Same-Day Evaluation and Surgery for Otitis Media and Tympanostomy Tube Placement: A Feasibility Study

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Abstract
Objective. To determine the feasibility of providing streamlined same-day evaluation and surgical management of children with recurrent otitis media or chronic serous otitis media who meet criteria for tympanostomy tube (TT) placement.

Study Design. Retrospective matched case series.


Methods. A comparison group (age, sex, insurance product) was utilized to determine if the same-day process decreased facility time and surgical time for the care episode. A parent satisfaction survey was administered.

Results. Thirty children, with a median age of 16 months (range, 12-22 months), participated in the same-day surgery process for TT. Twenty-one patients (70.0%) were male, and these patients were matched to a comparison group (similar age, sex, and insurance product) having non-same-day (routine) TT placement. The same-day patients spent significantly less time in clinic for the preoperative physician visit (average, 15 minutes) when compared with the non-same-day patients (average, 51.5 minutes; P < .001). The operative experience for the same-day patients was similar to the non-same-day patients (average, 145 vs 137 minutes, respectively; P = .35), but the overall experience was significantly shorter for the same-day patients (average, 151 vs 196 minutes for comparisons; P < .001). All parents surveyed in the same-day group were satisfied with the efficiency of the experience.

Conclusion. The same-day surgery process for management of children who meet the criteria for TT placement is a model of improved efficiency of care for children who suffer from otitis media.

Keywords
otitis media, tympanostomy tubes, same day surgery, acute otitis media, otitis media with effusion, access to care

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Each year, around 650,000 children <15 years old receive tympanostomy tubes (TTs), accounting for >20% of all ambulatory surgeries in this group.¹ By the age of 3, nearly 1 of every 15 children (6.8%) will have TTs placed, with a 2-fold increased incidence in those attending day care.² Despite clearly developed guidelines for TT placement, there are subsets of the population—namely, rural or underinsured—who have more difficulty with access to subspecialty care for surgical treatment when indicated.³⁴ This may delay treatment and place these children at risk for complications of otitis media, thereby increasing expenditure of health care dollars for medical management. For children with chronic otitis media with effusion, tube insertion reduces the prevalence of middle ear effusion by 32% in the first year and improves average hearing levels by 5 to 12 decibels.⁵⁶

The Affordable Care Act and projected changes in health care and payment models are driving health care centers to provide innovative, cost-effective care delivery process models. This was a motivator to determine the feasibility of a streamlined patient care model for a common diagnosis, otitis media, which carries a low surgical risk. Our objective was to determine if a streamlined process was possible, whereby a child who meets clinical criteria for TT placement for the treatment of recurrent otitis media or chronic otitis media with effusion could be evaluated by a subspecialist and have the surgical procedure done on the same day.
day. Additional objectives were to determine if the time spent at the medical facility and the surgical time to perform the procedure were different when compared with a matched comparison group (age, sex, payer) that also underwent TT placement for otitis media. Parental satisfaction with the efficiency and overall comfort with the same-day surgery process was assessed with a brief survey.

Methods

Same-Day Surgery Process

A project team consisting of physician champions from otolaryngology and anesthesia, administrative sponsors, a project lead manager, and representatives from clinical informatics, ambulatory services, surgical services, audiology services, point of service, and concierge services met to create the workflow and care process model for same-day surgery (Figure 1). Included children met criteria for TT placement according to the American Academy of Otolaryngology—Head and Neck Surgery Foundation’s clinical practice guidelines\(^1\) and/or the American Academy of Pediatrics’ clinical practice guidelines.\(^7\) Indications included (1) recurrent acute otitis media (AOM; \(\geq 3\) episodes in 6 months or \(\geq 4\) episodes in 12 months with 1 episode within past 6 months) with unilateral or bilateral effusion at the time of the evaluation or (2) otitis media with effusion duration \(\geq 3\) months (chronic otitis media with effusion) with documented hearing difficulties. Children who did not meet these criteria were not selected for the same-day process and were scheduled for routine clinic visits as indicated. Children with potential anesthesia risks, medical comorbidities (cardiac, pulmonary, or neurologic), and other otolaryngology concerns (ie, adenotonsillar hypertrophy) were excluded from same-day surgery to allow adequate time for further evaluation.

