

## Perioperative inefficiencies and distractions in an endocrine surgical service



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### ABSTRACT

**Introduction:** The goal of this study was to examine intraoperative timing, distractions, and delays in search of inefficiencies as a basis for future quality improvement projects.

**Method:** Cervical endocrine surgeries at a large tertiary academic center were analyzed over a two year period. Time spent in the operating room (OR) and post-anesthesia recovery area, in addition to time was studied for variations between surgeons. A select number of operations were observed from the time the patient first entered the OR to the time the patient left the OR to document any distractions. Distractions were documented from the time of entry in the OR to the time the patient left the OR. These distractions were categorized to determine whether a delay in the operation had occurred.

**Results:** A total of 1518 cervical endocrine operations were performed. The total overall time in the OR and total operative time were statistically significantly different both overall and broken down for parathyroid and thyroid cases ( $p < 0.01$ ). A total of 12 cases specifically observed. The most common type of distraction was someone entering or leaving the room, with the next most common being equipment issues. The most common etiology for a delay was due to equipment with delays waiting for personnel coming in second.

**Conclusion:** Variation in timing exists between surgeons during the different components of the operation even on a standardized endocrine surgery service. Distractions frequently occur and can lead to delays in the operation. These should be targeted for future OR efficiency improvement projects.

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### 1. Introduction

A major concern facing modern healthcare is the improvement of efficiency without compromising quality of care. New techniques are constantly being sought after to facilitate improvement initiatives in medicine. These initiatives are mainly derived from the manufacturing industry and have proven very effective at improving efficiency while maintaining or improving overall quality.<sup>1</sup> For example, the Lean and Six Sigma techniques use qualitative and quantitative analyses to determine the sources of inefficiency and error within the flow of a certain process. This has been documented in previous surgical and anesthesia literature.<sup>2–6</sup> When using these techniques, it is typical to uncover areas of inefficiency that were not anticipated.<sup>7</sup>

Surgical operations can be compared to industrial methods in that they are complex, team based processes that focus on producing a final result. Surgery involves not only a team of attending physicians, residents, fellows, and physician assistants, but also

anesthesiologists, nursing staff, transport staff, and cleaning crew. In order to maintain a smooth workflow, each group must accomplish their task as efficiently as possible without compromising quality of care. They must also work in tandem with other team members to execute a desired task without causing a bottleneck in the workflow.

Unnecessary distractions remain a major source of inefficiencies in the OR. Some studies have demonstrated that distractions can increase errors and prolong task performance time in controlled environments.<sup>8–10</sup> Different types of intraoperative distractions have been characterized and have been found to contribute differently to the rates of delays depending on the type of operation.<sup>8–10</sup> However, there is a relative paucity of information demonstrating the role of these distractions can in the overall surgical process.

The goal of this study was to examine the entire surgical process and identify distracting events at a large academic medical center. These distractions were then evaluated to determine if they resulted in a delay in the conduct of a procedure. Two different methods were employed. The first was to use electronic medical record database to quantify the amount of time spent on each part of the surgical process from entering the room until transfer to the

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recovery unit. The second was to observe the flow of the operating room and to record the number and type of distractions and delays that occurred during a typical operation.

## 2. Methods

As part of an initiative to begin a comprehensive unit-based safety protocol (CUSP), cervical endocrine operations from seven surgeons at a large academic center were analyzed. Two different sets of information were collected in order to look for ways to improve OR efficiency.

The first set examined the duration of each aspect of the operation. Only thyroid and parathyroid cases were recorded. The times measured were the wheels in the OR until induction, time of induction until intubation, time of intubation until time of incision, skin to skin time, closure until extubation, and extubation until wheels out of the OR. We also looked at the total time in the post-anesthesia recovery area (PACU). This information was then analyzed both in aggregate and by individual surgeon to determine variations between surgeons. All surgeries were performed in a standardized fashion using the same surgical instrument sets. All surgeries were performed in a standardized fashion using the same surgical instrument sets. All cases had an ultrasound performed prior to incision. Our endocrine surgery service does not use routine intraoperative recurrent laryngeal nerve monitoring. For parathyroidectomies we routinely use intraoperative parathyroid hormone (PTH) and do a four gland exploration except in reoperative cases. Cases were analyzed in aggregate and separated by thyroid or parathyroid by CPT codes. Information from all cervical endocrine surgical cases was collected over a time period from October 2011 to August 2013.

