# PhD. Proposal Outline:

**Literature Review –** reveal benefits and challenges in TEES

**Needs Analysis Study –** survey to understand what tool functionalities are required during TEES to address these challenges (done)

**Time Flow Study –** understand the steps during surgery that take the longest amount of time and what tool limitations exist during surgery to inform the desired tool functionalities (in progress – REB is done)

* Hair trimmer – shaved just 30 seconds and this wasn’t significant enough
* Time flow of interchanging instruments and if there’s a multi-tool that could reduce this time
* Gives an understanding of the OR and surgeon’s needs and how the instruments work
* Time flow study wasn’t a feasible method of measuring cholesteatoma dissection due to many factors: patient anatomy, extent of disease, how firmly it is stuck and where it is stuck, how much bone removal necessary
* Could compare length of tympanoplasty vs. cholesteatoma surgery to show the data is heterogenous and this variance requires me to study thousands of patients in order to really show a difference

**Tool Design –** outline the design of an instrument to address these challenges (in progress)

**Tool Development/Prototyping –** outline how the tool was prototyped

**Tool Validation –** is the instrument able to address these challenges?

* Clinical validation: survey for surgeons to evaluate the tool in a temporal bone model (in progress, (see instrument validation paper outline) REB is done for survey and using the CT scans to make models) (otology and neurotology paper)
* Mechanical testing – cyclic testing until fatigue, torsion testing, force to break tip (see ASME technical brief outline) (otology and neurotology paper or ASME design brief)

Novel Contribution: Needs survey to understand the challenges faced during TEES, designing, building and validating a tool to address these challenge(s)

Other Tasks:

* Provisional Utility Patent (by April 29, 2018)