# Time Flow Study Paper

Purpose: to analyze the efficiency of TEES

* Look up case reports on tympanoplasty (follow a case report layout)
* Medline search on timing surgeries
* Inconsistencies in how procedures are performed -> the technique/approach varies
* Why underlay or interlay
* Mesh terms: time, time analysis

## Abstract:

## Background:

Focus on the inefficiencies in TEES in the background -> are there papers that say this is inefficient, case reports that vary in terms of technique, times, blood loss, outcomes, etc.

Condition of the patient, inefficiencies, using different tools

Rube et al. Recorded the time for MRI-guided angioplasty and assessed the efficiency and feasibility of the proposed workflow and framework for this type of procedure (Rube et al., 2015). Similarly in an attempt to show the efficiency of a dedicated minimally invasive operating room (OR), Hsiao et al. recorded the time for steps during laparoscopic procedures in two types of OR’s: a dedicated minimally invasive OR and a traditional OR (Hsiao, Machaidze, & Pattaras, 2004). A time flow study was also used to measure the patient wait times before and after restructuring the practice patterns to assess the efficiency of the new practice (Racine & Davidson, 2002). Time flow studies have been employed to analyze the efficiency and compare between surgery procedures and hospital protocols.

This study will also assess the feasibility and efficiency of endoscopic ear surgery using the same method: recording the times of steps in the procedure. This will aim to determine the inefficiencies and address the steps where further instrument design would be beneficial. This would also provide a good benchmark against which to measure efficiency and feasibility of future tools that would be developed. This will aim to measure the efficiency of current endoscopic ear surgery and provide areas where instrumentation redesign is required.

## Methods:

### Study Design:

The SickKids Research Ethics Board reviewed and approved the study. The participants for this observational study included four staff otologists from Toronto: three from SickKids and one from Toronto General Hospital. Each participant had more than <insert number of years> years of experience in TEES. Patients who were undergoing tympanoplasty or cholesteatoma removal surgery using TEES were included in the study. Ten (??) surgeries from each otologist were studied.

The duration of the following steps were recorded using a standard stopwatch: cleaning out the ear canal, injecting anaesthesia, trimming the hairs, cleaning edges of the perforation, making the skin incision, raising the tympanomeatal flap, preparing the graft, placing and positioning the graft, replacing the flap, packing the ear canal. If the case was a cholesteatoma removal, then the time to remove cholesteatoma was also recorded.

The type of instruments used during these different maneuvers and the number of changes between different instruments will also be noted. These observations will also lead to an appreciation of the ergonomic requirements of instruments during ear surgery and the design advantages of different instruments for specific maneuvers.

The variance in time-flow between cases was high between cases based on patient specific factors such as extent of bleeding, ear canal morphology and extent of disease. As well, often the surgeon was teaching a trainee how to perform the surgery; this contributed to longer durations of steps as the staff surgeon was not the only one operating. Nevertheless, this methodology provided a more accurate assessment of surgical practice and challenges than anecdotal surgeon’s recall. Steps demanding a disproportionate amount of time or multiple changes in instrument will be determined from analysis of these data. This will reveal procedural areas in which surgical efficiency may be improved by instrument modification.

### Statistical Analysis:

The data was analyzed using the medians.

## Results:

## Discussion:

According to Lea and Mijovic, raising the tympanomeatal flap is the most challenging and bloodiest step of surgery (Mijovic & Lea, 2015).

In tympanoplasty, the choice of the approach, graft material and graft placement technique depend on training, case load, resources and experience (James, Papsin, & Papsin, 2012). The choice of underlay, interlay or overlay graft placement can affect the raising of the tympanomeatal flap because during interlay, the layers of the tympanic membrane must be separated which would take longer.

## Conclusion:

References:

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