Endometriosis is a chronic disease that affects more than 200 million women of reproductive age worldwide (Mutter, 2014). It is characterized by the irregular growth of endometriolike tissue outside of the uterine cavity. This causes severe symptoms such as dysmenorrhea, menorrhagia, and infertility. Currently there are no diagnostic methods available for endometriosis except for exploratory laparoscopic surgery (Biacchardi et al., 2011). My experience in the University of Rochester 2020 International Genetically Engineered Machine (iGEM) competition team had the main goal of identifying a novel, noninvasive diagnostic for endometriosis. During the nine months period of the team, I was the hardware manager of the team. In this role my focus was designing and building six different hardware devices that aid the non-invasive detection starting from the menstrual affluent collection, through processing and analysis and finally imaging the lateral flow assay (LFA) results. I was also part of the policy and practice and education efforts.

In the wet lab team, we selected endometriosis bio-markers in menstrual affluent and then working on designing a lateral flow assay that can qualitatively measure the biomarkers’ presence. The hardware process started with designing an endometriosis patient friendly menstrual cup for the menstrual affluent collection. This cup had its own UV-C light sterilizer to ensure cup sterility for safe reuse, even in the case of inaccessibility to water. For the the sample processing we worked on designing a low-cost centrifuge with the necessary RPM using mostly recycled materials and then provided the sample holder CAD for future reproduction. For the final step we designed an imaging station for reading the lateral flow assay. Since the intensity of the color for the gold nano-particle in the LFA indicates the level of biomarker presence, we focused on providing adequate lighting and magnification while maintaining low cost and reproducibility. Finally, for a more therapeutic approach we started working on a vaginal ring inspired by the clinical trials that Ferring Pharmaceuticals are performing. The RAQUEL study is ‘Randomized Trial Assessing Quinagolide Vaginal Ring for Endometriosis-related Pain’. Overall, we were able to create a simple diagnostic process for endometriosis that can be be easily used in a clinical setting in any location disregarding resource availability.

Raising awareness was not limited to dance and performance, I also worked on web page development for a website that provides most relevant endometriosis information based on age, with a specific section for physicians. The development was completed in collaboration with Gynecologists from University of Rochester Medical Center (URMC) who worked on proof reading all of our facts. Since we started providing educational material, the team decided on providing a more diverse approach and to release facts in multiple languages. For these efforts, I worked on translating our facts into Arabic, Hebrew and French. The final interdisciplinary approach was creating infographics that were distributed in local clinics as well as URMC to raise awareness to the public as well as health professionals.

References


iGEM is an international competition with over 300 teams from all over the world. This gave me the opportunity to host a global meetup program. Participants were from a total of 7 different countries. Aside from that, our policy and practice team worked with professionals from Germany and Denmark to discuss women’s health in Europe. iGEM also encourages global collaboration, so I did beta testing for a team from Sweden, and worked with multiple teams from India, for both education and hardware designs. Finally, we started a meta study to understand the impact of transition on further improving involvement and winning chance of non-native English participants in the competition.