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An Evaluation of the use of Antibiotics in Children with Otitis Media using Evidence Based Guidelines

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Abstract

Background: Otitis media is a common medical condition that practitioners need to accurately diagnose and treat using evidence based guidelines to avoid overprescribing antibiotics. The aim of this project was to gain understanding of practitioners’ knowledge of the evidence based guidelines for the treatment of otitis media and survey them with regards to their experience about adherence to best practice guidelines for the treatment of otitis media and indications for antibiotic use.

Methods: Excerpts from published guidelines and decision making on treating otitis media were provided by email to a group of Nurse Practitioners (NPs) practicing in clinic settings in the Northeast. This information was accompanied by an online survey regarding NPs knowledge and comfort with the interpretations of AAP/AAFP guidelines and identify their antibiotic use practices for Acute Otitis Media (AOM).

Result: The majority (97%) of the NPs surveyed believed that antibiotics were being overprescribed for AOM. While most (86%) stated they adhered to current AAP/AAFP guidelines for the diagnosis and treatment of AOM including first line antibiotic choice, 17% admitted to not feeling comfortable delaying the start of antibiotics in early cases as recommended.

Conclusions: Nurse Practitioners rely on scientific literature and evidence based guideline for practice to make informed decisions regarding antibiotic use for AOM, however they are reluctant to delay antibiotics for AOM in children due to parental pressure. Most felt comfortable diagnosing AOM, however not all felt the highest level of comfort with the otoscope and tympanometry.

Keywords: otitis media, overuse antibiotic, otitis children
Introduction and Background

Otitis media is common in pediatric patients. According to Casey, 2015 Otitis media (OM) with effusion is the most common cause of hearing loss in children, leading to problems including a delay in speech and language development. In the United States in 2008 approximately eight million children were diagnosed with otitis media (Nash, 2013). Seventy-five percent of children experience at least one episode of otitis media by the time they turn three years of age. It is estimated that almost half of these children will have more than three OM infections during their first three years of life (Monasta, Ronfani, Marchetti, Montico, Brumatti, Bavcar, & Tamburlini, 2012).

The American Academy of Pediatrics (2013) defines acute otitis media (AOM) as the quick onset of signs and symptoms of middle ear inflammation and defined by the presence of fluid in the middle ear accompanied by signs or symptoms of acute illness. According to Richardson, 2013, AOM can be further classified as: 1) uncomplicated - without the presence of otorrhea; 2) severe - which requires the presence of moderate to severe otalgia or a fever of at least 39 degrees Celsius; 3) non-severe- characterized by mild otalgia and a temperature below 39 degrees Celsius; or 4) recurrent, requiring at least three documented and distinct AOM episodes in the last six months or four or more episodes in the last twelve months and one or more episode in the last six months. Otitis media with effusion is defined as OM that includes ear discharge. The disease peaks in the first three years of life and is less common in the school-aged child, adolescents, and adults (Edwards, 2013).
Diagnosis of AOM can be challenging, as AOM can present with a wide range of symptoms as the condition progresses (AAP, 2013), and other diagnoses present with similar symptoms (Nash, 2013). The treatment of AOM can have a wide range of complications that would mandate the choice of antibiotics while minimizing patient’s complications. Some complications may prevent the patient complaint with prescribe medication (El-Shabrawi, Tolba, & El-Adly, 2016). Some short-term complications include: mastoiditis, labrynthitis, facial nerve paralysis, petrositis, hearing loss, subperiosteal abscess. Long-term complications include: speech and language delay, tympanic membrane perforation, cholesteatoma, tympanic membrane retraction pockets, hearing loss, chronic otorrhea, cognitive impairment.

Modifiable risk factors such as introducing infants into large day care groups increase the incidence of respiratory infections and otitis media. At least one episode of respiratory tract infections a month occurs during the first year of life, and otitis media is marked by about one third to one half of the respiratory tract infections (Tapainen, Paarlane, Arkkola, Renko, Pokka, Kaijalainen, & Uhari, 2014) and a lack of knowledge of how otitis media may interact with other, chronic conditions.

