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## Abstract

The “Clinical Practice Guideline: Tympanostomy Tubes in Children” published in 2013 by the American Academy of Otolaryngology—Head and Neck Surgery Foundation encourages that an “educational video, or other teaching aid, should be developed to illustrate how parents/caregivers” may manage postoperative complications such as tube otorrhea; however, the current literature is devoid of such patient safety and quality improvement measures. Our objective was to develop an effective educational model to assist parents and caregivers in understanding the signs and symptoms of tympanostomy tube (TT) otorrhea and how to independently institute the appropriate otologic treatment. A 3.5 × 2-inch instructional card was designed to illustrate TT otorrhea and describe the subsequent steps necessary to obtain and institute the appropriate medical therapy. This was distributed to caregivers of all patients undergoing TT placement in September 2016; patients undergoing TT placement in May 2016 served as the preintervention control cohort. Group comparisons were made before and after implementation of the educational model by number of telephone calls our clinic triaged regarding untreated TT otorrhea, as documented within the electronic medical record. A total of 30 sets of TT were placed in September 2016, compared to 27 sets of TT in May 2016. Postoperatively, a run chart revealed a significant shift (ie, 7 consecutive points) in the number of telephone calls received (16–5 calls) after establishment of the proposed educational model. This clinical experience demonstrates the utility of patient-driven management of TT otorrhea through ancillary educational material. Given the superiority of topical otic therapy, continued translation efforts are needed for continued focus on practice implementation and dissemination.

## Keywords

tympanostomy tube, tube otorrhea, patient safety and quality improvement, topical otic therapy

## Introduction

Tympanostomy tube (TT) insertion is currently the most common pediatric procedure performed in the United States, with over 670 000 children undergoing TT placement annually.<sup>1,2</sup> It has been shown to significantly curtail the incidence of recurrent acute otitis media and improve functional hearing,<sup>3</sup> and improve disease-specific quality of life for children with chronic otitis media.<sup>4</sup>

Complications of TT include premature TT extrusion, granulation tissue formation, persistent tympanic membrane perforation after TT extrusion, and TT otorrhea. The latter is by far the most common postoperative sequelae, occurring in 16% of children within 1 month of the procedure.<sup>5</sup> Prior randomized controlled trials comparing topical and oral/systemic antibiotic therapy have demonstrated equivalent, if not superior, outcomes with topical otic drops compared to oral antibiotic therapy with regard to bacterial eradication and symptom resolution.<sup>6–8</sup> Hence, the objective of this study was to develop an effective, simple, and sustainable educational model to assist parents in understanding the signs and symptoms of TT

otorrhea and how to independently institute the appropriate topical otic therapy.

## Patients and Methods

A prospective review was initiated, in which a 3.5 × 2-inch instructional card was designed to illustrate TT otorrhea and describe the subsequent steps necessary to obtain and institute

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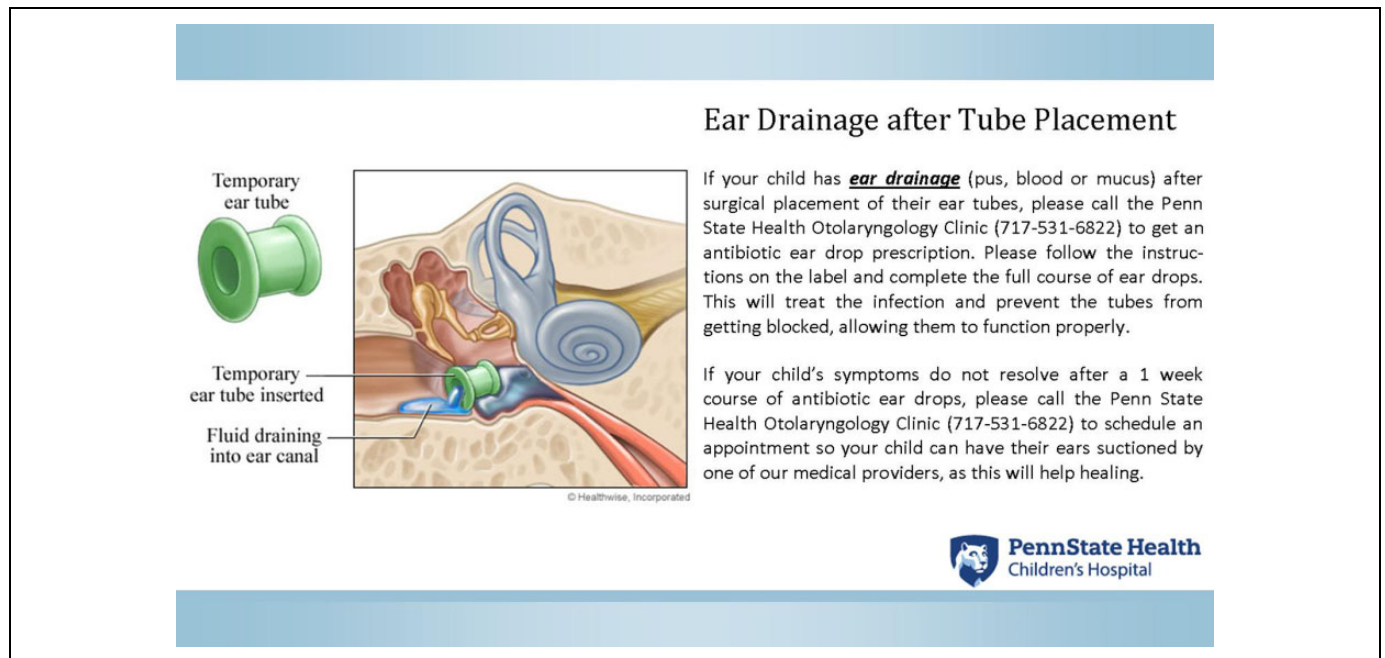
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**Figure 1.** A tympanostomy tube (TT) informational card (3.5 × 2-inch) designed to illustrate TT otorrhea and describe the subsequent steps necessary to obtain and institute the appropriate topical medical therapy.

