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Improving outcomes in a high-output pediatric otolaryngology practice

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ABSTRACT

Objectives: To identify factors associated with efficient operating room work flow on high volume pediatric otolaryngology days and the effects on provider and perceived parent satisfaction.
Methods: Retrospective review was performed of a sample of 20 days with greater than 10 cases per day performed by a pediatric otolaryngologist operating in 2 rooms. Turnover time and complications were the main outcome measures. Providers from otolaryngology and anesthesia that participated in these days were surveyed regarding efficiency, safety, and satisfaction.
Results: 223 cases were performed over 20 operative days. The average turnover time was significantly longer in "major" surgeries ($p = 0.03$), cases with multispecialty involvement ($p = 0.01$), cases requiring intubation ($p < 0.001$), and in cases where a fellowship trained pediatric anesthesiologist ($p = 0.01$) or CRNA was present ($p < 0.001$). When comparing "fast" (<25 min average turnover) operative days vs. "slow" (>25 min average turnover) days, presence of a non-fellowship trained anesthesiologist ($p < 0.001$), and the presence of an anesthesiology resident ($p = 0.03$) were significantly associated with "fast" days, while the presence of a CRNA was associated with "slow" days ($p < 0.001$). A significantly greater proportion of patients required intubation on "slow" turnover days vs. "fast" days ($p = 0.13$). Only one complication was observed (0.4%). 48 providers were surveyed with a 63% response rate. Reported satisfaction amongst providers was significantly greater on days with at least 10 cases ($p = 0.047$) and on days with turnover times of 25 min or less ($p < 0.001$). Pre-operative nursing evaluation/preparation of the patient, inter-provider communication and delays in room cleaning/setup were identified most often as causative factors responsible for delays in turnover.
Conclusions: High-operative volume operating days are common in pediatric otolaryngology and can be safely performed in an efficient manner. Appropriate scheduling and high-level communication between providers is needed to ensure success on these days. Identified areas of potential inefficiency can be a starting point for work flow optimization practices.

1. Introduction

Pediatric otolaryngologists regularly encounter a busy work flow during a typical operative day. Often a single provider may perform 10 or more cases and occupy more than one operating room. The added complexity of these high-volume operative days can create disparities in operating room efficiency. In addition, patient satisfaction may be directly linked to efficiency; in our practice we observed that faster turnover times and shorter patient waiting time seemed to be associated with increased satisfaction in both patient and provider. However, there was a paucity of data to confirm these suspicions.

Recent efforts have been geared toward quality improvement in the field of otolaryngology. Analysis of work flow during direct laryngoscopy and bronchoscopy has been done in an attempt to identify areas where quality improvement methods can be applied [1]. Optimizing surgical work flow is important as inefficiencies are linked to increased costs, fewer cases being performed, and reduced provider satisfaction [2]. Improvements in operating room efficiency are most realized in those cases with short duration,

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such as commonly performed pediatric otolaryngology cases [2,3]. However, study has not been directed toward the efficiency and safety of high surgical volume pediatric otolaryngology days in which various procedures are performed.

We aimed to identify the factors that were associated with efficiency in the operating room on high volume days. Furthermore, we aimed to examine the downstream effects of operating room work flow efficiency: effect on parent waiting times, perceived parent satisfaction and overall provider satisfaction. Finally, we aimed to examine the safety of a single surgeon operating in two rooms consecutively on high volume day.

2. Methods

Approval for this study was obtained from the Institutional Review Board. Patient records were then examined and a retrospective analysis was performed of the most recent 10 days with at least 10 operative cases for each of our 2 pediatric otolaryngologists. All records examined were from February 2013 to September 2013. Data analyzed included: demographic information, details of surgeries performed, and work flow time points through the operative queue. We examined the initial data and divided operating room turnover times (TOT) into "slow" and "fast" groups. TOT < 25 min was "fast", and TOT greater than 25 min were "fast". Surgeries were considered "minor" or "major". "Minor" procedures were: tonsillectomy, adenoidectomy, PE tubes, frenuloplasty, septoplasty, direct laryngoscopy and bronchoscopy. Surgeries that were considered "major" were: supraglottoplasty, tympanoplasty, balloon laryngoplasty, FESS, choanal atresia repair, excision of neck mass, and cases with multispecialty surgical procedures.

