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

Date: 9/24/2025

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 3 of our design project, the team each created a preliminary design to present to the group so that we could combine and create three distinct designs for our design matrix. We also attended a training session for medical students that was led by our client. This allowed us to be hands-on with the current training model and to better understand the teaching cues that were used so that our model can be the most effective in the future. We learned that the angle of insertion is incredibly important as well as that the ability for it to be portable and at the correct

heights is key. After attending the training session we refined our design matrix criteria and scored our designs.

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 preliminary design ideas for the Bougie Introducer. 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.

Upcoming Team and Individual Goals

- Team
    - Split up roles for the preliminary presentation
    - Complete the preliminary design slideshow and practice for our presentation during the next lab period.
    - Have a plan for prototyping and determine what supplies need to be purchased.
- Renee Sobania
    - Begin working on the prototype and solidworks for our design. Begin trying to consider how to fabricate our model with casting and 3D printing.
    - Order initial materials that will be needed.
    - Preparing and presenting our preliminary presentation to the other students in our class.
- Evelyn Ojard
    - To complete the preliminary presentation.
    - Start prototyping the winning design from the design matrix.
    - To research and order the materials.
- Ellinore Letts
    - Begin prototyping design, consider materials.
    - Continue preliminary research on materials, testing methods, and casting methods.
- Abigayle Chapman
    - Continue researching for chosen design, especially potential materials and assembly process
    - Work on preliminary presentation
    - Begin prototyping design
- Nora Lorentz
    - Continue researching further
    - Work on preliminary presentation and begin practice my sections of the presentation
    - Begin prototyping design
- Cadence Seymour
    - I want to draw out an accurate image of our teams selected design so I can fully understand each component and start to brainstorm ideas regarding it
    - I also want to begin prototyping with the team
    - Work on my preliminary presentation with the team completing my portion.

Previous Weeks Team and Individual Goals

- Team

    - Come up with at least three different design ideas for our Design Matrix, including materials, an aspiration test and setup.
    - Attend our clients training session to get insight on what her current practice model is and see how it works and what it looks like.
    - Meet with our client to update her on our progress and show her some of our designs we have thought of.
- Renee Sobania
    - Create detailed sketches or SolidWorks designs for our design matrix.
    - Continue to do in depth research on the PCBTM.
    - Consult with advisor and client on different designs and begin initial plans for design and fabrication.
- Evelyn Ojard
    - To refine and draw out my design ideas to share with the team
    - To do some research on different potential materials to make the device out of, as we need to best replicate that of gynecological tissues and need to order materials ASAP.
    - Execute rapid prototyping of preliminary designs
    - Help complete the Design Matrix.
- Ellinore Letts
    - Begin considering material selection for the project.
    - Model design ideas in solidworks.
    - Compare design ideas via a design matrix, finalize choice.
- Abigayle Chapman
    - Further refine design ideas, portraying various angles and inner workings of potential design ideas
    - Further research suitable materials for the model, taking into account pricing and attainability
    - Attend training session for paracervical block insertion, document and take pictures of client's current model for paracervical block training for consideration while designing our model
- Nora Lorentz
    - Continue researching. Currently, need to learn more about specific anatomy like vaginal tissues and cervicovaginal junction.
    - Refine sketches and think of more ideas and details.
    - Use what I learn in the training session to identify gaps in my knowledge, then address the gaps.
- Cadence Seymour
    - I want to research more about materials that best mimic the material of the vaginal wall.
    - Form some better sketches for a preliminary product.
    - Meet with our client to update her with our progress and attend the presentation/training session for IUD insertion and paracervical block insertion.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Renee Sobania	10/24	Attended a training Session at UW Health. Sketched out different designs.	3 5	8	16.5
Evelyn Ojard	10/23 10/24	Attended a training session led by our client. Researched and completed our design matrix.	3 4	7	15.0
Ellinore Letts	10/23 10/23	Attended training session Design Matrix work.	3 3	6	7.5
Abigayle Chapman	10/19 10/23 10/24	Sketched in-depth design idea Attended training session led by our client Worked on and completed design matrix	1 3 2	6	11.5
Nora Lorentz	10/23 10/24	Attended client's training session Design matrix and researched	3 3	6	11.5
Cadence Seymour	10/19 10/23 10/24	Sketched ideas for designs Attend clients training session Completed the design matrix	1 3 2	6	12.00

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	10%															
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**	