the appropriate topical medical therapy (Figure 1). This was distributed to caregivers/parents of all patients undergoing TT placement in September 2016 by the first and senior authors. Patients undergoing TT placement in May 2016 were used as the preintervention control cohort. Data on the experimental (postintervention) group were gathered prospectively but compared to retrospective (preintervention) controls. Group comparisons were made before and after implementation of the educational model by the number of telephone calls our clinic nurses and residents triaged regarding untreated TT otorrhea, as documented in the electronic medical record during postoperative follow-up in the outpatient setting. Exclusion criteria include patients older than the age of 18 and patients with incomplete electronic medical records. Given the quality improvement nature of this initiative, it was reviewed by the institutional review board of Penn State Hershey Medical Center and deemed exempt. Standards for reporting quality improvement initiatives have been developed and published by the SQUIRE Development Group and were applied when appropriate in this particular activity.<sup>9</sup>

## Results

A total of 57 patients were included: 27 versus 30 patient underwent TT placement in May 2016 and September 2016, respectively. All TT placements were performed by the senior author, a fellowship-trained pediatric otolaryngologist. Sixteen (59.3%) patients in the preintervention group placed a phone call regarding TT otorrhea in contrast to 5 (16.7%) patients in the postintervention group. A run chart revealed a significant shift in the number of telephone calls received

## Ear Drainage after Tube Placement

If your child has **ear drainage** (pus, blood or mucus) after surgical placement of their ear tubes, please call the Penn State Health Otolaryngology Clinic (717-531-6822) to get an antibiotic ear drop prescription. Please follow the instructions on the label and complete the full course of ear drops. This will treat the infection and prevent the tubes from getting blocked, allowing them to function properly.

If your child's symptoms do not resolve after a 1 week course of antibiotic ear drops, please call the Penn State Health Otolaryngology Clinic (717-531-6822) to schedule an appointment so your child can have their ears suctioned by one of our medical providers, as this will help healing.

