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Assessing Provider Confidence of Acute Otitis Media Diagnosis and Treatment with an Optical Coherence Tomography Device in the Urgent Care Setting

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Introduction of the Problem

Acute otitis media (AOM) remains one of the most common causes of infection in pediatric patients worldwide (Tong et al., 2018). Every year, over 350 million visits are attributed to AOM in children aged 5 and under (Tong et al., 2018). Traditionally, diagnosis of AOM is made with the use of an otoscope to visualize the tympanic membrane evaluating for middle ear fluid and inflammation (Prasad et al, 2020). Middle ear fluid without inflammation or additional constitutional symptoms is considered otitis media with effusion (OME) or middle ear effusion (MEE) (Preciado et al, 2020). One challenge with diagnosing AOM versus OME in pediatric patients is that approximately 75% of the tympanic membrane must be visualized with the otoscope in order to make the diagnosis (Damery, 2018). Other challenges include poor visualization, inaccurate positioning of device, cerumen impaction, otorrhea, narrow outer ear canal, tympanic membrane orientation, and irritability of the child (Damery, 2018).

An overwhelming amount of antibiotics are prescribed for pediatric patients with AOM and inappropriately for OME. Current guidelines from the American Academy of Pediatrics (AAP) suggest watchful waiting, which yields 57% fewer filled prescriptions (Brinker, MacGeorge, & Hackman, 2018). However, over 75% of patients continue to receive antibiotic therapy (Islam & Hassinger, 2018). Similar trends in antibiotic prescribing existed across OSF HealthCare, prompting the system to tackle this issue as an initiative during Fiscal Year (FY) 2021. One approved avenue was to evaluate innovative devices that could positively impact the care delivered to patients complaining of ear pain.

Literature Review

According to a study conducted by Brinker, MacGeorge, & Hackman (2018), 50% of patient's [complaining of ear pain] physical exam findings did not support the diagnosis of AOM. Approximately half of the antibiotics prescribed in the outpatient urgent care setting are unnecessary, with about 74% of those being prescribed to children with a diagnosis of OME (Burns et al, 2019). Antibiotic therapy was prescribed in 82.5% of patients diagnosed with AOM in the first visit, where the watch and wait method was only utilized in 17.5% of visits (Barbieri et al, 2019).

Provider confidence in identification of an infected tympanic membrane varies greatly. Correct diagnosis can range from 48.6 to 100%, with some of the top trained ear physicians' accuracy being around 72% (Moberly et. al, 2018). Utilization of new technologies such as optical coherence technology (OCT) can potentially enhance the provider's confidence as well as accuracy of differentiating OME from Acute Otitis Media. Preciado et. al found an accuracy of 90.6% when diagnosing OME with OCT (2020). MacGeorge et. al found that parents remembered providers who educated them on the likely cause of the ear infection, monitoring, and pain management (2017).

Project Methods

Implementation of this quality improvement project occurred at two OSF OnCall Urgent Care clinics specifically selected by executive leadership due to their location and higher volumes when compared to the other clinics, including pediatric patients. The urgent care clinics are open from 8 am to 8 pm daily and provide care to patients of all ages by appointment or walk-in. The population of focus for the project was patients 0-17 years of age with a chief complaint of otalgia. The intervention included implementation of the TOMi Scope, an optical

coherence tomography (OCT) device by PhotoniCare Inc, into the urgent care setting with the goals to increase provider confidence in both AOM and OME diagnoses, improve parent or patient satisfaction, and decrease unnecessary antibiotic prescribing to patients with complaints of otalgia. IRB approval for this project was granted on March 11, 2021. Implementation occurred from March 18, 2021 to September 17, 2021. The week prior to the go live date, on site device training was completed by project members and PhotoniCare Inc representatives. On-site support was provided by the team members on day one and incrementally throughout the six month project.

Evaluation

Measurement Tools

Every 30 days, the TOMi Scope trained providers at the two OSF OnCall Urgent Care clinics were to complete a brief 1-2 minute survey utilizing the platform *Qualtrics*. The survey link was sent to their employee email and a response was requested within one week. The survey included five to seven questions that required responses utilizing a four-point Likert scale. In addition to the provider survey, project members collected aggregate data from both Urgent Care clinics then filtered by patients aged 0-17 evaluated with a chief complaint of ear pain, final diagnosis, and medication prescribed (if any). The aggregate data and survey outcomes were reviewed, evaluated, and reported out to project stakeholders each month.

Outcomes

Outcomes were evaluated and reported based on the three main objectives of the project: increase provider confidence in both AOM and OME diagnoses, provide patient/parent

satisfaction, and decrease unnecessary antibiotic prescribing to patients with complaints of otalgia. Survey responses were calculated based on the four-point Likert scale.