Problem Statement

According to the Centers for Disease Control and Prevention, 2015 Otitis media has a high prevalence, with well over 20 million episodes of acute otitis media alone occurring in the United States every year. The annual costs of office visits, antibiotics, and surgeries related to OM have been estimated to be approximately $4 billion in the United States (Underwood & Ba-kaletz, 2011). The high prevalence and treatment costs of otitis media with antibiotics; increased rates of hearing loss and long term complications of late speech and language development; and
the challenges of inappropriate antibiotic use to treat otitis media are important challenges. One of the main risk with over prescribing antibiotics is that increases the chances of developing resistance. It is important to intervene now to prevent the risk of antibiotics not been able to treat otitis media. Antibiotics should only be prescribed when necessary and after an assessment of the patient’s condition.

**Review of the Literature**

A search of the EBSCO database was conducted using the keywords 'otitis media' AND 'guidelines' AND 'adherence' OR 'attitudes'. Inclusion criteria for articles consisted of publication in the last ten years regarding the adherence of clinicians to best practice guidelines for the diagnosis or treatment of otitis media in children. Studies were excluded if the study population or methods of the study could not be clearly identified.

The variability in how and why antibiotics are prescribed for OM has been well researched, and the fact that overuse in the pediatric population is more likely than for adults (El-Shabrawi, Tolba, & El-Adly, 2016). Furthermore, the most important contributing factor for resistance to antibiotics is overuse. Prescribing antibiotics for too long or too short a time period, and when not necessary may destroy the normal intestinal flora allowing opportunistic pathogens that are resistant to survive and take over (Dooling, Shapiro, Van Beneden, Hersh, & Hicks, 2014).

Younger patients seem to be at added risk for overprescribing of antibiotics and should be the focus of proper assessment appropriate treatment with antibiotics (Roditi, Liu, Bellmunt, Rosenfeld, & Shin, 2016). One of the most important treatment issues with otitis media is the amount and selection of antibiotics prescribed to treat children. There is also the problem that two small a small number of new antibiotics are being developed to treat bacterial infections.
In one comprehensive study, McGrath, Becker-Dreps, Pate, and Brookhart (2013) examined trends in antibiotic dispensing patterns to treat AOM, as well as trends in antibiotic failure. Researchers found that prescribers prescribed antibiotic when there was no need to treat with antibiotics. Using the MarketScan Commercial Claims and Encounters database, the authors examined over 4 million cases of children between three months and twelve years of age diagnosed with AOM between January, 2000 and December, 2011. The authors found a great deal of fluctuation in the proportion of patients being prescribed antibiotics: 66% in 2005, 51.9% in 2007, and 57.6% in 2011, for instance. Prescription of amoxicillin, recommended by AAP/AAFP guidelines, also fluctuated over the 12 years, for example between 57% and 53% in 2005-2008. Antibiotic treatment failure was approximately 10%, with slight decreases over time. The researchers also note a surprisingly high rate of antibiotic prescription (42.2%) for children diagnosed with OME, despite treatment guidelines recommending watchful waiting over use of antibiotics. These fluctuations in overall antibiotics prescription (amoxicillin in particular) suggest some lack of consistency in practitioners following published guidelines for treating otitis media in children, as well as a lack of adherence to guideline recommendations regarding antibiotic prescription following OME diagnosis.

Other researchers have examined factors that can influence antibiotic prescription/selection. For instance, Fleming-Dutra, Shapiro, Hicks, Gerber, and Hersh (2014), attempted to determine whether race is associated with differences in OM diagnosis and antibiotic prescribing in the United States. They used the National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey to examine 4,178 OM visits between 2008 and 2010 for patients under 14 years of age. The researchers found that the rate of OM diagnosis was 30% lower in black children than non-black children, despite a lack of differences in OM prevalence
between black and non-black children. In cases in which antibiotics were prescribed, black children were also found to be less likely to be prescribed broad-spectrum antibiotics (42%) than non-black children (52%). While it is not clear whether the disparity indicates undertreatment of OM in black children or overtreatment in non-black children, the literature on antibiotics prescribing again includes inconsistency that is difficult to rationalize.

