Progress Report - Week 8

Title: Vaginal Self-Swab Device to Minimize Contact Contamination

Client: Dr. Jean Riquelme
Advisor: Dr. Megan McClean
Team:

Sara Morehouse (Leader)
Cherry Qiu (Communicator)
Katherine Kafkis (BWIG and BSAC)
Adam Berdusco (BPAG)

Date: March 21, 2024

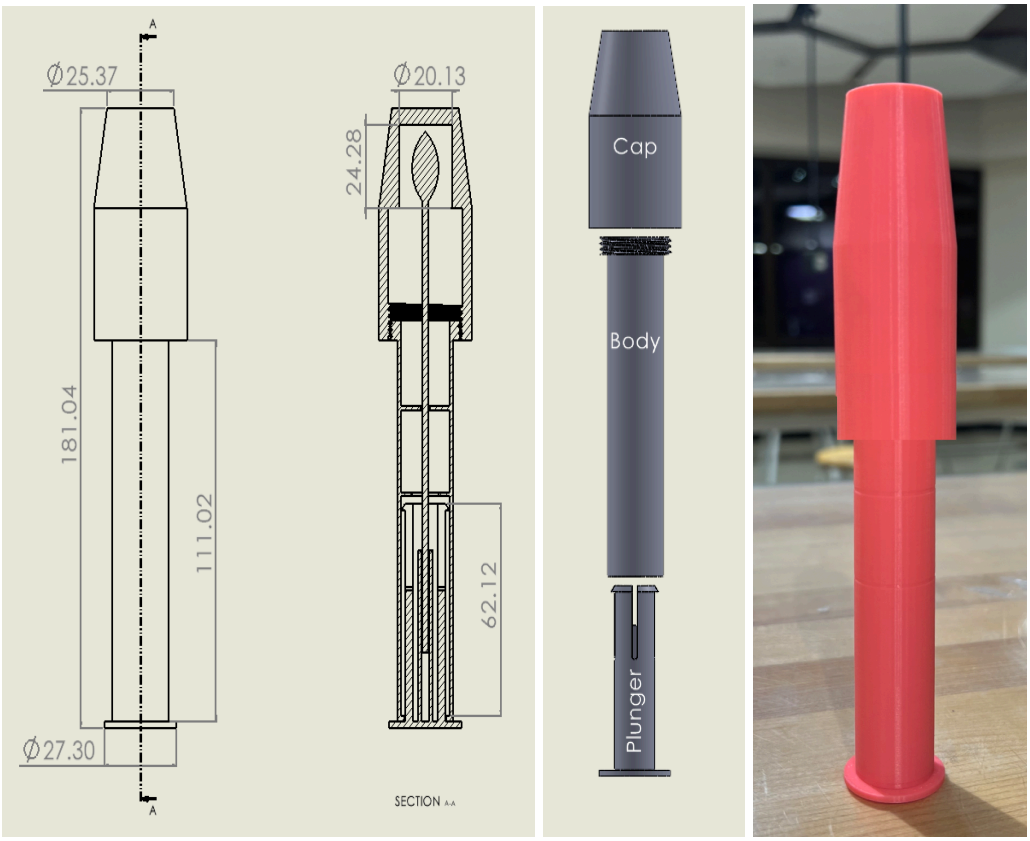
Problem Statement:

Quality sexual health is important for every woman to sustain, but with women ages 15-24 accounting for 43% of undiagnosed STI cases, the system supporting women's sexual health could use some improvement (CDC). The team has developed a novel self-swab STI testing device that allows women the privacy of swabbing themselves without the potential discomfort of a physician present. This was conceived with the goal in mind of making STI testing more accommodating while reducing contamination of the testing environment. However, the current design has issues with media leaking from the device after use, as well as with the aesthetics of the design. Additionally, the device requires the addition of a thin, puncturable film to the cap to contain transport media. The team is tasked with modifying the original design to address the issues currently being faced while still seeking to limit contamination of the device and testing environment as well as account for patient comfort.

