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

Date: 10/2/2025

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 4 of our design project, the team finalized the design matrix for the project and chose the Modified Task Trainer as our ideal design for the project based on the Design Matrix. The team worked on preparing for the preliminary presentations to show other students what our project was and to inform them on the gap for paracervical block models on the market. We also began working planning out our Solidworks designs for the Task Trainer Model that we chose to ensure that we could create a model with a cervicovaginal junction.

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 met to discuss the preliminary presentation and each team member was assigned a portion of the presentation.
    - The team worked on and practiced for the preliminary presentation.
- Renee Sobania
    - Did research to find a material with similar mechanical properties to the cervix.
    - Began sketches for the SolidWorks Designs of the cervix by collecting measurements.
    - Worked on and practiced for the preliminary presentation.
- Evelyn Ojard
    - Completed my assigned portion of the preliminary design presentation and practiced
    - Looked into potential materials to make the uterus and cervix out of and methods of fabrication
    - Brainstormed some methods of testing for the model.
- Ellinore Letts
    - Researched materials for prototyping different parts of the PCTMl.
    - Prepared for preliminary presentation.
- Abigayle Chapman
    - Did research on materials that realistically mimic the uterus and cervix (especially in terms of needle insertion), as well as how beneficial trainees felt the training model was when made of particular material
    - Researched potential complications that may arise during IUD insertion, and the force required for perforation and fracture as well as properties and shape of the uterus as it pertains to IUD insertion
    - Prepared for preliminary presentation
- Nora Lorentz
    - Completed one of the design sections of the preliminary presentation. Worked on slides and practiced my portion to be prepared for Friday's presentation.
    - Researched materials that would be anatomically accurate.
- Cadence Seymour
    - Did more research on the purpose of the paracervical block and the effectiveness of the IUD as a primary birth control method.
    - Additionally I did research on the percentage of people who have the IUD amongst other types of birth control as well.
    - I did the background research and slides for the preliminary presentation and began practicing for Friday.

Upcoming 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.

Previous Weeks Team and Individual Goals

- Team
    - The team met to discuss preliminary design ideas for the Paracervical Block model. The team narrowed down their ideas to three designs. These designs were influenced by their new ideas and the client's ideas
    - The team attended our clients training session to better understand how she teaches the paracervical block with the current model and were able to ask trainees what could be improved.
- Renee Sobania
    - Attended Dr. Dalby's training session to see her current tomato model and learn

more about the restrictions and challenges with that model and spoke with the clients to get feedback.
    - Finalized the designs and criteria for our matrix with the team.
    - Sketched out our three designs for the matrix to clearly show our ideas.
- Evelyn Ojard
    - Met with the team to decide on the final three designs for the design matrix
    - Completed my assigned portion of the design matrix
    - Attended training session for paracervical block training session.
- Ellinore Letts
    - Discussed final design ideas, and the team came up with matrix criteria.
    - Attended a training session with a team and client to observe the current model.
    - Spoke with clients about challenges and design considerations.
- Abigayle Chapman
    - Drew potential design, discussed design ideas with team and collaborated to combine our ideas into a more ideal design
    - Attended client's training session, observed her students as they practiced a paracervical block and noted limitations and characteristics of the current model being used
    - Continued research for our future model to better understand IUD insertion, as this may be something our future model will be used for
- Nora Lorentz
    - Went to the client's training session. Observed the current model and how it is used during our client's typical class (i.e. what type of procedures it is used for, what devices are used with it, etc)
    - Continued researching competing designs and anatomy
    - Worked on my section of the design matrix.
- Cadence Seymour
    - Attended the training session for the paracervical block insertion as well as other gynecological procedures.
    - Drew out some preliminary designs for our model kit
    - Completed my portion of the teams design matrix.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Renee Sobania	9/29	Worked on and practiced the Preliminary Presentation	3.0	4.5	21

		Materials Research	1.5		
Evelyn Ojard	10/1	Worked on preliminary presentation and met with the team to practice.	3.0	3.0	18.0
Ellinore Letts	10/1	Materials Research Worked on preliminary presentation.	2.0 3.0	5.0	18
Abigayle Chapman	01/1	Worked on preliminary presentation.	3.0	3.0	14.5
Nora Lorentz	10/1	Preliminary presentation and practiced with team Researched materials	3 1.5	4.5	16
Cadence Seymour	09/30/2025	Worked on a preliminary presentation and practiced.	3.0	3.0	15.00

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**	