Access for a child to the care process model occurred through 3 routes: (1) a partnership with community pediatricians utilizing a same-day surgery referral form or a “dot phrase” intake template entered into the electronic medical record with share of information and placement of request for consultation/appointment; (2) otolaryngology office staff identifying children with a diagnosis of otitis media or otitis media with effusion, followed by a midlevel provider telephone intake and entry of the “dot phrase” intake template; and (3) parent self-referral to the hospital website, followed by a midlevel provider telephone intake and entry of the “dot phrase” intake template. Duration of midlevel provider phone calls to the families averaged 15 minutes. Although exact numbers were not recorded, most families either chose a routine clinic visit or were directed to one because they did not meet inclusion criteria or they preferred it. For those opting for the same-day surgery process, prior authorization for surgery was obtained by the surgery coordinator (a same-day authorization could be performed by available staff if needed), and the families were provided with the arrival time and fasting instructions by the operating room coordinator. All patients had tentative surgical times and were given fasting instructions specific to these times per standard anesthesia protocols.

On the scheduled day of same-day surgery, the patient and family arrived between 6:45 and 7:30 AM and were directed to the clinic area for consultation with 1 of 2 physicians (K.R.B. or D.M.T.) involved in the same-day program. A clinical nurse assistant and registered nurse performed the initial patient assessment. An audiogram could be scheduled...
and performed on arrival, if needed, for those with chronic otitis media with effusion, based on the previsit advanced practice nurse (APN) phone assessment. The physician took the patient history, completed the examination, and made formal recommendations on placement of TTs. The physician discussed the risks, benefits, alternatives, and expectations of the procedure and obtained parental consent. The child and family were directed to the preoperative area to meet with the anesthesia team and to prepare for surgery (Figure 2). The start of the operative day was delayed by approximately 30 to 45 minutes to allow time for the clinic visits, and generally 1 to 4 patients were seen per same-day session to avoid longer delays and longer fasting times (all patients were seen in clinic between 6:45 and 8:00 AM; then, the first patient seen had surgery scheduled for 7:45 or 8:00 AM, depending on number of patients per session).

Patients
Approval for this study was obtained from the Institutional Review Board at Ann & Robert H. Lurie Children’s Hospital of Chicago (2015-390). This retrospective matched case series consisted of 30 consecutive patients who participated in the same-day surgery process in the year following its inception (March 1, 2014, to April 30, 2015). Same-day surgery patients were matched and compared with 30 similar healthy patients (per age, sex, and payer status) identified via an electronic medical record search who underwent TT placement after being scheduled for surgery following the routine office visit. Demographic data were collected, including age at time of surgery, sex, and payer status (managed care product or Medicaid).

Measures
Data points were extracted from the electronic medical records of all patients (same-day surgery and matched control). For same-day patients, time from referral to the day of surgery was calculated. For comparison patients, days from recommendation for TT to surgery were calculated. Time of checking into clinic, clinic visit time, preoperative wait time, and time in operating room, as well as time in postanesthesia care and overall time to discharge, were recorded. The duration of the overall encounter time for same-day surgery patients was calculated from time of checking into the clinic to discharge (specific time data for the 3 patients who had audiograms on their same-day visit were excluded from overall analysis to avoid inconsistency). Overall encounter time for matched comparison patients was the sum of the separate otolaryngology office visit and length of admission on the day of surgery. A preoperative history and physical are required for all surgical patients, and time required for these additional primary care visits was not factored into the overall time statistics. A survey of parental satisfaction with the same-day surgery process was completed by one of the authors (A.R.) via telephone.

Statistical Analysis
Shapiro-Wilk and Anderson-Darling tests were used to test the assumption of normal distribution ($P > .1$). Normally distributed interval data were reported as mean (SD) and analyzed with independent Student’s $t$ test. Nonnormally distributed interval and ordinal data were reported as median (range or interquartile range) and were analyzed with the Mann-Whitney $U$ test. Categorical data were presented as counts and analyzed via Fisher’s exact test. Data were analyzed with STATA 12 (College Station, Texas).