Questions raised in the literature include the efficacy of amoxicillin/clavulanic and cefdinir as treatment for OM among children. Casey, Block, Hedrick, Almudevar, and Pichichero (2012) conducted a prospective, randomized, investigator-blind trial to compare the clinical efficacy of 10 days of amoxicillin/clavulanic acid high dose therapy with five days of cefdinir therapy for treating AOM at recommended doses. Three hundred and thirty children between six and 24 months of age who had been diagnosed with AOM were included in the study. Ten days of amoxicillin/clavulanic acid high dose therapy were found to result in a significantly higher cure rate (86.5%) than 5 days of cefdinir therapy (71%), confirming that amoxicillin/clavulanic should be a preferred first option over cefdinir for treating AOM in children.

Often patients ask and expect antibiotics, and although perceived patient expectations are important, the provider is responsible and it is expected to educate patients in the appropriate use of antibiotics. Providers are likely to prescribe antibiotics if they believe patients expect them. Cases of bacterial infections are the easiest infections for patients able to diagnose accurately. Patients sometimes do not realize that differentia between bacterial and viral infections is important, and most do not realize that antibiotics do not work against viral infection. (Ikram, Ahmed, Siddiqui, Maqbool, Mushtaq, & Sohail, 2015).

The overuse of antibiotic use can lead to antibiotic resistance. Resistance to antibiotics has forced us to relook at how we view diseases and the way patients are treated (Teillant,
Gandra, Barter, Morgan, & Laxminarayan, 2015). The more an antibiotic is used, the more quickly resistance occurs by allowing opportunistic pathogens that are resistant to survive and take hold. Unnecessary prescriptions make infections harder to treat later. Clinicians often over-prescribe antibiotics even when they believe that antibiotics are only minimally effective for a variety of reasons including patient’s insistence.

The overuse of antibiotics leads to antibiotics being less effective in future treatment. Providers that adhere to guidelines of delayed prescribing of antibiotics and only giving antibiotics if their condition worsens help to combat the overuse of antibiotics. One study found that nurse practitioners prescribe antibiotics at a higher rate than doctors in outpatient settings (Sanchez, Hersh, Shapiro, Cawley, & Hicks, 2016). Nurse practitioners understand that education is an integral part of patient care and spend time explaining consequences of inappropriate antibiotic use to patients and family (Duffin, & Griffin, 2015). Patient education is an important tool in promoting the proper use of antibiotics. Proper use of antibiotics on only bacterial infections can reduce the widespread and inappropriate use that results in increase in antibiotic-resistant bacteria. Antibiotics are to be used against bacterial infections and not viral infections (Klompas & Rhee, 2016).

**Synthesis**

A number of evidenced-based practice guideline demonstrate that patients and families persuade or place pressure on providers to prescribe antibiotics inappropriately causing harmful effects on patients. Better infection control and evidence-based administration of antibiotics will result in better patient’s outcomes. Inappropriate antibiotic use contributes to antibiotic resistance, side effects, and increased cost (Holloway, Rosella, & Henry, 2016).
Antibiotic resistance is an increasingly serious public health issue in United States: resistant bacteria have become an everyday concern in this country. Infections with antibiotic-resistant bacteria can result in increased patient morbidity and mortality, as well as increased hospital length of stay (Merchant, Tabak, Deryke, Depestel, Johannes, Moise, & Gupta, 2016). Antibiotic resistance frequently leads to a delay in appropriate antibiotic therapy. Inappropriate or delayed antibiotic therapy in patients with severe infections is associated with worse patient outcomes and sometimes death.

Misuse of antibiotics is one of the main factors that drive development of antibiotic resistance. Patients in the United States have a high probability of receiving an antibiotic and 50% of all antibiotic use can be inappropriate (Sillanpää, Sipilä, Hyötý, Rautiainen, & Laranne, 2016). Antibiotic prescribing practices and decreasing antibiotic resistance can be addressed through multifaceted strategies by ongoing education, relay on robust evidence-based antibiotic guidelines and policies, and by restrictive measures and consultations from infectious disease experts (Brauner, Fridman, Gefen, & Balaban, 2016).