Provider Confidence

Prior to implementation, providers were asked to assess their confidence with diagnosis of AOM and OME with use of a traditional otoscope. Subsequently, providers were asked to assess their confidence in diagnosing AOM and OME with the TOMi Scope every 30 days throughout implementation. Average initial confidence scores with a traditional otoscope resulted as 3.6 for AOM and 3.6 for OME, compared to a six month average confidence score with the TOMi Scope of 2.86 and 3.19 for AOM and OME respectively. Two common themes in provider comments included: the device was time consuming and the device was great for teaching.

Patient/Parent Satisfaction

At the end of every 30 days, the providers were surveyed on patient/parent satisfaction after use of the TOMi scope device. An overall average score of 3.28 was recorded. Open ended feedback was also reported by the providers based on comments made by the patient/parent. Two main themes were noted: patients and parents enjoyed seeing images of the ear and patients reported discomfort with use of the device.

Antibiotic Prescribing

Aggregate data collected from March 2020 to September 2020 resulted in 404 patients aged 0-17 who were evaluated at one of the two defined OSF OnCall Urgent Care clinics for a complaint of ear pain. Out of the 404 patients, 253 patients received an oral antibiotic (62.6%

prescription rate). Comparatively from March 2021 to September 2021, 884 patients aged 0-17 were evaluated for ear pain at the same OSF OnCall Urgent Care clinics, with a total of 398 patients who received oral antibiotics (45% prescription rate). Overall, prescription rates improved by 17.6%, with the highest improvement noted during March and April 2021. Upon further evaluation of the monthly data (table 1), months June to September saw two to four times the amount of ear complaints in 2021 than 2020, which resulted in a higher monthly prescription rate.

Limitations

After the first 60 days of evaluation, several limitations were noted by the project members. First, two of the seven providers trained on the TOMi device were out on extended medical leave, creating a gap in utilization between both clinic sites. In order to increase utilization, TOMi Scope device training was given to eight additional providers who were temporarily covering these clinics. A second limitation identified was a low average provider response rate (40%) during the first 90 days. The project members discovered that providers were not checking their email within the one week deadline; therefore, the survey was then distributed by both email and text message, which increased the average response rate to 64% in the final 90 days. The third, and largest limitation, was the impact device use had on provider workflow. In the Urgent Care clinics, an overall door to door goal time is forty minutes. Device utilization adds an additional ten minutes to the visit including time to get the device, proper use, uploading data, and patient/parent education. Unfortunately, this limitation deterred providers from utilizing the device on a routine basis. Lastly, implementation occurred as the healthcare climate was shifting with the COVID-19 pandemic. During the Summer of 2020, unusually low patient visits were seen in the urgent care clinics. Conversely, during the summer of 2021, an

influx in pediatric upper respiratory infections were seen in the OSF OnCall Urgent Care sites due to the late influenza and respiratory syncytial virus season, likely resulting in higher ear complaints.

Impact on Practice

A 17.6% improvement in antibiotic prescriptions for patients aged 0-17 with ear complaints was noted during the implementation of the TOMi scope device. Even though this did not cause an immediate impact on the healthcare organization, an immediate impact was seen in clinical practice, particularly in the first three months of implementation when the highest scores in provider confidence and patient/parent satisfaction were reported. The last three months showing lower scores, (table 2) likely are reflected by the increase in patient volumes. The predicted long-term impact could be improved monitoring of antimicrobial stewardship. Longer implementation time periods with simulation training of the TOMi Scope device could increase provider confidence, which could decrease patient discomfort and increase accurate diagnosis.

Conclusion

The implementation of OCT in urgent care clinics was proven to have success in reducing antibiotic prescription rates in patients aged 0-17 with ear complaints. Provider and patient satisfaction remained higher in months with lower patient census, where time was less of a barrier to use of the TOMi scope device. Due to the time constraints of urgent care, the device may have higher success rates in primary care and pediatric clinics. Another recommendation would be to trial various OCT devices that could connect to the providers' smartphones and reduce timeliness of device use.

Table 1

Monthly Prescription Rate		
	2020	2021
March	64.29	38.37
April	66.67	37.93
May	25.81	30.34
June	29.27	35.90
July	41.82	44.98
August	38.64	47.48
September	34.78	51.69

Table 2

	Confidence with AOM	Confidence with OME	Patient or Parent Satisfaction
30 days	3	3	3
60 days	4	4	4
90 days	4	4	4
120 days	2.14	2.14	2.67
150 days	2	3	3
180 days	2	3	3

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