The second set of information evaluated the specific type and length of potential distractions and delays within the OR. The team wanted to define the different types of distractions in the operative room. All distractions have the potential ability to adversely affect surgery, however in most situations many of these effects are difficult if not impossible to quantify. Delays, or a distraction causing a pause in the process requiring resolution of the issue prior to completion of the procedure, were an area we felt was able to easily quantify. By observing their frequently and whether they produced a quantifiable delay in the procedure, these distractions would allow reviewers to develop ways to implement targeted improvement for the flow of surgery. The operations were observed from the time the patient first entered the OR to the time the patient left the OR. The type of distraction was recorded and differentiated into the following categories: equipment issues, pager or phone interruption, conversation, staff change, improper positioning, someone entering or leaving the room, waiting for personnel, excessive sedation (defined as time > 10 minutes from completion of surgery until extubation), and delays related to pathology (i.e. picking up specimen, processing through pathology, etc.) (Table 1). Distractions were further categorized by whether or not they led to a delay in the surgical procedure. A delay was defined as a pause in workflow that could not be overcome until the distraction was resolved. All data was collected by one of two different observers. All cases were chosen randomly and the surgical teams were not notified in advance. In order to limit behavior modification due to our observation, only one case per day was observed.

### 2.1. Statistical analysis

The results of the study were analyzed using JMP Pro 10.0.0 (SAS Institute Inc. 2012) and Excel 2010 (2010 Microsoft Corporation). Comparisons were done using ANOVA and t-test to

**Table 1**  
Types of OR distraction.

KEY	
1	Equipment issue
2	Pager/Phone
3	Conversation
4	Staff change
5	Improper Positioning
6	Someone Entering/Leaving Room
7	Waiting for personnel
8	Excessive sedation
9	Delays related to pathology

determine the relationship of means between groups. For all data analyzed, the 95% confidence interval was computed with a resulting p value of < 0.05 being considered statistically significant.

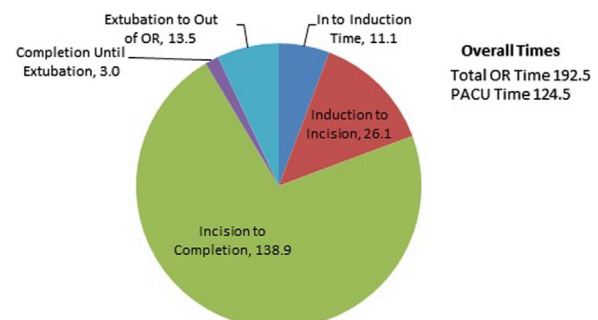
## 3. Results

For the first set of data, a total of 1518 cervical endocrine operations were studied. The average breakdown of these operations can be seen in Fig. 1. There were statistically significant differences between surgeons for the mean length of most steps of the operation with the exceptions of the time between completion of the procedure and extubation, and the total time in the PACU (Fig. 2a and b). These generalized relationships held up when separated by parathyroid or thyroid procedure with the exception of extubation until wheels out which was only statistically significantly different in the parathyroid group.

The next aspect of this quality improvement initiative involved an impartial observer in the OR documenting various potential distractions. The types of distractions are listed in Table 1. A total of twelve cases were observed between August 2012 and November 2013 with nine different categories of distracting events. The most common type of distraction was someone entering or leaving the room, with the next most common distraction being equipment issues (Fig. 3). The most common reason for a delay involves equipment issues, with delays resulting from waiting for staff and residents being second most common (Fig. 4). Despite not being common, the delays that consumed the most time were related to intraoperative pathology results (specimen awaiting pick up, and reporting from pathology), waiting for residents and staff, and equipment issues (Fig. 5).

## 4. Discussion

In recent years, clinicians have borrowed process improvement techniques from industrial fields in an attempt to improve outcomes. The Six Sigma and Lean techniques capitalize on the fact



**Fig. 1.** Average Time breakdown for intraoperative time (in minutes).

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