Misuse of antibiotics is an ongoing issue, including prescribing antibiotics when they are not necessary. Some broad-spectrum or narrow-spectrum antibiotics are used incorrectly, with too high or too low dose of antibiotics. Evidence based prescription of antibiotics can prevent the emergence and selection of antibiotic-resistant bacteria. Decreasing antibiotic use has also been shown to result in lower incidence of Clostridi infections (Wang, Zhou, & Hesketh, 2016). There is also good evidence that most antibiotic prescriptions do not help otherwise healthy patients with common infections get better any quicker.
Theoretical Framework

The theoretical framework that provided a basis for implementation of this project is the Lawrence Kohlberg’s theory of moral development. This theory is an appropriate framework, as it has been designed to translate developing or improving upon one’s morals or values. It is important to do one's duty to maintain patient’s health. Components of this framework will incorporate well with the project by reinforcing and supporting the overall mission to improve care by caring and promoting the right knowledge to provide better outcomes. It allows the incorporation of evidence into practice and flexibility.

The Lawrence Kohlberg’s theory of moral development change is comprised of six main stages. The premise is that everyone has certain moral dilemmas and this determines which stage of moral reasoning a person uses. Dilemmas are short stories in which a person has to make a moral decision. Behavior is either right or wrong and NPs must ask themselves what they should do in order prescribes appropriately. This theory is also well positioned for the NPs who have the ability to evaluate new knowledge and expertise and to support change in practice. Once NPs understands overprescribing antibiotics unnecessarily they may transform their beliefs (Snarey, & Samuelson, 2015).

This DNP project involves examining each phase of the Lawrence Kohlberg’s theory of moral development requires and will focus on patient and family-focused collaboration as well as informed decision-making by the NPs. It supports services that promote the development of highly competent providers, and the incorporation of evidence based into practice and is designed to allow flexibility and quality patient care and contributes to effective care. Pediatric pa-
tients and their families deserve compassion, respect, and our trust. Nurse Practitioners are accountable for our actions and responsible to provide our patients with outstanding care each and every day that.

Patient care involves working and sharing in a multi-disciplinary health care team to accomplish a common goal to treat patients. Nurse practitioners work in a multi-disciplinary environment to create a patient-focused and patient-driven system. This theoretical framework provides the ability to consider all aspects of the patient and their needs and to actively support the welfare of the patient through personal and professional actions.

**Project Design and Methods**

**Setting and resources**

The setting of this project consisted of several community health facilities in the Boston metropolitan area. These facilities provide a broad array of community health programs targeting populations at risk for health care disparities. These groups include low-income, immigrants, or of cultural or linguistic minorities, and those marginalized because of homelessness or behavioral health disorders. The model is to educate these groups about available services, reduce barriers to accessing care, create links to appropriate health care services and provide culturally appropriate, accessible, and engaging education about preventive care and healthy lifestyles.

The resources that were available for this project includes the administrator being willing to release emails of thirty nurse practitioners NPs that can be part of the survey. Nurse Practitioners in the numerous clinics facilities have a high level of visits annually and have a lot of ex-
perience in seeing patients with otitis media. Some of the facilities lack on guidelines for treatment that would be beneficial, although each NP has access to the latest guidelines for evidence-based care.

**Description of the participants, population or community**

The sample consisted of thirty NPs dedicated to providing essential services to all members of the community. All of the participants specialize in family care, pediatrics, and emergency care and provide inclusive care and are committed to provide care to vulnerable and diverse patients. Many of its patients have public subsidized insurance (Medicare and Medicaid) and traditionally experience barriers to care. In order to serve these individuals and families the facilities management has recruited bilingual providers and created a robust interpreter program. The facility is staffed with nurse practitioners supervised by physicians who are available for consultation. The participants were 83% female and 17% were male. All eligible participants were involved in prescribing, assessing, and teaching patients.

The staff at the facilities consists of a mixture of thirty full-time nurse practitioners, which some of them are either part time or full time NPs who each hold at least a Master’s degree in nursing and have a minimum of one year of experience in clinical settings; there are also several per-diem nurse practitioners who holds at least a Master’s degree in nursing. All evidence-based guidelines are required to be followed by staff at the facilities. The facilities included have more than twelve locations in Massachusetts.

**Organizational analysis of project site and stakeholder support**

The DNP student was granted email access to the thirty NPs at the facility. They received an email with an invitation to participate on the questionnaire by the DNP student including the
latest AAP/AAFP guidelines and a follow up email with a link to the actual questionnaire. The NPs had two weeks to complete the questionnaire. The most effective way to reach participants was via email since they work at different locations and times. The NPs also received an explanation of the project via an email. That helped achieve a better response rate.