2.1. Survey

Providers that participated in the operative days were identified and provided an opinion survey regarding factors that may affect outcomes on days that have more than 10 pediatric otolaryngology cases. These providers included pediatric otolaryngologists, pediatric anesthesiologists, general anesthesiologists, otolaryngology residents, anesthesia residents, and certified registered nurse anesthetists (CRNAs).

2.2. Statistical analysis

The main outcome measures were operating room TOT between cases and complications observed. Secondary outcome measures were time from arrival to the hospital to arrival in recovery room, time in operating room to incision time, and operating time. Statistical analysis was then performed using Fisher exact test to compare categorical data and a Student's *t*-test with Welch's correction to compare continuous variables. Secondary to small sample size, Mann–Whitney rank sum was used to examine differences in continuous variables between cases with more than 3 surgeries performed vs. less than 3 surgeries, "major" vs. "minor" cases, and those cases with multispecialty involvement.

3. Results

In total we identified 223 cases. There were a total of 20 operative days with 10 or more cases performed in two rooms; 10 days from each of our two senior pediatric otolaryngologists.

3.1. Types of surgery and multispecialty involvement

The average number of distinct procedures performed was 1.71 procedures per case. Table 1 displays the variety of surgical procedures performed. The average turnover time was not different when comparing cases that had fewer than 3 types of surgery performed vs. 3 or more (21.45 ± 0.74 min vs. 22.69 ± 2.08 min; $p = 0.99$). There were 23 "major" cases performed and 200 "minor" cases. The average turnover time was significantly longer during major cases compared to minor cases (34.47 ± 4.41 min vs. 24.02 ± 0.83 min; $p = 0.01$). There were 7 cases (3%) with multispecialty involvement. The average turnover time was significantly slower in cases with multispecialty involvement (47 ± 10.97 min vs. 24.51 ± 2.08 min; $p = 0.01$). The average turnover time was significantly slower for any case that required intubation (26.37 ± 0.99 min vs. 18.09 ± 1.26 min; $p < 0.001$).

Table 1
Types of surgeries performed.

PE tube	125
Adenoidectomy	124
Tonsillectomy	75
DLB	18
Frenuloplasty	7
Myrinoplasty	4
Supraglottoplasty	4
Tracheostomy	3
FESS	2
Turbinate reduction	2
Choanal atresia repair	2
Excision of neck mass	2
Balloon laryngoplasty	1
Septoplasty	1
Other	10
Total	380

3.2. Surgeon

All cases had a pediatric trained otolaryngologist present. Surgeon A performed 107 cases (48%) and surgeon B performed 116 cases (52%) ($p = 0.45$). There was no significant difference in the average TOT between surgeon A and surgeon B (26.73 ± 1.51 min vs. 23.25 ± 0.93 min; $p = 0.052$). All cases had an otolaryngology resident present. Surgeon A performed a significantly greater proportion of "major surgeries" (18, 17% vs. 5, 4%; $p = 0.01$) and significantly more multispecialty cases (7, 7% vs. 0, 0%; $p = 0.005$). Surgeon B had a significantly higher average number of procedures per case than surgeon A (1.51 ± 0.06 vs. 1.87 ± 0.05; $p < 0.001$).

3.3. Anesthesia

All cases had a staff anesthesiologist as well as an anesthesia resident or a CRNA present. 152 cases (68%) were performed by a non-fellowship trained anesthesiologist and 71 cases (32%) were performed by a fellowship trained pediatric anesthesiologist ($p < 0.001$). The average TOT was significantly longer in those cases with a fellowship trained pediatric anesthesiologist present (28.34 ± 1.75 min vs. 23.24 ± 0.96 min; $p = 0.01$). There was no difference in the proportion of "major" ($p = 0.24$) or multispecialty cases ($p = 0.21$) performed between fellowship and non-fellowship trained anesthesiologists. Significantly more cases (133, 60%) had a CRNA present vs. an anesthesia resident (90, 40%) ($p < 0.001$). The average TOT was significantly longer in those cases with a CRNA present vs. an anesthesia resident (26.69 ± 1.51 min vs. 22.33 ± 0.93 min; $p = 0.008$). There was no difference in the number of "major cases" ($p = 0.37$) or multispecialty cases ($p = 0.70$) performed between CRNAs and residents.

3.4. Fast & slow turnover days – multivariate analysis

There were 13 "fast" turnover days (<25 min) with 150 cases performed, and 7 "slow" turnover days (>25 min) with 73 cases performed. There were an average of 10.57 cases performed on