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Auditing of operating room times: A quality improvement project

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ABSTRACT

Objective: A quality improvement project to evaluate operating room efficiency and utilization and to identify areas for improvement.

Methods: A retrospective assessment of a single surgeon's surgical cases over a 6-month period at a tertiary children's hospital. Primary outcomes included case timing defined as T1, T2, T3 and T4. (T1)—Patient enters OR-to-procedure start. (T2)—Procedure start-to-procedure end. (T3)—Procedure end-to-patient exits OR. (T4)—Patient exits OR-to-next patient enters OR (turnover). Comparison to existing literature was performed and results were presented to stakeholders.

Results: A total of 180 surgical cases were reviewed, 92 adenotonsillectomies (T&A), 33 Bilateral Pressure Equalization Tube Placement (PET) and 55 microlaryngoscopies and bronchoscopies (MLB). All outcomes were calculated by case type, except T4, and compared to available published data. T2 was compared to published benchmarks for otolaryngology demonstrating favorable operative times for T&A and PET. However, T4 was considerably longer at our institution (average 31.09). Overall OR efficiency was 20.58%.

Conclusions: The operating room represents one of a hospital's most costly resources. Ensuring that this resource is designed, staffed and utilized efficiently is of major importance to both the quality of patient care and financial productivity. Surgeons are key components of operating room efficiency, utilization and other measurements of institutional performance. How surgeons schedule and perform cases directly impacts, and is impacted by, these measurements of performance. For fields dominated by high volume, short duration procedures such as pediatric otolaryngology, T4 may be the most important variable in determining OR efficiency. By utilizing modern electronic medical records, surgeons can easily track OR time points thereby determining the potential causes of and solutions for OR inefficiency.

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Introduction

Operating room (OR) efficiency and utilization are of vital importance to hospitals. These resource-intensive rooms and the patient flow within them are the subject of numerous studies. Most projects begin with examinations of a single operating room or surgeon while some larger studies have involved entire hospitals [1–10]. All are labor-intensive projects designed to identify areas for improvement in patient throughput and efficient care delivery, thereby improving the quality of the patient's experience and hospital resource utilization. Several of these projects were

conducted as quality improvement (QI) exercises using specific and proven methodologies. These studies have demonstrated benefit at their respective institution, in quality of care (measured by increased on time starts, shorter length of stay for specific procedures, and improved patient perception of care quality) and in resource management (more rooms finishing on time, more cases completed with same or reduced OR resource expenditure, increased OR financial performance, and increased OR capacity) [2–4,7–10].

One confounding factor in applying conclusions from various studies to one's own situation is the lack of standardized nomenclature for this field of study. For the purposes of this manuscript, the definitions employed by Varughese et al. have been used [1]:

$$\text{OR utilization} = \left(\frac{\text{sum of time OR occupied by patients}}{\text{sum of block time available}} \right) \times 100\%$$

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$$\text{OR efficiency} = \left(\frac{\text{sum of operative time}}{\text{sum of case process time}} \right) \times 100\%$$

Case process time

= previous patient out of OR to current patient out of OR

Despite the growing literature regarding OR efficiency and utilization, many surgeons may not be familiar with their role in these performance measures. Although surgeons may know how long it takes to complete a certain procedure, they may not be involved in the decisions that affect how well the OR functions and that therefore impacts their patients and their ability to perform these procedures.

The present inquiry began when the senior author reviewed a day in the OR on which cases started late, families expressed frustration with long preoperative stays at the hospital for short procedures, the OR finished later than scheduled, and little operating had occurred because the room was often not occupied by a patient. In addition there were no identified representatives or committees responsible for addressing these concerns to whom the author could present these issues. On this particular day, 7 cases were performed in one room (3 adenotonsillectomies (T&As), one adenoidectomy and ventilation tube placement (adenoidectomy with PET), one T&A with examination of ears under anesthesia, one T&A with PET, and one adenoidectomy with microlaryngoscopy and bronchoscopy (MLB) and endoscopic repair of laryngeal cleft). During this day, there were 159 min of operating time, 144 min of turnover (room was empty between cases), 291 min of time with a patient in the room and 438 min of

case process time (sum of previous patient out of room to current patient out of room) in a 450 min block (Table 1). The surgeon operated for ~55% of the time that the patient was in the room (159/291). This day reflects 36% OR efficiency and 65% OR utilization. Since there were only 6 periods of time in which the room was being cleaned and readied for the next patient (turnover time), this period averaged 24 min. In addition, all procedures took less operating time than the planned operating times, including the last case which was booked for 150 min of operating and took 82 min to perform. While the procedure times compared favorably to published averages, the turnover time did not [1,10]. In addition, the length/percentage of time that patients spent in the room not being operated upon seemed excessive.

While standards for operating room efficiency and utilization for these types of procedures do not exist, this day subjectively failed to deliver quality and efficient care. Experiences such as this led to the creation of a QI project designed to examine efficiency and utilization more closely, with particular attention to identifying areas for improvement. The results of this study are presented in this manuscript. The aim was to identify opportunities to improve the efficiency and quality of care as well as to present this data to stakeholders in the perioperative environment in order to increase the surgeon's role in decision making.

Methods

A 6-month period of operating room use by a single pediatric otolaryngologist was examined. This project was approved as a QI study by the Organizational Research Risk and Quality Improvement Panel of Children's Hospital Colorado (CHCO) Research

Table 1
Representative day in the OR.

| Case # | Procedure | Time Booked (min.) | Schedule d Start Time | Actual Times | Case Process Time (min.) | Study Times (min.) | Turnover (min.) |
|--------|---|--------------------|-----------------------|--|--------------------------|---------------------------|-----------------|
| 1 | T&A | 30 | 7:30 | In: 7:44 Start: 7:54 Stop: 8:06 Out: 8:12 | 42* | T1: 10 T2: 12 T3: 6 | T4: 19 |
| 2 | Adenoidectomy & PET | 30 | 8:00 | In: 8:31 Start: 8:45 Stop: 8:58 Out: 9:05 | 53 | T1: 14 T2: 13 T3: 7 | T4: 21 |
| 3 | T&A with examination of ears under anesthesia | 30 | 8:30 | In: 9:26 Start: 9:38 Stop: 9:50 Out: 9:55 | 50 | T1: 12 T2: 12 T3: 5 | T4: 23 |
| 4 | T&A | 30 | 9:00 | In: 10:18 Start: 10:30 Stop: 10:40 Out: 10:46 | 51 | T1: 12 T2: 10 T3: 6 | T4: 19 |
| 5 | T&A with PET | 45 | 9:30 | In: 11:04 Start: 11:15 Stop: 11:32 Out: 11:39 | 53 | T1: 11 T2: 17 T3: 7 | T4: 17 |
| 6 | T&A | 45 | 10:15 | In: 11:56 Start: 12:08 Stop: 12:21 Out: 12:26 | 47 | T1: 12 T2: 13 T3: 5 | T4: 45 |
| 7 | Adenoidectomy with MLB & Endoscopic Repair of Laryngeal Cleft | 165 | 11:00 | In: 1:11 Start: 1:27 Stop: 2:49 Out: 2:58 | 142 | T1: 16 T2: 82 T3: 9 | |

Notes: * For Case no. 1, the scheduled start time was used to calculate case process time instead of the time the previous patient left the OR as this was the first case of the day.

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