Paracervical Block Training Model (PBTM), BME 200/300

Date: 10/8/2025

Client: Dr. Jessica Dalby
Advisor: Professor Randolph Ashton
Team:
Renee Sobania (Co-Team Leader)
Evelyn Ojard (Co-Team Leader)
Ellinore Letts (Communicator)
Abigayle Chapman (BSAC)
Nora Lorentz (BWIG)
Cadence Seymour (BPAG)

Problem Statement

A paracervical block (PCB) is a medical procedure which consists of injecting the tissue where the vaginal wall meets the outer part of the cervix, the cervicovaginal junction, with lidocaine in four locations; 2, 4, 8, and 10 o'clock. This procedure is done to reduce pain during intrauterine device (IUD) insertion and other gynecological procedures. Many women have to endure the procedure without the help of a PCB, or only have access to other less effective methods because of limited provider training and lack of realistic affordable models to practice on. Current task trainers that are used to practice IUD insertions typically do not have a cervicovaginal junction, which is making these models less realistic as you are unable to practice a paracervical block. This results in fewer providers learning proper PCB technique and thus more patients who are unable to have access to this procedure.

Our team is tasked with creating a realistic, reproducible, and low cost model that includes a realistic cervicovaginal junction to simulate PCB injections to train healthcare professionals to make this procedure more accessible. Creating an anatomically accurate model with materials that better simulate the mechanical properties of the female reproductive tissues by having a needle insertion resistance of 1.09N, and elasticity of 1.94 kPa/mm. This will allow providers to practice needle placement, injection, and IUD insertion in a supervised safe learning environment. Ultimately, our goal is to improve provider access to learning the PCB procedure and expand patient access to pain management in women's healthcare.

Brief Status Update

During week 5 of our design project, the team worked on completing the Preliminary Report. The team also decided on final specifications for the design and chose a material for the models silicone components. The team decided on using Ecoflex 00-20 due to its mechanical properties. The team worked on the first mold for the model of the cervix which included a cervicovaginal junction. We will be meeting with our client on Friday to discuss our final design, purchasing details, and fabrication plans.

Weekly/Ongoing Difficulties

The team has no current concerns with completing the background research for the project. However, there are logistical project questions that will need to be addressed in upcoming client meetings and team meetings.

Summary of Weekly Team Member Design Accomplishments

- Team
    - The team modeled a Solidworks design mold for the cervical plate.
    - The team worked on and completed the Preliminary Report.
    - The team began compiling a list of specific materials and their prices to purchase for the project.
- Renee Sobania
    - Designed the cervical plate in solidworks with a region for the cervicovaginal junction.
    - Completed my sections of the Preliminary Presentation.
    - Compiled a materials list of items we need to buy and their prices.
- Evelyn Ojard
    - Completed the preliminary report
    - Researched testing methods to use for strength analysis of the model
    - Started looking through UW Shop to determine where we can acquire materials
- Ellinore Letts
    - Completed preliminary report.
    - Sat in on consultation to design cervical plate.
    - Researched material testing methods to conduct on cervical piece.
- Abigayle Chapman
    - Completed and revised preliminary report.
    - Researched more on specific aspects of female anatomy that may be helpful while ensuring realism and fabricating our model
    - Researched different testing methods of strain on silicon and other materials, including potential limitations and qualities of materials we plan to use for our design
- Nora Lorentz
    - Worked on my assigned portion of the Preliminary Presentation
    - Further research, specifically in how other task trainers have created materials/tissue
- Cadence Seymour
    - Worked on my portion of the preliminary presentation and added in pictures to the presentation
    - Researched more on materials for imitation the vagina
    - I worked on the preliminary report, as well as researched to do so.

Upcoming Team and Individual Goals

- Team
    - Discuss final design, materials, and purchasing details with our client.

    - Order all materials including pieces for the base and Ecoflex 00-20.
    - Finalize fabrication plan for cervix, uterus and vaginal opening.
    - Design and print all molds for cervix, uterus and vaginal opening.
- Renee Sobania
    - Complete CAD design for the Uterus and Cervix and print them off in the makerspace to ensure they will work properly and have correct dimensions.
    - Order all materials for the project including Piping, wooden base, and Ecoflex.
    - Begin a specific testing protocol for Ecoflex mechanical testing.
- Evelyn Ojard
    - Order all materials for the project including Piping, wooden base, and Ecoflex.
    - Assist with SolidWorks designs as needed and look into trying to 3D print at the maker space for a preliminary prototype
    - Start writing out fabrication protocol and formal testing protocol.
- Ellinore Letts
    - Order materials needed for prototype manufacturing.
    - Decide on base and support dimensions and fabrication plan.
    - Begin on material testing protocol.
- Abigayle Chapman
    - Continue research on potential limiting factors of our design and materials to consider
    - Finalize and order materials for design and fabrication process
    - Consider and explore material testing practices to ensure model achieves its purpose
- Nora Lorentz
    - Finalize and order the materials we will need for our design
    - Work with team to define the final details for our design and fabrication plans
    - Continue researching
- Cadence Seymour
    - Work on ordering materials with the team
    - Work on manufacturing the mold for our lab kit.
    - Continue researching on materials to find the best fit for our team.

