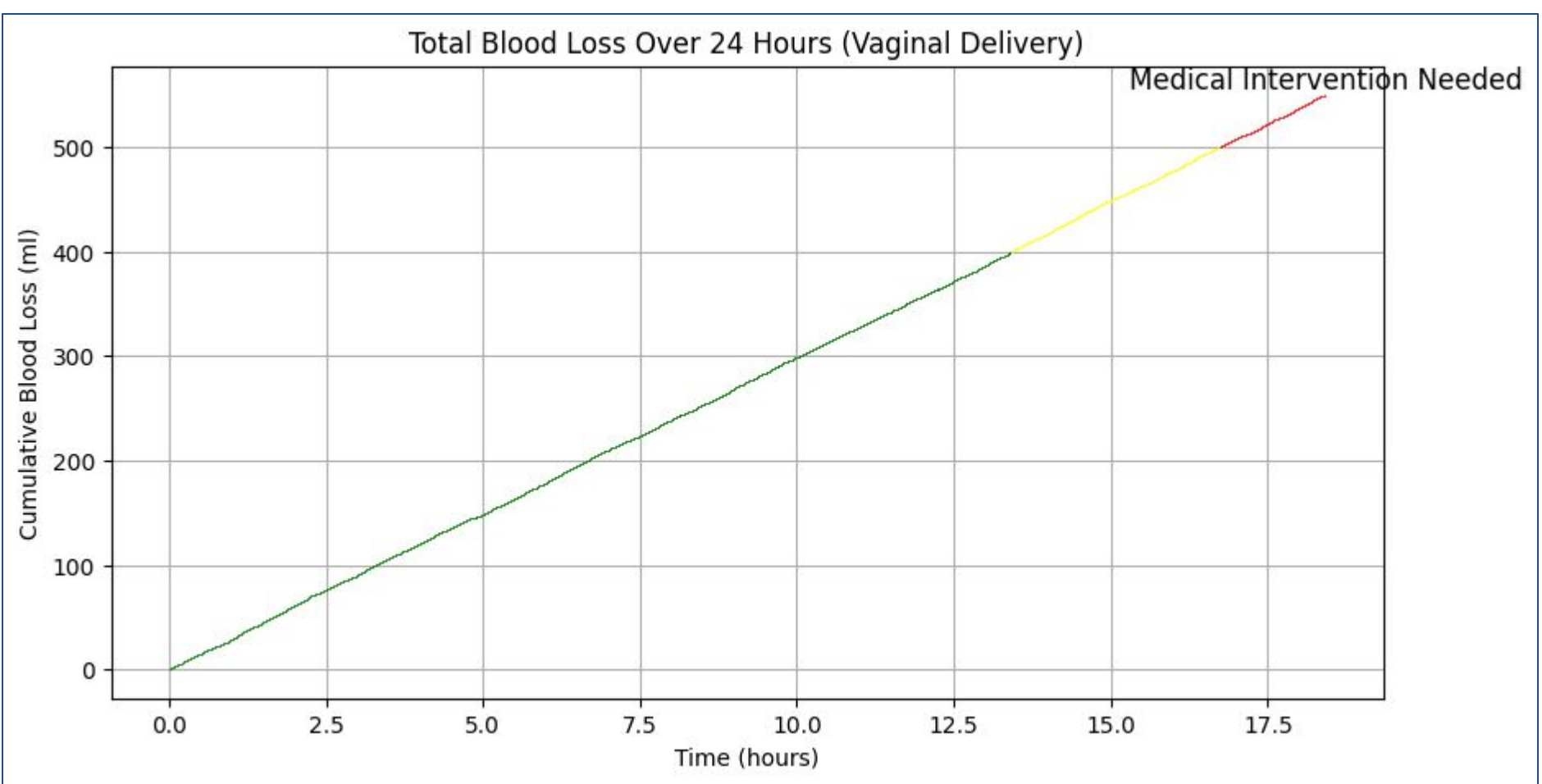
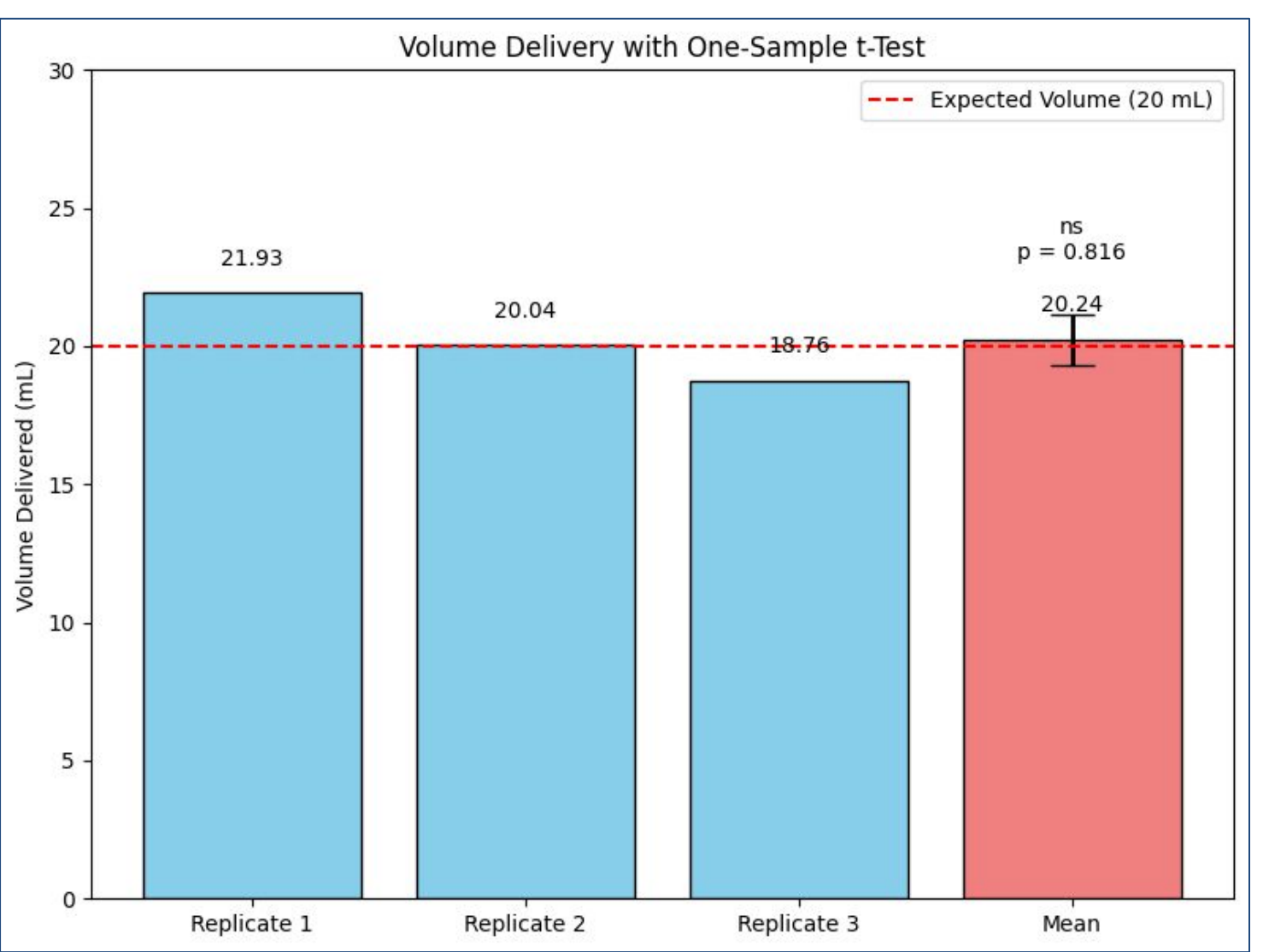
Mass flow is inversely proportional to the temperature difference detected by the sensors

