

Research Training Environment Statement

The Department of ORL-HNS at the Hospital for Sick Children will be funding the Master's student's stipend. The supervisor and student have received a Perioperative Services Innovation Project grant from the Hospital for Sick Children and the Harry Barberian Scholarship Award from U of T to fund materials and tools. The supervisor and student will apply for CIHR and University-Wide Awards to fund the stipend as well. The following labs have provided equipment and expertise to support successful completion of the proposed project: Centre for Image Guided Innovation and Therapeutic Intervention (CIGITI) at SickKids, the Surgical Skills Centre (SSC) at Mount Sinai Hospital and IBBME. The labs have been successfully used by the investigators to develop a functional initial prototype which was tested inside a 3D printed ear model from a patient CT scan. CIGITI has provided bench space, technical support and machines to manufacture instrument prototypes. CIGITI has also provided office space and computer software to design and test instruments. The SSC will facilitate prototype testing using cadaveric temporal bone models by trained personnel. The SickKids operating room has been used for a time flow study to evaluate the duration of and instruments used during surgery.

This project encapsulates an overarching goal of collaborating between two IBBME research themes of Engineering in a Clinical Setting and Biomaterials and Regenerative Medicine as this new tool will be used to facilitate ear drum reconstruction surgery which places a synthetic graft implant biomaterial to treat a patient's damaged or perforated ear drum in the clinical setting of the operating room.

The primary investigator, Otorhinolaryngologist Dr. James, is recognized internationally for his experience in transcanal endoscopic ear surgery (TEES). He has provided guidance on surgical ergonomics, functional requirements of instruments and feasibility of design proposals. He has previously developed instrumentation for minimally invasive cochlear implant surgery. Co-supervisor Dr. Andrysek has supervised multiple graduate students through the MASc and MHSc programs at IBBME and his experience with medical device design has provided technical engineering support for the project.

Dr. James and Dr. Andrysek's collaboration thus far has enabled Arushri to present an instrument prototype at the 2nd World Congress for Endoscopic Ear Surgery, obtain Research Ethics Board approval to conduct two studies and prepare a draft needs analysis paper to be submitted to an otolaryngology clinical journal next month. Thus, Dr. James, Dr. Andrysek and Arushri's collaboration with IBBME has led to the development of a new instrument as well as clinical research to facilitate TEES.

We believe that the combination of surgical and engineering experience with state of the art facilities for design, manufacturing and testing of novel instruments provides an excellent training opportunity, and the likelihood of successful outcomes from the project, including generation and dissemination of novel research (as conference and peer-reviewed journal papers), as well as development and potential commercialization of novel medical instruments.