Previous Weeks Team and Individual Goals

- Team
    - Have a plan for prototyping and determine what supplies need to be purchased.
    - Complete the Preliminary Design Report.
- Renee Sobania
    - Schedule a meeting with the design team to create a mold for the cervix.
    - Work on and complete the preliminary design report.
    - Order all the materials needed for the design.
- Evelyn Ojard
    - To complete my assigned portion of the preliminary design report
    - Prototype the task trainer preliminary design
    - To decide on materials and order them

- Ellinore Letts
    - Determine what materials need to be ordered for prototyping.
    - Continue researching different casting methods, determine rough outline for prototype.
- Abigayle Chapman
    - Continue research on model specifications, including shape/angles/appearance to ensure an anatomically and visually correct model
    - Decide on materials with group
    - Research assembly of model, including casting methods, and come up with potential ideas or notes on prototype to discuss with group
- Nora Lorentz
    - Continue researching more materials for the fabrication process.
    - Further research anatomical details for the fabrication process to ensure accuracy.
    - Complete preliminary design report.
- Cadence Seymour
    - Meet with the designing team so we can start to order materials and fabricate our mold for the design.
    - Continue to research materials that have the same properties as the inside of the vagina and the cervix.
    - Decide with the group on the correct material for our prototype and product.

Activities

Name	**Date**	**Activity**	**Time (h)**	**Week Total (h)**	**Sem. Total (h)**
Renee Sobania	10/7	Designed Cervical Mold Worked on Preliminary Report	1.5 3.0	4.5	25.5
Evelyn Ojard	10/07	Designed Cervical Mold Worked on Preliminary Report Research	1.5 3.0 1.0	5.5	23.5
Ellinore Letts	10/06	Preliminary Report Research	2 2	4	18

Abigayle Chapman	10/07	Preliminary Report Research	2 2	4	18.5
Nora Lorentz		Research Preliminary Report	1 2	3	19
Cadence Seymour	10/09	Preliminary report Research	2 3	5	20.0

Project Timeline

PROJECT TITLE	Paracervical Block Training Model	TEAM NAME	PCBTM Team
DATE UPDATED	9/18		

					PHASE 1 - Prototype			PHASE 2 - Testing										PHASE 3 - Final Design	
TASK TITLE	TASK OWNER	START DATE	DUE DATE	PERCENT OF TASK COMPLETE	9/7 - 9/13	9/14 - 9/20	9/21-9/27	9/28-10/4	10/5 - 10/11	10/12 - 10/18	10/19-10/25	10/26-11/1	11/2-11/8	11/9-11/15	11/16-11/22	11/23-11/26	Thanksgiving Break	12/1-12/6	12/7-12/12
Materials and Research																			
Conduct Initial Background Research	Everyone	9/7	9/17	100%															
Product Design Specifications	Everyone	9/10	9/18	100%															
Design Matrix Criteria and Design Ideas	Everyone	9/19	9/24	100%															
Fabrication																			
Design in SolidWorks	Everyone	9/19	9/26	75%															
Start Fabrication Process	Everyone	9/22	10/3	0%															
Complete First Iteration	Everyone	10/3	10/31	0%															
Preliminary Presentation	Everyone	9/28	10/3	0%															
Show-and-Tell	Everyone	10/27	10/31	0%															
Testing																			
Tensile Testing	Everyone	11/1	11/8	0%															
Compression Testing	Everyone	11/9	11/15	0%															
Data Collection and Revisions	Everyone	11/16	11/22	0%															
Client testing	Everyone	11/16	11/22	0%															
Final Product																			
Final Product Client Testing	Everyone	11/23	11/29	0%															
Final Data Collection	Everyone	11/23	11/29	0%															
Final Report Draft	Everyone	11/23	11/29	0%															
Final Team Meeting	Everyone	11/23	11/29	0%															
Deliver Final Product to Client	Everyone	11/23	11/29	0%															
Final Documents																			
Final Notebook	Everyone	11/30	12/5	0%															
Write final report	Everyone	11/30	12/5	0%															
Prepare poster	Everyone	11/30	12/5	0%															
Review all final documents	Everyone	11/30	12/5	0%															
Final Poster Session	Everyone	11/30	12/5	0%															
Final peer and self evaluation		11/30	12/12	0%															

Gantt Chart

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**	