$$V = \int m(t)/\rho \, dt$$

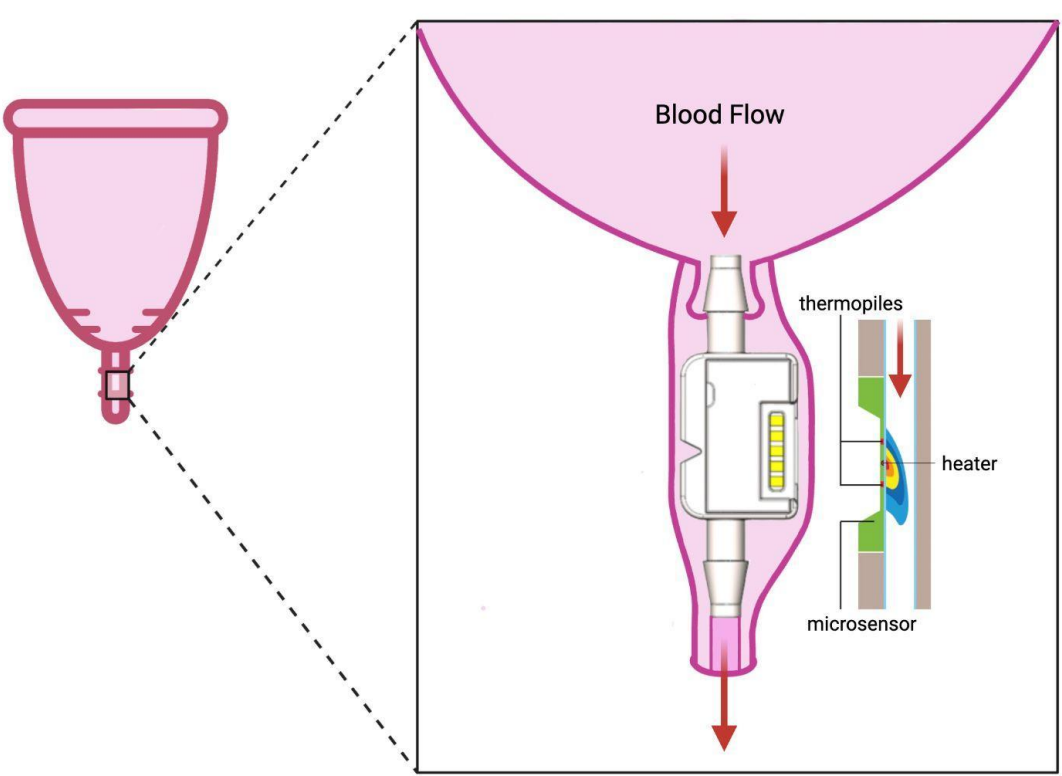
Mass flow can then be integrated over time to get the total blood loss volume over 24 hours.