Results
During the study period, 30 patients participated in the same-day surgery program for TT placement. The median age of patients was 16 months (range, 12-22 months), and
Table 1. Patient Characteristics of Children Participating in the Same-Day Surgery Process for Tympanostomy Tube Placement versus Age, Sex, and Insurance Product Controls.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control (n = 30)</th>
<th>Same-Day Surgery (n = 30)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, n</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21</td>
<td>21</td>
<td>1.0</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Insurance, n</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>8</td>
<td>8</td>
<td>1.0</td>
</tr>
<tr>
<td>Private/managed care</td>
<td>22</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Average (range)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, mo</td>
<td>18 (14-25)</td>
<td>16 (12-22)</td>
<td>.18</td>
</tr>
<tr>
<td>Days from scheduling</td>
<td>14 (6-21)</td>
<td>7 (4-11)</td>
<td>.04</td>
</tr>
</tbody>
</table>

*Difference in days between scheduling otolaryngology office visit and surgery and difference in additional office visits with primary care physician prior to surgery between groups are shown. Significant value is in bold (P < .05).

21 (70.0%) were male. All 30 participants had been pre-screened by the otolaryngology APN and did proceed with TT placement after meeting with the otolaryngology physician. All 30 patients had a history of recurrent AOM, with an average of 5.1 bouts (range, 3-7 AOM infections) in the 6 months prior to their visit. Twenty-eight patients (93.3%) had middle ear effusion bilaterally, 1 (3.3%) unilaterally, and 1 (3.3%) had no effusion (ie, had AOM at the time of the referral 1 week prior and proceeded with surgery based on mutual decision making). Twenty-three children (76.7%) attended day care, and 8 (26.7%) had family members or relatives who had undergone TT placement. Most patients had managed care insurance carriers (n = 22, 73.3%), and the remaining had Medicaid (n = 8, 26.7%).

Nineteen (63.3%) were referred to the same-day program by the primary physician; 9 (30.0%) were contacted by the otolaryngology APN for consideration (they all had regularly scheduled appointments); and 1 each was referred by the hospital website and a sibling’s otolaryngologist. These patients were matched to similar children (ie, per age, sex, and insurance product) undergoing TT outside the same-day surgery program for further analysis (Table 1). The patients participating in the same-day surgery program were scheduled for the same-day visit, on average, 7 days (range, 4-11 days) after the initial phone call, as compared with 14 days (range, 6-21 days) between the office visit and surgery for the non-same-day patients (P = .04; Table 1).

An analysis of the overall component times spent in the clinic and operating room was conducted between the same-day surgery patients and the comparisons (Table 2). The same-day patients spent, on average, 15 minutes in the clinic visit, compared with an average of 51.5 minutes for the non-same-day group (P < .001), which included time for nursing check-in, time with the physician, time spent with the nurse and/or surgery scheduler for preoperative education, and general waiting time to be seen. The total operative experience times for both groups was similar (P = .35). When the total clinical and operative experience times for both groups were added, the same-day group had significantly less wait time for the overall experience (average, 151 minutes for same-day vs 196 minutes for comparisons, P ≤ .001; Table 2). Three same-day patients (10.0%) had an audiogram performed on the day of the visit during our initial feasibility trial. This added 30 ± 15 minutes to the total time, similar to a routine office visit.

Of the 23 (76.7%) respondents to the parent satisfaction survey, all were either very satisfied (n = 20) or satisfied (n = 3) with the same-day surgery process. Cited disadvantages included uncertainty about the duration of the overall experience (n = 1), the long time spent in the recovery room and overall length of the process (n = 2), and concern about being intimidated by the process if other child had not already had TT placement (n = 1). The survey questions, possible responses, and results are shown in Table 3.