The DNP student spoke with all NPs whose names were provided and emailed the information to them. The goal was to improve their practice by helping them to understand their prescribing patterns and their relationship to evidence based practice guidelines. The NPs that participated in the project were committed to providing evidence based care to their clients and clinics in order to improve practice and have a healthy work environment.

**Facilitators and barriers**

There were some barriers to getting the NPs to fill out the online surveys, but given they were online it gives them flexibility as to when they fill them out. Potential barriers included vacation time, some of them may change their mind and not want to participate, and nurse practitioners may not be available because of patient caseload. One facilitator that provided most of the support for the project was my mentor. She encouraged the participation of the providers to the project and she participated in the information session. She also made phone calls and emailed providers to remind them to complete the survey.

**Goals, Objectives, and Expected Outcomes**

Goals for this DNP project presented to the NPs at the clinic were:

1. To evaluate current literature on antibiotic prescribing patterns for otitis media and best first line treatment of antibiotics.
2. Determine if clinic NPs are utilizing AAP/AAFP evidence based guidelines

3. Advocate for the best treatment for pediatric population affected by otitis media and current evidence based guidelines

4. Support and explore nurse practitioners experience and use of these guidelines in the clinic setting.

5. Determine their beliefs about antibiotics are been over prescribe for Otitis Media

6. Explore if antibiotics should be delayed

7. To evaluate if parents pressure in antibiotic prescription plays a role

Expected outcomes for this project are to explore current first line of treatment among providers at a multi-campus facility of otitis media and their use of the evidence based guidelines. Results will be shared with NPs and clinic administrators to consistent protocols and better practice.

**Implementation Plan**

This project involved an online survey of the thirty NPs on their experience in prescribing antibiotics and how they feel about prescribing antibiotics for Otitis media for children between the ages two to eighteen with otitis media. The NPs at the selected practice site received the latest guidelines for the diagnosis and treatment of AOM by The American Academy of Pediatrics listed in Appendix B via email. These guidelines were sent after completing the survey in order to receive a true sense of what the NPs of their experience and knowledge about the guidelines.
These guidelines define AOM as having a fast onset of signs and symptoms of inflammation in the middle ear. Acute otitis media can be further classified as uncomplicated, which is without the presence of otorrhea; severe, which requires the presence of moderate to severe otalgia or a fever of at least 39 degrees Celsius; non-severe, characterized by mild otalgia and a temperature below 39 degrees Celsius; or recurrent, requiring at least three documented and distinct AOM episodes in the last six months or four or more episodes in the last twelve months and one or more episode in the last six months (AAP, 2013).

Quantitative data was gathered via a questionnaire sent to practicing NPs in an outpatient setting on their experiences in treating otitis media in their current practice setting using the evidence based guidelines recommended as listed in Appendix B. Qualitative data was also collected to explore and understand NPs experiences, perceptions and beliefs. This quality improvement project explored the level of knowledge and attitudes of NPs towards prescribing antibiotics for otitis media. Data was collected in this project by means of an online questionnaire, which was emailed to the thirty NPs that practice at the facility. Questionnaires were administered online using survey monkey and included the questions listed in Appendix A.

The plan for implementation was to have a survey using survey monkey and the survey deadline by March 2017. Data collection consisted of questionnaires and survey data without identifying subjects sent via email to the NPs. Data is stored only in this DNP student password protected computer files, with no identifiable information obtained that could match subjects to survey answers (U.S. Department of Health & Human Services, 2010).
Participants completed a survey with questions about their prescription habits. Questions were designed to collect demographic information, as well as to assess the amount and levels of involvement with otitis media diagnosis/treatment, knowledge of current AAP/AAFP guidelines for the diagnosis and treatment of otitis media, and how they feel about adhering to the guidelines. In this survey, participants were in their access to their knowledge and comfort level of prescribing antibiotics. The NPs received a mnemonic that they are able to follow to help diagnose and make the right treatment decision and prevent overprescribing of antibiotics. Nurse practitioners should aim to ensure that antibiotics are prescribed only when necessary, to improve antibiotic prescribing and patient safety.

