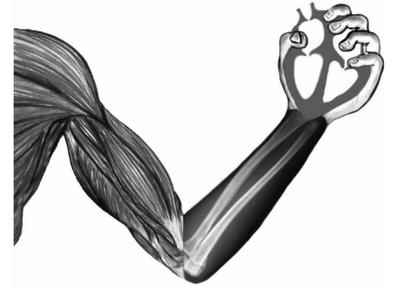


# The Development of an Educational e-Module to Teach the Pathogenesis of Cancer Using an Anatomical Donor Case Study.

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## Background

There is a great need for understanding the complexity and the gravity of cancer pathogenesis as it continues to be the leading cause of death worldwide. Therefore, an interactive e-module was developed to teach the pathogenesis of cancer using an anatomical donor case for integration into the first year medical curriculum. The interactive e-module takes a novel approach by capturing foundational principles of cancer pathogenesis that will resonate throughout medical education as well as following a specific case study to deepen understanding, retention and application for future practice.

## Methodology

This project conjoins two aspects of active learning, case-based learning, and an interactive e-module for optimal understanding and authentic learning. The Storyline Articulate 360 was used to generate the e-learning module with pre- and posttest questions covering the concepts of cancer pathogenesis, tumor heterogeneity, cancer nomenclature, lineage of differentiation, cancer classification, as well as the medical process pertaining to the Uterine Leiomyosarcoma case including presentation and history, imaging and histology, etiology and pathology, differential diagnosis, treatment and prognosis. The e-module will be beta tested for usability and accuracy with a focus group of graduate students who will provide qualitative and quantitative feedback.

## Learning Objectives

1. Develop a case study to learn the pathogenesis of cancer using an anatomical donor
2. Evaluate the effectiveness of implementing an interactive module for preclinical medical education
3. Integrate into the cancer pathogenesis lecture in the General Mechanisms of Disease M1 module of the care forward curriculum

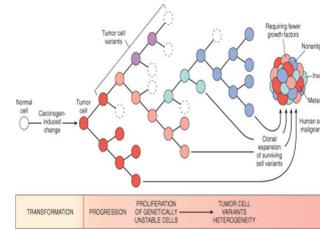


Figure 1. Tumor Heterogeneity

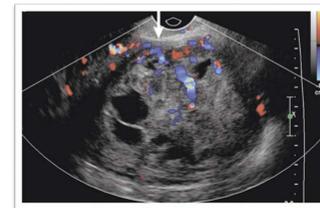


Figure 3. Ultrasound of Uterine LMS tumor.

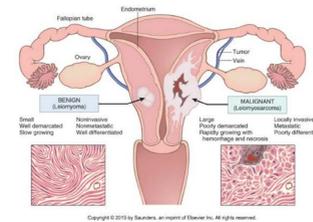


Figure 2. Classification of cancer.

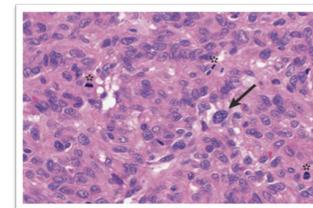


Figure 4. Endometrial biopsy of Uterine LMS tumor.



Figure 5. Uterine LMS tumor specimen.



Figure 6. Enclosed morecellation procedure video clip.

Benign Smooth Muscle Tumors of the Uterus	
Leiomyoma variants that mimic malignancy	Smooth muscle proliferation with unusual growth patterns
<ul style="list-style-type: none"> <li>▪ Mitotically active leiomyoma</li> <li>▪ Cellular leiomyoma</li> <li>▪ Hemorrhagic leiomyoma &amp; hormone-induced changes</li> <li>▪ Leiomyoma with bizarre nuclei (atypical leiomyoma)</li> <li>▪ Myxoid leiomyoma</li> <li>▪ Epithelioid leiomyoma</li> <li>▪ Leiomyoma with massive lymphoid infiltration</li> </ul>	<ul style="list-style-type: none"> <li>▪ Disseminated peritoneal leiomyomatosis</li> <li>▪ Benign metastasizing leiomyoma</li> <li>▪ Intravenous leiomyomatosis</li> <li>▪ Lymphangioleiomyomatosis</li> </ul>
Smooth Muscle Tumors of Uncertain Malignant Potential	
Pathologic Criteria	
<ul style="list-style-type: none"> <li>▪ Tumor cell necrosis in a typical leiomyoma</li> <li>▪ Necrosis of uncertain type with <math>\geq 10</math> MF / 10 HPFs, or marked diffuse atypia</li> <li>▪ Marked diffuse or focal atypia with borderline mitotic counts</li> <li>▪ Necrosis difficult to classify</li> </ul>	

Table 1. Uterine Sarcomas Review Gynecological Oncology (2009).

## Results

Qualitative data will compare the average score on the pre-test with the average score on the posttest. The results will be statistically analyzed using a two-tailed t-test and a calculated p-value to be less than 0.05. The percentage values will reflect the marked increase or decrease in knowledge reflected by the change in retention rates of the summative exam. However, qualitative feedback will be evaluated by the following 5 point Likert scale.

The education e-Modules was an effective way to present cancer pathogenesis?

Strongly Agree    Agree    Neutral    Disagree    Strongly Disagree

Figure 7. Qualitative data 5 point Likert scale question.

## Conclusions

The interactive e-module is an effective pedagogical tool to provide the foundation of cancer pathogenesis using an anatomical donor case study. Phase two of this project is to augment the medical curriculum for 2019. The integration of this interactive e-module in the medical school curriculum could potentially be a powerful resource for understanding the foundational principles of cancer pathogenesis as well as have great impact for lives of those touch by it.

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