Surgical Instrument Utilization in Otolaryngology: Identification of Improvement Opportunities

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Introduction and Project Aim

The Problem: Significant number of re-usable instrumentation missing or damaged & many instruments in sterile tray unused

Context: The Surgical Instruments Processing Cycle

A given surgical instrument follows a process cycle, allowing it to be reused after a surgical operation. While a variety of steps exist, we can consider the cycle to be generally as an input and output (i.e. I/O) centered on the operating room (See Cycle Below). Reusable surgical instruments are packaged into sterile trays & opened in the OR.

Problem: Unused, missing, & damaged instruments

After opening in the OR, all instruments in a sterile tray must be re-sterilized. Frequently, most of these instruments are never used (see Figure 1 & 2). Additionally, many of these instruments are damaged or lost during the processing cycle. This decreases efficiency and may contribute to difficulties in the OR.

Impact: Small costs have significant cumulative effect

At any given moment, there is an average of 374 instruments missing/damaged from otolaryngology trays, representing a calculated valuation of $36,902. Across West surgical services at Froedtert, there were 311 instruments missing/damaged, representing an estimated valuation of $240,099 Total annual financial impact is unknown at this time and is likely much higher.

Hypothesis: By removing frequently unused instrument types, can we reduce the number of instruments that are lost or damaged due to the processing cycle?

Theory of Processing Cycle: (Processing Cycles) ≃ (Lost Instruments) × (Instruments in Tray) × (Processing Cycles) × (Labor) × (Loss Rate)

Research Methodology

Phases of Project:

1. Baseline Data Collection
2. Intervention & Monitoring
3. Post-Intervention Monitoring

Methods Summary: Direct observation and merging of multiple data sources

The main data concerning the use rate of various surgical instruments (Figure 3) was determined by direct observation of surgeries. However, the complexity and interconnectedness of related processes related to this project necessitated data collection from multiple sources to support the study. Financial burden of missing and damaged instruments. Labor cost data was pulled from internal sources and included in cost calculations. Additionally, an online survey was developed to validate the rate of missing or damaged instruments relative to the number of processing cycles as well as to characterize the impact on instrument preparation logistics and productivity.

Conclusions

Excess surgical instrumentation results in inefficiency

This inefficiency results in excess operational costs in labor & increased instrument depreciation as well as clinical impacts on surgeon efficiency and efficacy

Instrument reduction intervention is simple and rapid

If developed across all surgical specialties, reduction of unused surgical instruments could yield significant financial savings for Froedtert Hospital.

Conclusions

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References


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Direct Costs of Never Used Instrument Types by Tray Type

Results of the ongoing online survey of service coordinators indicate that on average 4.2 instruments per day are not available on the day of surgery and 49.7% of these instruments cannot be acquired before surgery commence. This equates to a missing or damaged instrument for every 1 in 275 processing cycles, helping to verify the algorithm used to establish cost estimates. This investigation is ongoing to confirm added productivity burden of missing and damaged tools.

Over 23 surgical days, 74 surgeries were observed, yielding utilization data on 7,785 instrument types. Overall averaged utilization rate across 207 surgical instrument trays was 30.4% (Figure 3). Extrapolated to the annual period, this yields $4,756 wasted instrument-processing cycles. This inefficiency yields $7,230 in wasted labor and $70,347 in total costs (annually) if 1 out of every 250 processing cycles yields a damaged or lost instrument.

Moreover, 30.6% of instrument types were never used across all surgeries (15,516 wasted processing cycles). This yields $2,041 in wasted labor and $17,183 in direct costs (annually). (Figure 4).

Estimated Potential Annual Savings due to Improvements in Otolaryngology Instrument Usage

Considering a labor/availability ratio of 1 instrument per 275 processing cycles