**Ethics**

A Human Subjects Determination form was submitted to the University IRB and it was determined that this project qualified for a waiver from IRB. Subjects were not at risk or identified in the project and data collection consisted of a survey monkey without identifying information on participants. Data was stored only in Microsoft Office computer files, with no information obtained that could match subjects to survey answers. The survey did not have any identifiable information, and only a summary of results were shared with all thirty NPs. This DNP project respected the confidentiality of every participant and each participant participated in the project voluntarily. Safety was a priority throughout the project and there were no anticipated risk factors anticipated in this project, as NPs will continue to follow their regular treatment protocols. Benefits of the project include contribution to the clinic of the latest evidence based guidelines and a sense of how current practice is following them.
Results

Thirty providers participated in the completing of the survey. Table one below shows the number of years that NPs in this project have been practicing as providers the table shows a wide experience within participants.

Table 1. Numbers of years in practice of each nurse practitioner

<table>
<thead>
<tr>
<th>Number of years</th>
<th>0 – 5 Years</th>
<th>5 – 10 years</th>
<th>11 – 15 Years</th>
<th>16 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>37.93%</td>
<td>10.34%</td>
<td>24.14%</td>
<td>27.59%</td>
</tr>
</tbody>
</table>

The survey result showed that 86.67% of providers reported that they followed the current AAP/AAFP guidelines for the diagnosis and treatment of otitis media compare and 13.33% stated that do not follow the current guidelines. After presenting the results to the NPS some of the NPs responded by stating that do follow the guidelines because they most stay with current trends in prescribing.

Table 2. Percentage of providers that follow AAP/AAFP guidelines

<table>
<thead>
<tr>
<th>Follow Guidelines</th>
<th>Do not follow Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>86.67%</td>
<td>13.33 %</td>
</tr>
</tbody>
</table>
As shown in Table 3 a total of 93.3% of participants submitted that the first-line antibacterial agent the use to treat acute otitis media is Amoxicillin, which according to AAP/AAFP guidelines is the best treatment. Results revealed that 6.7% of participants believe that Penicillin is the first-line of treatment. Some NPs revealed that Amoxicillin is the right treatment but they have been prescribing it for ten days in lieu of seven days for the treatment of AOM.

**Table 3. First-line of treatment for AOM**

<table>
<thead>
<tr>
<th>Amoxicillin</th>
<th>Penicillin</th>
</tr>
</thead>
<tbody>
<tr>
<td>93.3%</td>
<td>6.7%</td>
</tr>
</tbody>
</table>

Most (89.7%) of the NPs surveyed reported that they thought current guidelines for antibiotics for the treatment of AOM were appropriate as shown in Table 4. The rest of the NPs (10.3%) believed that current guidelines were inappropriate and did not follow the guidelines on the use of antibiotics for clinical practice. NPs that believed that the guidelines were inappropriate had a changed after they read the Mnemonic Tool (Appendix S) and the current guidelines.

**Table 4. NPs opinion appropriate and inappropriate antibiotic use for AOM**

<table>
<thead>
<tr>
<th>Appropriate antibiotics</th>
<th>Inappropriate antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>89.7%</td>
<td>10.3%</td>
</tr>
</tbody>
</table>

The results on Table 5 shows that 96.7% NPs felt that antibiotics are been over prescribed for Otitis Media while only 3.3% of participants did not feel that antibiotics are been over prescribe for Otitis Media.
Table 5. NP Feelings on Antibiotics Prescribing for AOM

<table>
<thead>
<tr>
<th>Over prescribed for AOM</th>
<th>Right prescription for AOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>96.7%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

A total of 83.3% of participants believe that prescription of antibiotics should be delayed for Otitis Media, while 16.7% do not believe that antibiotics should be delayed as shown in Table 6. The survey did not look to find out the reason that antibiotics should be delay.

Table 6. Delayed antibiotic prescription of Antibiotics for AOM by NPs

<table>
<thead>
<tr>
<th>Delayed</th>
<th>Do not delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>83.3%</td>
<td>16.7%</td>
</tr>
</tbody>
</table>

A total of 53.3% of practitioners felt that parents often demand antibiotics during the visit even when it is not recommended and they NPs feel compelled to prescribe antibiotics. Another good percentage of participants did not feel compelled to prescribe antibiotics (See Table 7). The results are alarming that the majority of the NPs feel compel to prescribe antibiotics because parents pressure to have their child medicated.
Table 7. NPs that feel compelled against non-compelled to prescribe antibiotics

<table>
<thead>
<tr>
<th>Compelled to prescribe</th>
<th>Non-compelled to prescribe</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.3%</td>
<td>46.7%</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

However, a total of 100% responded that they are aware that antimicrobial-resistant infections are associated with increased morbidity, mortality, and cost (Appendix I). A total of 80% have never prescribed prophylactic antibiotics to reduce the frequency of episodes of AOM while 20% (Appendix J).

All of the NPs had never prescribed penicillin to a child that has a history of allergic reaction to penicillin (Appendix K). A total of 36.7% rate themselves at a comfort level at diagnosing otitis media while 3.3% did not rate themselves as comfortable (Appendix L).

A majority of providers 43.3% rated their comfort level at the middle of the scale at utilizing tympanometry while only 30% rate their comfort level at utilizing tympanometry at the highest level (Appendix N). These is a significant finding that only thirty percent of the NPs feel a comfort level with tympanometry to aid in the diagnosing of AOM. These ratings were based on a five point rating scale of 1 to 5 in which 1= strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree 5 = strongly agree.
Most providers about 93.4% reported seeing less than twenty patents with Otitis media per week while 6.7% report seeing twenty-one to thirty patients with Otitis media per week (Appendix O). The majority of participants 76.9% reported a good knowledge of AAP/AAFP guidelines for diagnosing and treating otitis media while 13.3% reported not having a good knowledge of the guidelines (Appendix P). The majority of NPS (86.6%) felt well prepared from their education readiness to diagnose and treat otitis media in children (Appendix Q).

After the project was completed, the aggregate results of the survey were shared with the NPs in the different practice settings. Some of the NPs were surprised to find that many other NPs agreed with their views in overprescribing antibiotics for AOM. There was also a concern with the views of some NPs feeling that they have to prescribe antibiotics because of parents request, some NPs found the results alarming.

Discussion

The findings indicated that most NPs have a sound understanding of the guidelines that need to be followed in order to appropriately diagnose and treat Otitis Media. However, some NPs could benefit from further training with the equipment and the use of mnemonics to help remember the guidelines regarding when to treat with antibiotics and when to consider taking a wait-and-see approach, based on the child’s age and symptoms. Most of the unnecessary and inappropriate antibiotic use associated with treating ‘ear infections’ comes from treating conditions that are thought to be acute otitis media, but actually are a viral upper respiratory tract infection.

The Lawrence Kohlberg’s theory of moral development change shows that changes comes at many different times in life. With education and skills people can develop a dynamic concept that encompasses a new vision of how we see patients and the ways in which we treat
them. Nurse Practitioner are empowered and can empower patients of all ages to assume responsibility for creating a better outcome and sustainable their future. In this project NPs found a need to refocus many existing knowledge and practice so that they build the concepts, skills, motivation and commitment needed to develop better knowledge and provide better care.

The movement that this theory helped focus consisted of NPs intending to take action in their practice and successfully modify their behavior, experiences, or environment in order to overcome their deficit in knowledge. Action involves the most overt behavioral changes and requires considerable commitment of time and energy in part of the provider.

Antibiotic treatment should not be offered routinely in children with AOM. Parents can be reassured that AOM can be a self-limiting illness and serious complications are rare. Antibiotics may be useful for some patients where the benefits may outweigh the risks of adverse effects (e.g. children under two years of age, those who are systemically unwell, or those who have recurrent infections). Strategies of watchful waiting and use of delayed prescriptions may be appropriate for many children.

**Nursing Implications**

The survey results indicated that most NPs follow current AAP/AAFP guidelines for the diagnosis and treatment of otitis media and are aware of the first-line antibacterial agent to treat acute otitis media. Another significant finding is that NPs feel that antibiotics are been over prescribe for Otitis Media. However, the survey indicated that confidence for using the otoscope and tympanometry as well as confidence for diagnosing AOM was not at the highest level among all NPs. Though guidelines indicate that Pneumatic Otoscopy with tympanometry is necessary for an accurate diagnosis of AOM, most NPs were confident they could accurately diagnose AOM. The effectiveness of this project alone is likely to be limited without further opportunities to
practice these techniques. Further training and practice for both diagnostic techniques is required to ensure appropriate right diagnosis.