### Verification Results

#### Quantification of BMF Volume Over Time



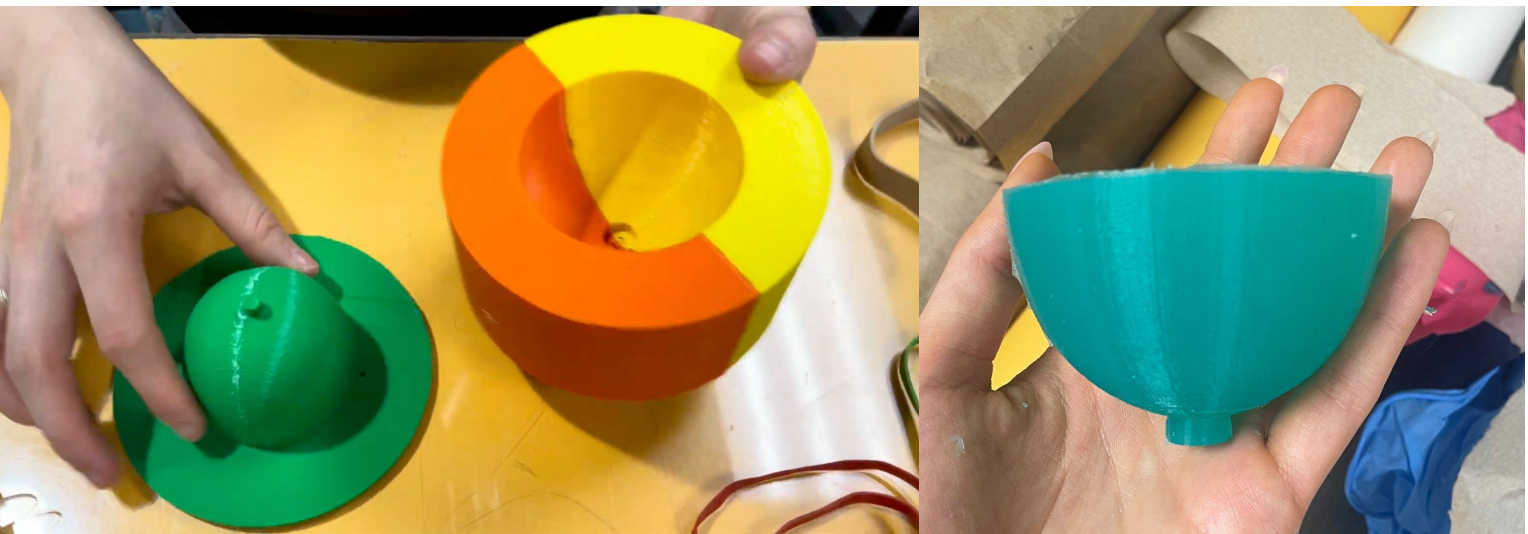
### Prototypes



#### Menstrual cup funnel design

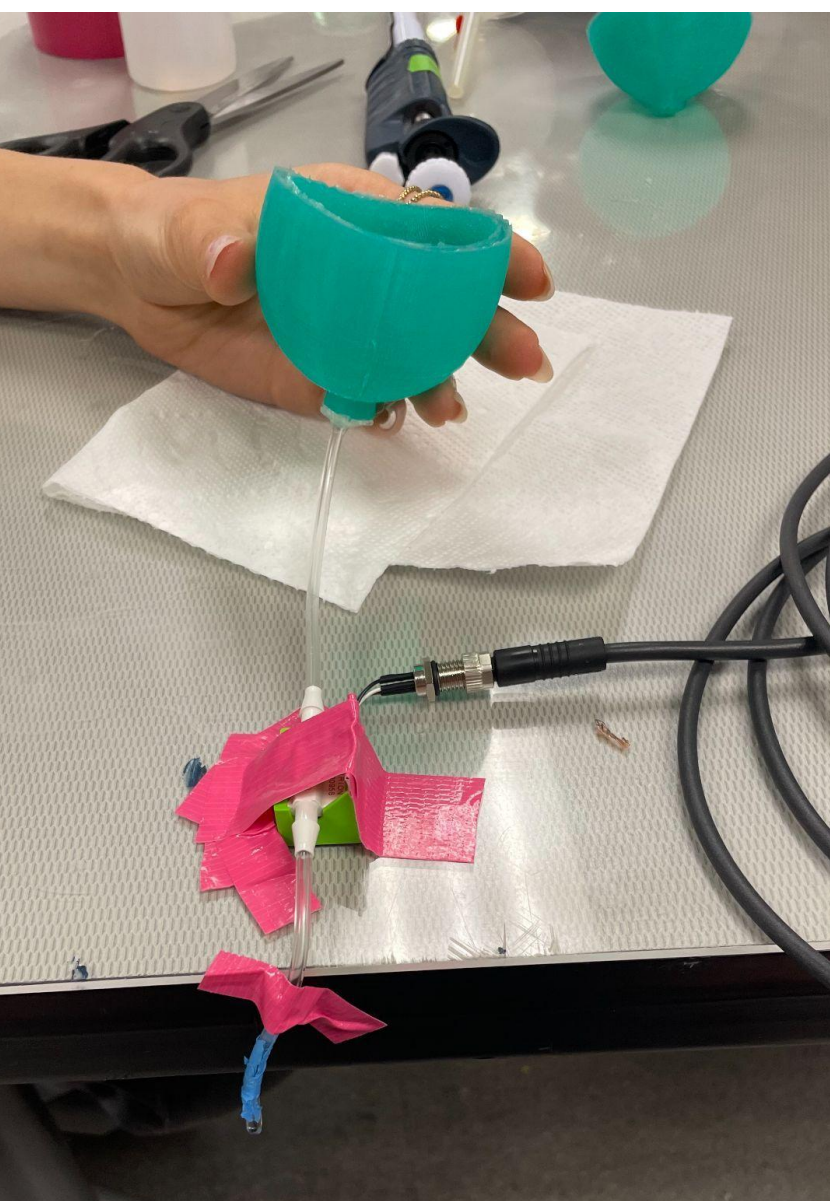
- Open barrel to allow the blood to flow through
- Sensor liquid flow microsensor adjacent to the barrel
  - Measures flow rate of blood
  - Translated to total blood loss volume

#### 3D Printed Mold & Silicone Cup



- A three piece mold bearing our desired dimensions was 3D printed
- 75mL of liquid silicone resin was then injected into the mold and left to cure overnight to create our silicone cup

#### Prototyping Setup



### Status and Future Work

FemEng Health Solutions is currently working on obtaining IP and discussing with VC for funding for next steps.

Physical Prototyping

Patent Discussions

FDA Compliance & Regulations

Scaling & Manufacturing

### Acknowledgments

Special acknowledgment to Dr. Barbara Smith and Dr. Ramses Galaz for their mentorship and guidance throughout the development of this project. Also, thanks to Dr. Bradley Gregor, Dr. Brent Vernon, and the entire Senior BME Capstone Faculty their assistance.

### More Information

Complete Reference List:



Youtube Video:

