Algorithm-Based Pediatric Otolaryngology Management During the COVID-19 Global Pandemic: A Children’s Hospital of Philadelphia Clinical Consensus

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Keywords: COVID-19, coronavirus, pediatric otolaryngology, consensus
Abstract

Objective: The coronavirus disease 2019 (COVID-19) pandemic requires clinicians to explore alternatives to routine patient management. Otolaryngologists caring for children commonly depend on physical examination, laboratory data, and ambulatory surgical procedures. Limiting patient care, mindful allocation of resources, and concern for safety have challenged all aspects of our healthcare system. This evidence-based clinical consensus is designed to guide practitioners of pediatric otolaryngology for common scenarios during this time.

Data Sources: Peer-reviewed literature, published reports, institutional guidelines, and expert consensus.

Review Methods: A clinical consensus on six common clinical scenarios in pediatric otolaryngology developed with evidence-based strategies.

Conclusions: Providers should suspend all in-person non-essential office visits and elective surgical procedures. An emphasis on medical management and caregiver education will provide reasonable approaches to many of the common outpatient concerns. Surgery for chronic otitis media, obstructive sleep apnea, and acute rhinosinusitis should occur only in response to severe complications or failure of medical regimens. The approach to the pediatric neck mass focuses on timely management for oncologic etiologies and cautious surgical intervention for abscess drainage or tissue sampling. Finally, epistaxis and otorrhea must be triaged and addressed without the usual ambulatory procedures.

Implications for Practice: Adaptation of practice patterns during this unprecedented moment for our healthcare system requires thoughtful planning. The strategies described allow for safe handling of common pediatric otolaryngology diagnoses. Ultimately, otolaryngologists must be stewards of our global health community while advocating for the care of individual pediatric patients.
Introduction

On March 11, 2020, the World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19) a global pandemic. Within seven days, The Centers for Medicare and Medicaid Services (CMS) recommended deferring non-emergent, elective and preventive medical services for patients of all ages. In order to preserve equipment, ensure safety, and expand capacity, the Centers for Disease Control and Prevention (CDC) has subsequently asked healthcare facilities and clinicians to delay all elective ambulatory provider visits, reschedule elective and non-urgent admissions, and delay inpatient and outpatient elective surgical procedures. The result has been a rapid evolution in practice management, an adjustment of clinical protocols and a growing role for telemedicine.

Otolaryngologists caring for pediatric patients must adapt to these changes and reconsider many routine management strategies. Determining which surgical procedures are elective depends on many unique patient factors. An elective surgery, typically non-emergent and scheduled in advance, should be considered on an assessment of all available medical and logistical information. As a result, organizations such as the American College of Surgeons have worked toward clarifying urgency for specific interventions. Among the nearly 1.5 million ambulatory otolaryngology procedures performed on children each year, an interface with the upper respiratory tract mucosa occurs with obvious regularity. The high viral load of COVID-19 identified in the nasopharyngeal mucosa raises particular concern for airway secretion exposure.

The objective of this clinical consensus was to disseminate specific management considerations for common scenarios in pediatric otolaryngology. An evidence-based opinion among pediatric otolaryngologists at Children’s Hospital of Philadelphia (CHOP) provides an algorithmic approach for clinicians across all practice settings. Limited patient contact will influence screening, diagnostics, and management during the COVID-19 global pandemic. Strategies for practitioners emphasize safety and resource conservation while concomitantly providing exceptional care for children.

Methods

A group of six pediatric otolaryngologists and one pediatric otolaryngology nurse practitioner developed a clinical consensus on six common clinical scenarios in pediatric
otolaryngology. The group represented expertise across the subspecialties of pediatric otology, sleep medicine, airway, head and neck, and rhinology. Peer-reviewed literature, published reports, and institutional guidelines supplemented the approaches outlined. Algorithms were created to allow for streamlined visualization.

Discussion

Otitis Media

Otitis media (OM) rarely requires urgent surgical intervention. Guidelines published by the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF) recommend that clinicians offer tympanostomy tubes in the following situations: chronic bilateral otitis media with effusion (COME) with hearing difficulty, COME with associated symptoms, recurrent acute otitis media (RAOM) with middle ear fluid at time of consultation, or at risk children with RAOM or OME on shared decision with the child’s caregiver. Until it is reasonable to consider elective tympanostomy tube surgery, otolaryngologists must triage by otologic severity. As shown in Figure 1, urgent tympanostomy tube placement should be reserved for clinical scenarios where the patient is particularly vulnerable to ongoing middle effusions and their sequelae. This includes immunocompromised children, those with exacerbating comorbidities, acute mastoiditis, facial nerve palsy, or intracranial complications.

Clinicians and caregivers can identify potential modifiable risk factors for OM. Practicing good hand hygiene, avoiding second-hand smoke exposure, mitigating allergic symptoms, limiting pacifier use, improving gastroesophageal reflux (GERD), reducing daycare visits (albeit less common during this pandemic), and maintaining timely vaccination schedules should be underscored. Additionally, non-ventilated or under-ventilated bottles used for feeding can generate negative pressure in the middle ear and supine feeding position may allow aspiration of milk into the middle ear leading to abnormal tympanometry. Certainly, these strategies are not curative, but can offer actionable plans in anticipation of addressing OM surgically.

There is some evidence that prophylactic antibiotics may be a reasonable alternative to surgery. For example, amoxicillin (20-40 mg/kg/daily) for up to 6 weeks has been described. The higher dose should be reserved for locations with a high prevalence of penicillin-resistant Streptococcus pneumonia, sulfamethoxazole (50 mg/kg daily) may be offered if penicillin
Physicians must remind families of the risks of prolonged antibiotic use in children. Prophylaxis may be of particular benefit in specific scenarios, such as following a course of intramuscular ceftriaxone in children who initially fail oral antibiotics, infections causing tympanic membrane perforation, or patients without contributing modifiable risk factors.

Children may have hearing loss with COME. Otitis media with middle ear effusion produces average air conduction thresholds of 27 dB HL at 500, 1,000, and 4,000 Hz in children. Particularly as speech and language development occurs, parents should be offered techniques to help with learning during this time. It is important to emphasize to the parent that they should expose their child to as many words as possible while engaging the child to look at the caregiver’s face. Parents can face the child with a book when reading so that the child can look at both the words in the book and caregivers’ lips while reading. Frequently talking with the child can be strategies to ensure that children are progressing during speech milestones even when mild hearing loss may be temporarily present. If the family has significant speech concerns, we also recommend referring the child for speech therapy, which can be done through telemedicine in certain locations.

**Sleep Disordered Breathing**

The approach to children with sleep disturbances outlined in Figure 2 focuses initially on stratification. If a polysomnogram (PSG) has been obtained, then this assessment commences without uncertainty. Unfortunately, the ability to obtain a PSG will be challenging during this time and highlights the need for a precise history. Despite poor correlation with obstructive sleep apnea (OSA) severity, the OSA-18 survey does allow clinicians to obtain some quantitative information based on a scoring scale. The OSA-18 survey is a disease-specific quality of life survey, which helps quantify symptoms and impact of SDB, but does not replace PSG for diagnosis of OSA. It is tremendously important to ask about growth, history of failure to thrive, somnolence, mouth breathing, apneic episodes, and obesity. Despite a low OSA-18 score, if the provider has a high suspicion for severe OSA, it is judicious to place a sleep medicine consult.

Several nonsurgical options may be considered for management of severe OSA. Modifying risk factors such as weight, avoidance of smoke exposure, control of GERD that includes dietary modifications (avoid eating 1.5-2 hours before bedtime, lower acidic intake in
the diet, and alkaline water at night) and proper management of asthma or allergies may have a role. There have been some anecdotal reports and limited data evaluating the efficacy of oral steroids or antibiotics for decreasing tonsil and adenoid hypertrophy with using oral steroids or antibiotics\textsuperscript{26}. When considering the addition of oral steroids, it is important to weigh the benefits given patient comorbidities and potential COVID-19 status.

Coordination with local or institutional sleep medicine specialists to create streamlined, safe protocols customized for management of OSA during this unique time is advised. Standard algorithms for proceeding to use of continuous positive airway pressure (CPAP) should be modified while surgical options are limited. If the child cannot tolerate CPAP, then the treatment group (consisting of at least the sleep medicine physician and otolaryngologists) must determine whether or not the child’s symptoms are considered life-threatening. If so, then surgery with proper precautions and preoperative viral testing should occur. At our facility, we recommend obtaining outpatient COVID-testing 1-2 days preoperatively while practicing home-isolation and physical distancing. Surgical options include adenoidectomy, tonsillectomy, adenotonsillectomy, and/or supraglottoplasty\textsuperscript{27,28}. That being said, we highly recommend to avoid any tonsil or adenoid surgery during the COVID-19 pandemic.

Children considered to have mild or moderate OSA should also be counseled regarding the modifiable risk factors mentioned above. Intranasal corticosteroids\textsuperscript{27,29}, such as fluticasone propionate with or without montelukast\textsuperscript{30-32} are medical approaches that have been described to manage mild OSA in prior studies. At this time, we will also extrapolate using these medications for treatment of moderate OSA. It is important to counsel families regarding the side effects of both medications, especially the aggressive behavior and nightmares reported with montelukast use\textsuperscript{33}.

**Sinusitis**

There are four sinusitis management algorithms (Figure 3): uncomplicated acute rhinosinusitis (ARS), ARS with orbital involvement, ARS with intracranial complications, and chronic sinusitis with acute exacerbation. During COVID-19, providers should contemplate counseling families regarding risk factor modification, such as avoiding second-hand smoke exposure, effective management of environmental allergies, and controlling asthma.
Uncomplicated ARS

The approach to ARS in children begins with an accurate diagnosis. Severe, worsening or persistent upper respiratory tract symptoms of greater than 10 days with no improvement, worsening or new nasal discharge, daytime cough, fever after initial improvement, or severe fever (at least 102.2°F (39°C)) with purulent nasal discharge for at least 3 days point toward ARS. If the child does not meet criteria for ARS, they should be referred to their pediatrician for work up and management of a viral upper respiratory tract infection.

Children with severe, worsening or persistent ARS should start antibiotics. Antibiotic regimens start with amoxicillin or amoxicillin-clavulanate. Intravenous (IV) or intramuscular (IM) ceftriaxone (50 mg/kg) would be warranted if the child is vomiting, cannot take anything by mouth, or not likely to take prescribed medication. If an amoxicillin allergy is known, then providers should offer cefdinir, cefuroxime, or cefpodoxime. Providers should treat patients until they are symptom-free for at least 7 days. It is important to be aware that some symptoms of ARS overlap with those of COVID-19. History should be aimed at identifying risk factors for exposure to SARS-CoV2 and at identifying specific signs and symptoms, such as cough, fever, fatigue, dyspnea, and acute anosmia. Direct patients to seek further evaluation and care for these concerning features with their primary physician.

ARS with orbital involvement

In cases where there is concern for orbital involvement, one should assess for signs of post-septal involvement, such as proptosis, ophthalmoplegia, visual complaint, or chemosis. Cases of pre-septal cellulitis without signs of significant illness can be managed medically with antibiotics, as listed in the Children’s Hospital of Philadelphia clinical pathway (Table 1).

Adjuvant medical treatments can be offered, however, there is limited data regarding their efficacy. Oral steroids, topical nasal steroids and oxymetazoline can be considered. In children who are known or deemed at risk for COVID-19, or in all hospitalized patients, we recommend against using nasal sprays and or irrigations due to risk of aerosolization of potentially infectious nasal secretions. Efforts should be made to maintain care on an outpatient basis with very close follow up as long as is safe. Telemedicine with video link can be utilized to ensure recovery.
Those with signs of post-septal involvement or pre-septal cellulitis with significant illness should undergo a fine-cut contrast-enhanced sinus computed tomography (CT) scan (consider scans compatible with image-guidance, if available). In the case where a subperiosteal (SPOA) or orbital abscess is identified and in the absence of a cavernous sinus thrombosis, ophthalmology should evaluate the need for operative intervention. In the case where cavernous sinus thrombosis is identified, the child should undergo COVID-19 testing, if available, followed by urgent surgery. Inpatient COVID-19 testing should be done within 24 hours of the anticipated surgical intervention. In rare occasions where sight or life is imminently threatened, surgery should proceed with presumption of COVID-19 positivity. For SPOA or intraorbital abscess drainage, we recommend the procedure be performed by an external approach. Endoscopic sinus surgery (ESS) should be avoided. If ESS is absolutely necessary, it should be performed without the use of high-powered instruments, such as drills. In a recent report, cold surgical instrumentation and suction-microdebrider pose significantly less aerosolization risk than a high-speed drill, but still present a particular risk supporting the need for PPE (personal protective equipment). We have found the sinus PROCISE EZ View Coblation Wand (Smith & Nephew, Watford, UK) to be a useful replacement to the microdebrider and we consider it to be lower risk for aerosolization as well as provide hemostasis.

ARS with intracranial complications
All patients with intracranial complications should have an urgent neurosurgery consultation. If the child has a significant intracranial collection with minimal sinus disease, intravenous antibiotics may be considered rather than ESS at the time of open neurosurgical drainage. Furthermore, in the case where neurosurgery performs a craniotomy on a COVID-19 positive patient, intravenous antibiotics may be given after the procedure. The patient must be closely monitored with serial examinations to ensure that the antibiotics are sufficient for management. If the patient fails to improve, ESS without powered instruments and proper PPE should be performed. Acute sphenoidal sinusitis with intracranial complication, such as cavernous sinus thrombosis or meningitis, may require urgent endoscopic drainage. The most experienced surgeon available should perform the sphenoidotomy as efficiently as possible with minimal aerosolizing dissection. There are currently no published studies assessing nonsurgical management of patients with intracranial complications of sinusitis; therefore, if the decision is
to proceed with surgical intervention, it is very important to utilize the utmost care in protecting yourself and others during the procedure.

**Chronic sinusitis with acute exacerbation**

Steroid nasal sprays, nasal and systemic antihistamines, optimal management of underlying medical conditions, and saline nasal irrigations are reasonable for managing chronic rhinosinusitis (CRS) medically\(^\text{39}\). With the use of saline nasal irrigations, there may be concern with increasing the spread of SARS-CoV2 if the child is COVID-19 positive. Providers must ensure that if they are doing the irrigations, gloves, facemask, and eye protection should be worn by the caregiver who is performing the irrigations upon the child. Proper hand washing after irrigations is required and washing all surfaces that are in the location of the irrigations, as well as surfaces that may be exposed to respiratory tract secretions. If there are signs of acute infectious exacerbation of CRS, we recommend a 20-day course of antibiotics. A reasonable first line choice would be amoxicillin-clavulanate, with consideration for clindamycin, levofloxacin, or second or third generation cephalosporin if penicillin allergic. A quinolone should be considered in patients known or suspected to be colonized with *Pseudomonas aeruginosa*. Culture data from prior procedures may be used to guide management if available.

**Neck Masses**

The pediatric neck mass algorithm (Figure 4) begins with a detailed history. The history should include onset, characteristics of the mass, immunization status, systemic symptoms (arthralgia, nasal/aural symptoms, oral ulcers, rash, enlarged lymph nodes in other locations), recent food or animal exposures, sick contacts, treatment history and presence of constitutional symptoms\(^\text{40,41}\). Based on the history, it may be determined whether an ultrasound (US) is necessary. The US can reveal a solid, cystic or infected lesion.

If on US a solid lesion does not appear benign and the child does not have constitutional symptoms, we recommend laboratory work up. The recommended lymphadenopathy lab panels include complete blood count (CBC) with differential, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), lactate dehydrogenase (LDH), purified protein derivative (PPD) test, liver function testing (LFTs), blood culture and other serologic testing based on history, such as Epstein Barr virus (EBV), cat-scratch, cytomegalovirus (CMV), and human immunodeficiency
virus (HIV)\textsuperscript{40,41}. Consultation with medical oncology may provide helpful guidance for the
workup. If the mass persists, progresses or if the child develops constitutional symptoms, we
recommend an US-guided core needle biopsy (CNB) after the patient undergoes testing for
COVID-19. Although open biopsy has the best diagnostic accuracy at 90\%, CNB was a close
second with 80\% accuracy\textsuperscript{42}. CNB is the better option at this time, as the procedure is shorter,
has less resource utilization, and may be performed under IV sedation. If surgical excision is
required, we recommend the procedure be performed with full PPE and using general
endotracheal anesthesia to prevent aerosolization from coughing. There has been a suggestion
that a supraglottic airway might prevent less aerosolization compared to bag-mask-ventilation\textsuperscript{43};
however, a laryngeal mask airway (LMA) might not protect operating room staff from viral
spread\textsuperscript{44}.

Patients with lesions that appear infected and are solid/phlegmonous in nature should
initially be treated with oral antibiotics that cover both Group A Streptococcus and Methicillin-
Sensitive Staphylococcus aureus\textsuperscript{45}. Intravenous antibiotics should be started in cases where
there is no improvement or with symptom progression. Surgery should be considered in cases
where there has been no improvement on IV antibiotics or if the initial ultrasound showed an
infected cystic mass that was fluctuant and pointing. Prior to any procedure, COVID-19 testing
is recommended to determine need for expanded PPE versus universal precautions. For resource
conservation, we recommend needle aspiration under sedation if possible. However, if the
patient is not amenable to this, or if the suspicion is high that symptoms will not resolve, then the
child may require a formal incision and drainage under general endotracheal anesthesia. In
either case, it is imperative that a culture is performed to allow narrowing the spectrum of
therapy. Once again, if the child is COVID-19 positive, we recommend endotracheal intubation
during any surgical procedure to decrease the risk of aerosolization.

\textbf{Epistaxis}

Epistaxis in children is rarely severe enough to require intervention beyond topical
therapeutics. This algorithm outlined in Figure 5 was adapted from the published epistaxis
consensus statement\textsuperscript{46}. Ensuring that there is no concern for a sinonasal mass is the primary
objective. Beyond that, determine if there has been significant blood loss that might warrant
observation or admission for further work-up. If there is a concern for a bleeding disorder based
on the history, laboratory testing should be performed for further evaluation\textsuperscript{47}. The use of nasal antibiotic ointment has been suggested for two weeks and pinching the nostrils together for a few seconds has been shown to help as well\textsuperscript{48}. The routine application of saline sprays or gel and avoidance of nasal mucosal trauma are paramount. Given the proximity to possible high viral particle shedding in the nose, avoiding close contact with the child’s nose for exam at this point is crucial unless absolutely necessary.

**Otorrhea**

Treatment of pediatric otorrhea cannot rely on minor procedures such as binocular microscopy and debridement during the COVID-19 crisis (**Figure 6**). A clear history focusing on potential modifiable risk factors, information regarding color and type of drainage to differentiate infection from cerumen are important. The providers must know if there is a history of tympanostomy tubes or tympanic membrane perforation.

It is important to counsel families regarding modifiable risk factors. Although there has been some recent controversy regarding the impact of water exposure in children with ear tubes, we believe it is best to avoid water exposure in a child with active otorrhea. It is important to emphasize that the family is vigilant about hand washing and hygiene. Due to current social distancing mandates, children are not in daycare or school; however, it is important to remind families to avoid large groups if possible. It is also important to ensure immunizations are up to date, or check S. pneumonia titers in the case of suspected poor immune response, avoid smoke exposure, limit pacifier use, and optimize both allergy and GERD management\textsuperscript{49}.

In conjunction with counseling families about modifiable risk factors, the family should perform aural toilet at home and start the child on ofloxacin drops after washing their hands. It is important to guide families to use a washcloth with hydrogen peroxide to wipe off any excess drainage at the entrance of the ear canal. In those patients with copious mucus, 3\% hydrogen peroxide can be squeezed from a cotton ball into the canal to help debride the discharge, then the bubbly discharge can be swabbed out so antibiotic drops can then be effectively instilled into the ear canal. Next, they should be given instructions regarding how to optimally instill ear drops (**Figure 7**). The parents/caregivers should make sure to wash their hands before and after using the drops. If the child fails ofloxacin ear drops, then they should be given a combination of ciprofloxacin/dexamethasone drops with the same instructions.
In the case of recalcitrant otorrhea, an initial trial of fluoroquinolone drops along with a broad-spectrum oral antibiotic is recommended. If there is concern for Methicillin-Resistant *Staphylococcus aureus* (MRSA), either from a previous culture or high community prevalence, we recommend considering the following topical antibiotics drops: tobramycin/dexamethasone (Tobradex), Chloramphenicol-containing solutions, or 1% hydrocortisone polymyxin-B sulfate-neomycin. Tobradex has the benefit of providing coverage for Pseudomonas as well. Unfortunately, all of these drops have been found to be ototoxic in animal models. One study reported decreased ototoxicity with Tobradex due to the steroid component in the preparation. If the family is concerned regarding the ototoxicity or if the family does not believe that the child will be compliant with drops, oral antibiotics with MRSA coverage such as clindamycin or trimethoprim-sulfamethoxazole should be prescribed.

Topical antiseptic powders and solutions are reasonable if drainage persists after using topical and oral antibiotics. At our institution, we use a compounded powder combination of ciprofloxacin, clotrimazole, and dexamethasone in a boric acid base. The capsules can be prepared by a compounding pharmacy and placed into an insufflator for application to the external ear canal at home, two puffs to the affected ear twice a day for two weeks. The solutions listed below have been used in cases of severe recalcitrant chronic suppurative otitis media, but can cause pain when instilled into the canal. The following solutions have been described in the literature for recalcitrant otorrhea: acetic acid with 1-part white vinegar to 1-part distilled water, 3% hydrogen peroxide and one-half sterile water two times per day, and Burow’s solution/Domeboro drops. The Domeboro drops increase the alkalinity of the external canal while acetic acid drops are bactericidal. Although these treatment strategies have been used as in-office procedures on patients for years, there is evidence that there is a potential for each solution to be ototoxic in animal models. It is important to counsel families regarding the ototoxicity of these solutions prior to treatment.

In cases that continue to drain despite all measures mentioned above, we recommend obtaining an ear culture. Typically, the culture should be performed much earlier; however, given our current challenges and trying to decrease patient contact we have placed this step at the end of the algorithm. The child should be treated based on the culture results; treatment should be extended for persistent disease.
Implications for Practice

Pediatric otolaryngology providers face particular challenges during the COVID-19 pandemic. The need for limited patient encounters and overall societal restrictions has tempered the emphasis on physical examination, imaging, and adjunctive testing. Common ambulatory surgeries cannot be performed at this time, which shifts the attention to mitigation strategies and medical management. Both measures have a tremendous impact on conserving valuable resources, particularly PPE. Finally, the safety of children, healthcare providers and caregivers must be ensured. This is especially crucial given the common exposure to nasopharyngeal secretions and the upper respiratory tract mucosa during aerosol producing procedures that are inherent in the field of otolaryngology. Even after full operations resume, otolaryngologists may still encounter situations where diagnostic and surgical routines are temporarily unavailable. These alternative strategies allow clinicians to navigate these challenging times and to remain focused on caring for their pediatric patients.

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Figure Legends

**Figure 1.** Management algorithm limiting patient contact for pediatric otitis media with effusion (OME) during the COVID-19 pandemic. Extended PPE (Personal Protective Equipment) includes: N95 mask/face shield/gown and gloves or PAPR (Powered Air-Purifying Respirator).

**Figure 2.** Management algorithm limiting patient contact for pediatric sleep disordered breathing (SDB) during the COVID-19 pandemic. Extended PPE (Personal Protective Equipment) includes: N95 mask/face shield/gown and gloves or PAPR (Powered Air-Purifying Respirator). **Note:** it is highly recommended to avoid tonsillectomy/adenoidectomy surgeries during the COVID-19 crisis.

**Figure 3.** Management algorithm limiting patient contact for pediatric acute rhinosinusitis (ARS) during the COVID-19 pandemic. Extended PPE (Personal Protective Equipment) includes: N95 mask/face shield/gown and gloves or PAPR (Powered Air-Purifying Respirator).

**Figure 4.** Management algorithm limiting patient contact for pediatric neck masses during the COVID-19 pandemic. Extended PPE (Personal Protective Equipment) includes: N95 mask/face shield/gown and gloves or PAPR (Powered Air-Purifying Respirator).

**Figure 5.** Management algorithm limiting patient contact for pediatric epistaxis during the COVID-19 pandemic.

**Figure 6.** Management algorithm limiting patient contact for pediatric otorrhea during the COVID-19 pandemic.

1. If Ciprodex is too expensive or not available, recommend family to use both dexamethasone and fluoroquinolone drops simultaneously.

2. Other topical or oral antibiotics or solutions to consider in refractory disease (see text).

**Figure 7.** Children’s Hospital of Philadelphia Division of Pediatric Otolaryngology Patient Family Education instructions on giving children otic drops.
Important: Keep ears dry during an ear infection with drainage. It’s important to keep water out of the ear canal during bathing, showing, and hair washing. You can put an ear plug in the ear during showers, or cover the ear with a plastic cup when rinsing hair during bathing. No swimming until the infection is gone.
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>First Line Therapy</th>
<th>Allergy to first line agent</th>
<th>Duration</th>
<th>Comments/Other Considerations</th>
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<tr>
<td>Orbital cellulitis</td>
<td>Ampicillin-sulbactam IV Monotherapy</td>
<td>Clindamycin IV Monotherapy</td>
<td>14-21 days</td>
<td>If there is concern for CNS extension on imaging, change to ceftriaxone, metronidazole, and vancomycin and consult neurosurgery. If surgery performed, tailor therapy based on operative culture results</td>
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<td></td>
<td>75 mg/kg/dose (max: 2 g/dose), q8hrs</td>
<td>14 mg/kg/dose (max: 900 mg/dose) q8hrs</td>
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<td>14 mg/kg/dose (max: 500 mg/dose) q8hrs</td>
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<td>History of Clindamycin-resistant MRSA</td>
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<td>Concern for imminent sight threatening infection based upon exam by Ophthalmology</td>
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<td>Vancomycin IV</td>
<td>Vancomycin IV 15 mg/kg/dose (max: 750 mg/dose) q8 hrs</td>
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<td>Outpatient Clindamycin PO</td>
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<tr>
<td>Inpatient</td>
<td>Cefazolin IV 35 mg/kg/dose (max: 2 g/dose) q8 hrs</td>
<td></td>
<td>5-7 days</td>
<td></td>
</tr>
</tbody>
</table>
Urgent

Yes

COVID-19 Testing

Positive/Unable to test

Surgery with extended PPE

No

COVID-19 Testing

Negative

Surgery with universal precautions

Counsel families regarding modifiable risk factors

No modifiable risk factors/unlikely to follow them

Consider prophylactic antibiotics

Hearing loss present

Counsel family regarding educating child with hearing loss

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OSA-18 Survey sent to families prior to visit

Discuss modifiable risk factors

Concern for severe OSA

Yes

Severe symptoms requiring emergent management

Medical management

No

Consider oral steroids, antibiotics

Yes

Refer to Emergency Department

No

Refer to sleep medicine for CPAP trial

Tolerates CPAP

Yes

Life threatening

No further intervention

=

Yes

Test for COVID-19

Negative

Surgery with universal precautions

Positive

Surgery with extended PPE

Unable to test

Surgery with extended PPE
Discuss modifiable risk factors

Acute sinusitis without complications
- Meets criteria for acute sinusitis
  - Yes
    - Antibiotics
  - No
    - Conservative management of viral upper respiratory infection

Acute sinusitis with orbital involvement
- Preseptal cellulitis
  - Yes
    - Postseptal involvement
      - CT sinus with IV contrast and image guidance
  - No
    - Medical management

Acute sinusitis with intracranial complications
- Cavernous sinus thrombosis
  - Yes
  - Subperiosteal/Otbral abscess
    - No
      - Medical management
    - Yes
      - Consider open drainage
      - Positive/Pending results
      - Surgery with extended PPE
  - No
    - COVID-19 testing
      - Negative
      - Surgery with universal precautions
      - Positive/Pending results
      - Surgery with extended PPE
      - Medical management

Acute on chronic sinusitis
- Ensure that child is complying with medical management
- Antibiotics for 20 days
Figure 5

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History

Concern for ear infection

Yes

Discuss modifiable risk factors

Discuss aural toilet at home

Ofloxin otic drops

Resolved

Persist

ofoxin/dexamethasone otic drops

Resolved

Persist

If patient had prior culture, use to direct therapy

Consider oral antibiotics and ear drops

Resolved

Persist

Obtain ear culture

Treat based on culture results

Resolved

Persist

Consider extending course of antibiotics

No

Observe

Resol
Instructions for Giving Ear Drops:

1. Read the instructions on the label of the medication and review how many drops you should give and for how many days. Which ear are you treating, right, left or both ears?

2. Wash your hands with soap and water or alcohol-based hand rub.

3. Gently shake the bottle. Warm the medication by holding the bottle in your hand for a few minutes.

4. If your child can understand and cooperate, explain what you are doing. If your child is not cooperative or too young to understand, you may need another adult to help you.

5. Ear drainage may build up at the opening of the ear canal. Gently remove the drainage with the twisted end of a dry tissue. This will help to absorb the drainage and clean the ear before you put in the ear drops.

6. Help your child lie on his back and turn his head to the side with the draining ear facing up.

7. Gently hold the outer ear and pull it up and back. This helps to straighten the ear canal so the drops can easily go down.

8. Hold the dropper above your child’s ear canal, being careful not to let the tip of the bottle touch the ear. Gently squeeze the bottle, putting in the prescribed number of drops in the ear canal; usually 5 drops.
9. After you put in the ear drops, “Pump” or massage the flap of skin in front of the ear (tragus) several times. This helps push medication down so it can go through the ear tube. **If the ear drops do not go down, please call your health care provider.**

![Diagram of ear massage](image)

10. Your child should stay on his side for a few minutes to make sure the medication stays in place. You can place a cotton ball in the ear to prevent the medication from flowing out.

Repeat Steps 1 – 10 in the other ear if ordered.

Give the ear drops as directed, even if the drainage stops and your child seems better. If you stop the medication too soon, some germs may survive and the ear infection may return.