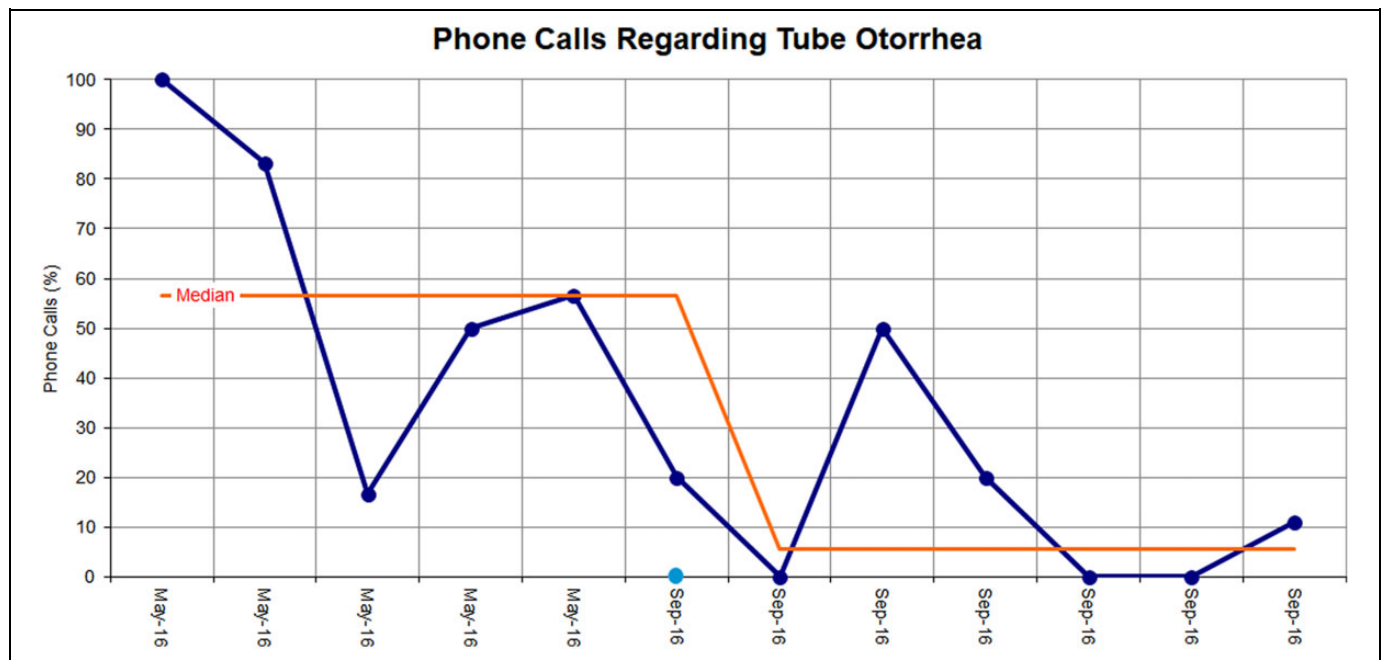


(ie, 16-5 calls) after establishment of the proposed educational model (Figure 2).

## Discussion

Tympanostomy tube otorrhea is the most frequently observed surgical complication of TT placement, with a mean incidence of 26% in observational studies and up to 83% with prospective surveillance.<sup>10,11</sup> The literature is monolithic in championing the use of topical otic therapy as the primary treatment modality for TT otorrhea<sup>8</sup> due to the higher concentration of antibiotic achieved in the middle ear space via the topical route.<sup>12</sup>

Despite resounding evidence validating the use of topical otic drops over systemic oral therapy, a recent study revealed that 54% of surveyed emergency medicine physicians used oral antibiotics to treat TT otorrhea, compared to 9% of surveyed otolaryngologists, a statistically significant difference.<sup>13</sup> This is concerning as a sizeable percentage of postoperative patients will present to the emergency department for treatment of TT otorrhea. Education and reinforcement for the parent/caregiver are imperative in this particular setting. Although the Clinical Practice Guideline: Tympanostomy Tubes in Children published in 2013 encourages that an “educational video, or other teaching aid, should be developed to illustrate how parents/caregivers” may manage postoperative complications such as tube otorrhea, the literature is devoid of such patient safety and quality improvement measures.<sup>1</sup> Our study sought to fill this gap and attempt to provide recommendations on effective as well as successful measures implemented in our daily otolaryngology practice. In this work, a simple, yet effective educational card was employed to educate parents/caregivers on the



**Figure 2.** A tympanostomy tube (TT) otorrhea run chart demonstrating a significant shift (ie, 7 consecutive points) in number of telephone calls (16 vs 5 calls) after the establishment of the proposed educational model.

management of TT otorrhea should they encounter this postoperative finding. Using the number of postoperative phone calls received regarding TT otorrhea as our primary end point, a run analysis revealed a substantial drop in phone calls in the postintervention cohort, reflecting a significant improvement in the understanding of TT otorrhea and its subsequent management.

There are several important implications for the implementation of this quality improvement measure. First, it empowers parents/caregivers with the knowledge to treat a complication and take an active role in their child's care. Second, there is a greater level of communication between caregiver and physician, adding solidarity to the physician–patient relationship. Third, educating caregivers/parents may, in turn, prevent unnecessary visits to the emergency department, which would also eliminate unnecessary financial burdens on both patient families and hospital systems alike.

There are several limitations to this study. Firstly, the limited sample size reduces its overall power and generalizability. Nevertheless, it is important to note that this is a pilot study and that further research of larger sample sizes and longer duration is warranted. Secondly, the present study is primarily focused on an outpatient setting, and thus, emergency department visit data, reflecting an acute care setting, are not included. The strength of this study lies in its demonstration of the effectiveness of caregiver education to promote patient-driven management of surgical complications/sequelae.

Utilizing a simple instructional card to educate caregivers/parents on the management of TT otorrhea demonstrates the notable effectiveness of patient-driven management of TT otorrhea. Given the known superiority of topical otic therapy, sustained knowledge translational efforts are needed for a

continued focus on patient education implementation and information dissemination.

#### Authors' Note

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#### Declaration of Conflicting Interests

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