Discussion

The same-day surgery program for TT placement was conceived as a means to improve access and efficiency of care for all patients suffering from otitis media who presented to otolaryngology physicians of the Ann & Robert H. Lurie Children’s Hospital of Chicago—regardless of payer status. The hospital serves a large diverse urban community, surrounding suburbs, western Indiana, and southern Wisconsin, where access to pediatric otolaryngology care may be limited. The goal of the pilot program was to develop a streamlined process whereby a child diagnosed with AOM or otitis media with effusion who meets clinical practice guideline1,7 criteria for consideration for TT placement could be seen in the clinic on the same day as the operative encounter. A process such as this, where long waits for clinic visits are avoided, might lessen the time that a child has to suffer from the ill effects of each episode and from hearing impairment, and it might improve the functional health status and quality of life of patients and families affected by otitis media.8,9

The same-day program runs twice a month at the Ann & Robert H. Lurie Children’s Hospital of Chicago and twice a month (opposite weeks) at a satellite surgery center in the suburbs of western Chicago. No child who meets criteria for TT placement would have to wait >2 weeks to be seen by an otolaryngology physician with the same-day program. Once the patient and family arrive for the same-day visit, there is little to no waiting time for the clinic visit and subsequent operative intervention. Our results show a significantly reduced wait time (P = .04) between scheduling the same-day visit for clinic visit/surgery and the average 2-week wait for surgery after a routine clinic visit (although variability in choosing surgery dates due to parental/patient factors are difficult to measure). This is not to say that our current practices are bad or dissatisfying but rather to test a method of streamlined patient care.
Table 2. A Comparison of Time Spent in the Clinical and Operative Portions of the Tympanostomy Tube Placement Experience between the Same-Day Patients and the Control Group.\(^a\)

<table>
<thead>
<tr>
<th>Time Variable(^b)</th>
<th>Control (n = 30)</th>
<th>Same-Day Surgery (n = 30)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinic waiting time</td>
<td>10.5 (5-15)</td>
<td>9.5 (8-15)</td>
<td>.86</td>
</tr>
<tr>
<td>Clinic visit duration(^c)</td>
<td>51.5 (32-61)</td>
<td>15 (12-31)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Admit to preoperative time</td>
<td>5 (3-10)</td>
<td>4 (2-7)</td>
<td>.35</td>
</tr>
<tr>
<td>Preoperative wait time</td>
<td>10.5 (5-15)</td>
<td>9.5 (8-15)</td>
<td>.86</td>
</tr>
<tr>
<td>Intraoperative time</td>
<td>13.5 (11-16)</td>
<td>11.5 (10-14)</td>
<td>.10</td>
</tr>
<tr>
<td>Phase 1 recovery time</td>
<td>19 (18-24)</td>
<td>21.5 (17-28)</td>
<td>.16</td>
</tr>
<tr>
<td>Phase 2 recovery time(^d)</td>
<td>32.5 (23-42)</td>
<td>42 (37-51)</td>
<td>.004</td>
</tr>
<tr>
<td>Admit-discharge time day of surgery</td>
<td>137 (114-158)</td>
<td>145 (135-169)</td>
<td>.35</td>
</tr>
<tr>
<td>Total clinic visit and surgical encounter time</td>
<td>196 (169-234)</td>
<td>151 (135-169)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

\(^a\)Same-day patients had shorter clinic visits and shorter overall experience (clinic visit and surgery time), although a longer recovery room time was noted. Significant findings shown in bold (\(P < .05\)).

\(^b\)Time shown in minutes: average (range).

\(^c\)Represents time in the examination room, including check-in with the nurse, education time, and general wait time. This was streamlined for the same-day patients to avoid delays and facilitate efficiency.

\(^d\)The same-day group included 2 sibling pairs, although the overall outcome was similar when this was factored into the statistics.