Brief Status Update:

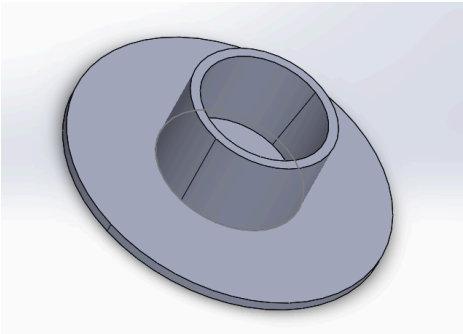
This week the team worked on further designing possible devices in SolidWorks, and we consulted with Jesse from the Design Hub for help with mechanisms of breaking the swab. We decided that a 3-point bending mechanism would work best for breaking the swab. We also decided to remove threading from the design as we were unable to determine the exact dimensions of the threading on the Aptima tube. Instead, we plan to proceed forward with a compression fit for attaching the device to the top of the Aptima tube.

Current Design:

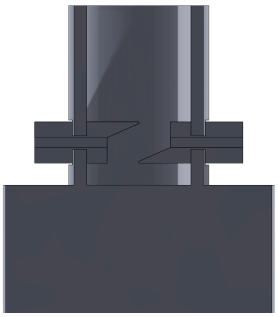


The current design was developed last semester and includes a plunger, body and cap. The prototype was 3D-printed and assembled with the plunger being inserted into the bottom of the body, and the cap screws onto the top of the body. A swab is inserted through the body and into the plunger.

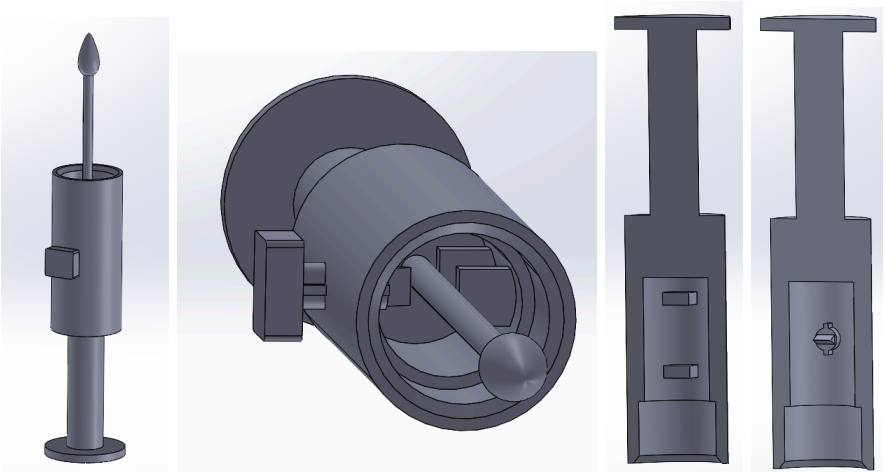
New Design Ideas:



This component is a base to house the Aptima tube while the patient conducts the test.

