

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

Date: 9/18/2025

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 2 of our design project, the team continued research about current designs on the market as well as research for our Product Design Specification. We met with our client Dr. Jessica Dalby to better understand her goals for the project and was better able to explain what areas of current models need improvement. We discussed budget and a re-occurring weekly meeting to maintain communication and the team was invited to attend a training session where she teaches current providers on the procedure on her current model. We had our second team

meeting to go over our PDS as well as teach the sophomores how to use zotero. We will have our second advisor meeting on Friday, September 18th.

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
 - Met with the advisor to discuss how the rest of the semester will play out with what is expected of us assignment-wise throughout the semester.
 - Met with the client to ask questions about the project, learn more about his goals with the project, and figure out a time to pick up materials.
 - Completed the Product Design Specifications (PDS) and worked as a group to edit and review this before submission.
- Renee Sobania
 - Did additional research specifically about the mechanical strength of the cervical tissue and needle insertion resistance.
 - Began writing and sketching potential design ideas for materials and an aspiration test.
 - Completed my sections for the PDS.
 - Met with our client to learn more about the background and her motivation for the project as well as learn about what she had in mind and specifics such as cost.
- Evelyn Ojard
 - Met with the client to better understand what the project entails and get my questions answered that were prepared beforehand.
 - Completed research on International Standards and Federal Regulations involving our project and medical devices.
 - Completed my assigned portion of the PDS.
- Ellinore Letts
 - Continued research on biomechanical properties of individual components of the project.
 - Communicated with client to schedule time to observe training.
 - Drafted original potential design ideas.
- Abigail Chapman
 - Drew up an initial design and ideas for materials for the model.
 - Filled out my section of the PDS, researching specific details and further information as needed to fill gaps in understanding.
 - Completed research on anatomy and various physical properties of the cervix and vagina.
- Nora Lorentz

- o Met with the client and recorded the meeting in lab archives.
- o Worked on sections of the PDS, especially focusing on specifications for the model using information learned from the client meeting.
- o Researched further, getting more niche details and needed information on PCBs.
- o Sketched basic, initial design.
- Cadence Seymour
 - o Met with the client and wrote down some of the design specifications
 - o Worked through my sections of the PDS and wrote out the client specifications on the document.
 - o Continued my research about the types of materials and other existing model trainers.

Upcoming Team and Individual Goals

- Team
 - o Come up with at least three different design ideas for our Design Matrix, including materials, an aspiration test and setup.
 - o 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.
 - o Meet with our client to update her on our progress and show her some of our designs we have thought of.
- Renee Sobania
 - o Create detailed sketches or SolidWorks designs for our design matrix.
 - o Continue to do in depth research on the PCBTM.
 - o Consult with advisor and client on different designs and begin initial plans for design and fabrication.
- Evelyn Ojard
 - o To refine and draw out my design ideas to share with the team
 - o 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.
 - o Execute rapid prototyping of preliminary designs
 - o Help complete the Design Matrix.
- Ellinore Letts
 - o Begin considering material selection for the project.
 - o Model design ideas in solidworks.
 - o Compare design ideas via a design matrix, finalize choice.
- Abigayle Chapman
 - o Further refine design ideas, portraying various angles and inner workings of potential design ideas
 - o Further research suitable materials for the model, taking into account pricing and attainability
 - o 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

- o Continue researching. Currently, need to learn more about specific anatomy like vaginal tissues and cervicovaginal junction.
 - o Refine sketches and think of more ideas and details.
 - o Use what I learn in the training session to identify gaps in my knowledge, then address the gaps.
- Cadence Seymour
 - o I want to research more about materials that best mimic the material of the vaginal wall.
 - o Form some better sketches for a preliminary product.
 - o Meet with our client to update her with our progress and attend the presentation/training session for IUD insertion and paracervical block insertion.

Previous Weeks Team and Individual Goals

- Team
 - o An initial timeline for the project will be discussed and finalized.
 - o The brainstorming process for product designs will begin after the team has an improved understanding of the project scope.
 - o Complete the Preliminary Design Specification's paper.
- Renee Sobania
 - o Continue to do research on the mechanics of the vaginal and cervical tissue to try to find materials that will be realistic for our model.
 - o Begin the Preliminary Design Specifications paper and assign sections to the team.
 - o Begin designing and sketching initial design ideas for the cervicovaginal junction based off of the background research.
- Evelyn Ojard
 - o Work with the team to divide up the Preliminary Design Specifications (PDS) and complete the section I am assigned to
 - o Continue researching for more information on our project and to provide valid sources for the PDS
 - o Begin brainstorming and designing initial designs for the PCB Training Model specifically modifying the task trainer to include the cervicovaginal junction.
- Ellinore Letts
 - o Polish questions for client meeting on Friday, September 12th.
 - o Begin researching material requirements, competing designs, associated costs and biological models.
 - o Brainstorm basic design ideas, to create a model for reference.
- Abigayle Chapman
 - o Conduct further research on existing cervical training models, considering the flaws and positive features of designs and materials that might be used for our project.
 - o Look through the materials provided by the client about the project and familiarize myself with them, and use the information to contribute to ideas for product design.

- o Begin brainstorming product design ideas, sketching ideas, coming up with specific options for materials.
- o Contribute to the PDS and complete which parts I can.
- Nora Lorentz
 - o Continue researching more and look specifically into the training models that are currently available
 - o Begin formulating ideas for future product designs
 - o Work on the PDS alongside my teams
- Cadence Seymour
 - o Research more about how the paracervical block works from an anatomical standpoint, as well as get a better understanding of the meaning of a cervicovaginal junction and how it adds to the simplicity of insertion.
 - o Brainstorm some ideas for the model kit and start sketching some preliminary designs.
 - o Complete my portion of the Preliminary Design Specification (PDS) before it is due.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Renee Sobania	9/16/2025	Did additional research specifically about the mechanical strength of the cervical tissue and needle insertion resistance. I also began writing and sketching potential design ideas and completed my sections for the PDS and began designing	5.0	5.0	8.5
Evelyn Ojard	9/16/2025	Completed more specific research pertaining to my PDS portions. Started brainstorming potential designs.	4.0	4.0	8.0
Ellinore Letts			4.0	4.0	7.5
Abigayle Chapman	9/16/2025	Completed assigned portion of PDS and completed research to fill gaps in understanding as necessary. Began brainstorming, roughly sketched design ideas, and considered potential materials.	4.0	4.0	5.5

Nora Lorentz	9/16/25	Wrote my assigned sections of PDS and did necessary research to accompany these sections. Brainstormed ideas.	4.0	4.0	5.5
Cadence Seymour	09/18/2025	I wrote my portion of the PDS and did some additional research	4.0	4.0	6.0

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