All patients selected for the same-day process did go on to surgical intervention. This likely related to our vigorous prescreening process, careful selection by our referring providers, and motivation and understanding of TT placement by these particular families (8 patients, or 26.7%, had family members or other children who had TT placement). One child did not have middle ear effusion on the same-day date, although this patient did have AOM at the time of the referral; however, through shared decision making with the otolaryngologist and clinical judgment, the family opted to proceed despite the deviation from the guidelines. Any child who is not a clear candidate for TT placement based on the guidelines, who may need an observation period before deciding about TT placement, or whose family is not comfortable with the pace of the same-day process would benefit most from a regular otolaryngology clinic visit. In the event that a child did not meet criteria for TT placement on the same-day visit or the family chose not to proceed with the surgery, we were prepared to cancel the procedure, understanding that this would affect operating room utilization, the revenue stream from the procedure, and, potentially, parents’ satisfaction with the process. Future considerations to avoid decreased utilization of operating room time and to build the program include adding otolaryngology physicians to the program, utilizing the current satellite facilities more regularly for same-day service, and extending the program to future growth sites.

All parental survey respondents of children undergoing TT placement through the same-day surgery process were either very satisfied or satisfied with the clinical and operative experience. All parents were very satisfied or satisfied with the overall efficiency of the process, although a couple parents commented on it being a long morning and a long time spent in the recovery room. All families stated that they would recommend the process to a friend (Table 3). Because all involved in the same-day process were motivated to ensure success of the efficiency model and because patients were likely motivated to participate in the success of this model, bias may have been created in the responses generated. Although the non-same-day patients were not surveyed, it was not felt that they would have had a poor experience with the traditional route of care; rather, the goal was to identify weaknesses or concerns with the new program.

Boss and Thompson\(^10\) found that outpatient otolaryngology experience scores were lower for children for the domains of access, visit, nursing issues, and assessment but equal to adults for caregiver experience. The goal of the same-day surgery program is to see all patients who meet the criteria for TT placement in a timely manner, regardless of their payer status, thereby mitigating any health care disparity. The clinic encounter is focused and specifically dedicated to the same-day patients. This allows for no waiting and a better ability to streamline the patient care experience without sacrificing the quality of the time spent with the physician. Children and families would miss less school and work with just the single visit. The potential need for fewer primary care visits, antibiotics, and overall sick days with the streamlined process could result in cost savings to the health care system and the family. Based on our experience with the same-day program thus far, the process seems best suited for those children with frequent bouts of AOM that necessitate frequent trips to a primary care physician, antibiotics, sick days, and impacts on quality of life, rather than those with otitis media with effusion, who might require longer observation periods and hearing assessments prior to TT placement.

Limitations to the same-day program include a need to restrict the number of patients seen per session to avoid significant delays in starting the operating day and lengthy fasting times. Limiting the number of patients to 4 per session seemed to work best, as this allowed for only a half hour delay in starting the operative day (from 7:30 to 7:45-
8:00 AM depending on the number of patients being seen). Consideration was given to having the APN or an otolaryngologist see the patient first for the clinic visit and then having another otolaryngologist perform the operative procedure. This practice was not adopted due to concern that the families would be most comfortable building a doctor-patient relationship with a single physician and to avoid having the operative otolaryngologist act as only a technician in the patient care experience. Because this was a new process and all participants in the development of the same-day process were motivated to make the morning as efficient as possible, bias may have been created in the overall duration of the visit relative to the traditional referral route. Transitioning such a program to other surgical procedures could pose a variety of challenges, but looking for an efficient, potentially cost-saving means of providing patient care warrants further investigation.

**Conclusions**

The same-day surgery process for the management and treatment of children who meet the criteria for TT placement is a model of improved efficiency of care for children who suffer from otitis media. The process of starting such a program requires the support of many factions throughout a hospital system but, once instituted, provides an efficient health care model.

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Author Contributions
Kathleen R. Billings, concept and design, data acquisition and interpretation, drafting the manuscript, final approval, accountable for work; John Hajduk, analysis and acquisition of data, critical revision, final approval, accountable for work; Allison Rose, design of manuscript, critical revision, final approval, accountable for work; Gildasio S. De Oliveira Jr, analysis and interpretation of data, critical revision, final approval, accountable for the work; Dana M. Thompson, concept of work, drafting and critical revision of work, final approval, accountable for work.

Disclosures
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