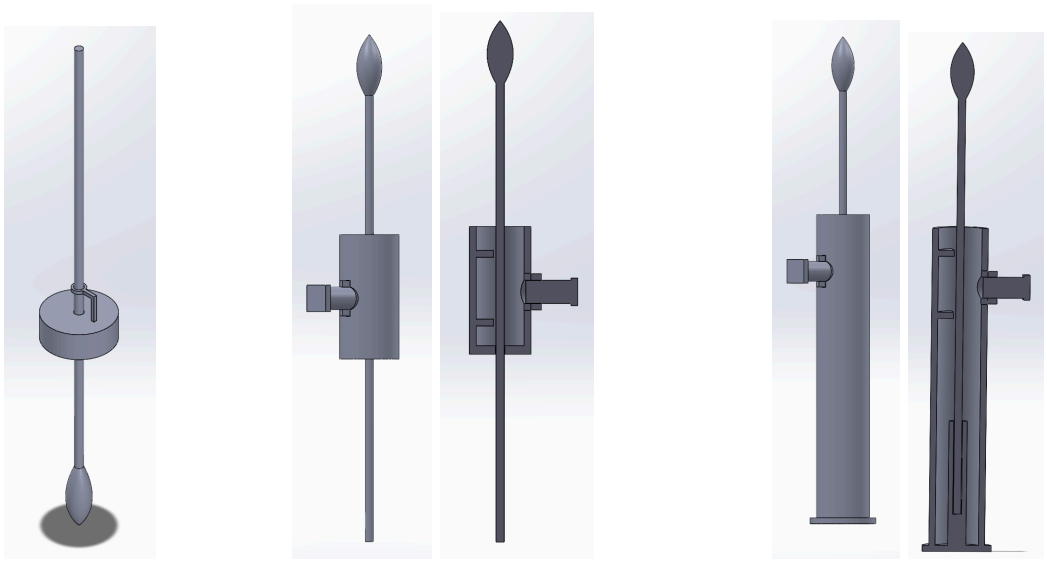


This design is a potential solution to breaking the swabs. There are two edges that actuate to apply pressure and bend the swab. If enough force is applied to the swab it will break at the already perforated section.



This design uses a 3-point bending mechanism to break the swab. When the patient is done swabbing, they press the device onto the uncapped Aptima tube and push the button to break the

swab, causing it to fall into the tube. They would then remove the device and screw the Aptima cap back on.



The leftmost design simply attaches to the Aptima tube over the threads, then the patient applies pressure to snap the swab and break the small support, which allows for the snapping of the swab to be contained within the tube.

The middle design also utilizes 3-point bending to break the swab and uses a button to apply a central force at the swab perforation.

The rightmost design is identical to the middle design except that it includes a full body that is the length of the swab and provides a base for it to stand up on.

Materials and Expenses:

Item	Description	Manufac - turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Preliminary prototype print	Material: PLA	n/a	n/a	Makerspace	n/a	2/27	n/a	n/a	$3.34	n/a
Prototype	Material: PLA	n/a	n/a	Makerspace	n/a	3/20	n/a	n/a	$4.92	n/a

prints										
-									$0.00	
-									$0.00	
-								**TOTAL:**	**8.26**	

Major team goals for the next week:

1. After our spring break next week, we hope to come up with a testing plan and begin drafting protocols.
2. Finalize prototypes to be printed for testing.

Next week's individual goals:

- Sara:
    - Draft testing protocols
    - Finalize prototype design and print
- Katherine:
    - Help work on testing protocols and look into purchasing luminescent dye for contamination testing
    - Modify the existing designs after testing with the swab and media tube. Focus primarily on methods of keeping the swab firmly attached to the collection device as well as compatibility with the Aptima Media tube
- Cherry:
    - Fix base solidworks design
    - Review feedback from upcoming show and tell
    - Finalize testing protocol and begin to test
- Adam:
    - Review feedback from show and tell
    - Finalize prototypes for testing
    - Finalize testing protocols

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																

Background research	X	X	X	X	X	X	X									
Design development				X	X	X	X	X	X							
Prototyping						X			X							
Testings																
Deliverables																
Progress Reports		X	X	X	X	X	X	X	X							
PDS			X			X	X									
Prelim presentation/report						X	X									
Final Poster																
Meetings																
Client			X					X								
Advisor	X	X	X	X	X			X								
Website																
Update	X	X	X	X	X	X	X	X	X							

Previous week's goals and accomplishments:

- Goal: Meet with Design Hub to get feedback on cutter design.
    - We met with Jesse and received helpful feedback on the mechanics of our design.
- Goal: Print prototypes and begin to formulate testing ideas.
    - We began printing prototypes in time for our Show-and-Tell presentation on Friday

Activities:

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Katherine	3/18	Worked on SolidWorks design of a cutting mechanism and 3D printed it	3	6	27.5
	3/19	Worked on a SolidWorks design that utilizes 3-point bending for breaking the swab	2		
	3/20	Worked on SolidWorks design that allows for the swab to be snapped off while also providing splash coverage	1		
Sara	3/18	Worked on solidworks design of a cutting mechanism	2	5	24.5

	3/19	Modified solidworks design to be a 3-point bending mechanism and edited fabrication protocol	3		
Cherry	3/18	Begin finalized base solidworks design	1.5	3	19.75
	3/19	Met with Jesse to talk about our new design	1		
	3/20	Finished first base design	.5		
Adam	3/16	Gathered information for fabrication protocol	0.5	3	22
	3/18	Work in solidworks to design the potential solution	2.5		