**Limitations**

Participant numbers were small, as was necessary for the nature and time of the project. Despite these small numbers, NPs differences in confidence for Otoscope and tympanometry as well as the level of comfort diagnosing AOM were apparent. Due to time limitations it was not possible to include an assessment of clinical skills in the use of both Otoscope and tympanometry but is a future recommendation for clinic NPs. Further research needs to examine how best provide ongoing support and training to best increase uptake of these techniques.

**Conclusions**

The high prevalence of otitis media is confirmed by the literature review and clinical experiences. The importance of following treatment protocols and understanding the realities of practice are clear as this is a condition that many suffer from repeatedly throughout their childhoods, potentially resulting in hearing/speech difficulties.

The opinion of the NPs in terms of the use and over use of antibiotics and the right prescription at their practice for the treatment of AOM is important because NPs are at the front line of patient care while performing thorough assessments. They have the responsibility and ability to diagnose patients, prescribe their treatments and medications, and take charge of their overall care of the patients. They have experience with prescribing antibiotics and take time to listen and discuss preventive health issues such as diet, smoking cessation and exercise with patients. They also have a very good patient outcome quality of care as well that should give NPs
the more viable opportunity to be able to discuss with patients the reason when antibiotics are not necessary (Jennings, Clifford, Fox, O’Connell, & Gardner, 2015).

About 73% of NPs responded that the feel adequately their education has prepared them for diagnosing and treating otitis media in children they are still overprescribing antibiotics contribute to antibiotic-resistant bacteria. As well as can also have side effects in patients such as stomach pain and diarrhea. The problem with overprescribing antibiotics is that that bacteria eventually will mutate and the antibiotic will no longer work on that bacteria. Often times the provider feel pressure by the parents and the prescriber do provide the unnecessary prescription. Providers need to continue educating patients and not give into demands to prescribed when not necessary. Inappropriate antibiotic prescribing in the treatment of AOM puts patients at increased risk for antibiotic resistance, exposes patients to unnecessary side effects, and may even lead to complications (Jennings, Clifford, Fox, O’Connell, & Gardner, 2015).

This project showed the experience of the NPs working at numerous facilities in the following of guidelines for Otitis media treatment. Survey result showed the 96.7% of NPs surveyed believe that antibiotics are unnecessarily prescribed, and 83.3% believe that antibiotics use should be delayed. These data helped inform efforts to improve antibiotic prescribing at the facilities. It may also serve as a needed guideline for the diagnoses and treatment of AOM.

The goal of this project was to provide clinicians obtain vital information and made must needed recommendations based on the best available evidence and to help clinicians deliver the best health care possible. NPs rely on scientific literature, in addition to their knowledge, experience, and patient preferences, to make inform decisions. These guidelines are statements that include recommendations intended to optimize patient care ad better outcomes.

The NPs in this project were able to use a mnemonic that be might be helpful to
memorize or remember information. By following the techniques in the mnemonic NPs are able to concentrate and organize this information and improve the ability to remember. Nurse practitioners must follow the same guidelines to obtain satisfying positive patient outcomes.

Antibiotic prescribing for Otitis Media is standardized across the USA to help reduce inappropriate prescribing and medication resistance. In order to avoid antibiotic resistance which is a major health care problem in this country. Inappropriate antibiotic prescribing, particularly for infections, has been blamed for driving the problem. Providers should never feel push to give children antibiotics for any illness unless is warrant to do so because there is always an increase that someday that is caused by germs that are resistant to antibiotics.
References


Duffin, C., & Griffin, M. (2015). Patients know nurses are less likely to prescribe antibiotics, study finds. *Nursing Standard, 29*(52), 11-11.


OTITIS MEDIA IN CHILDREN PREVENTING OVERUSE OF ANTIBIOTICS 35


Appendix A Survey for Nurse Practitioners

1. How long have you been a Nurse Practitioner?
   0 – 5 years
   6 – 10 years
   11 – 15 years
   15 – over

2. Do you follow current AAP/AAFP guidelines for the diagnosis and treatment of otitis media?
   Yes
   No

3. What is the first-line antibacterial agent to treat acute otitis media?
   Amoxicillin
   Penicillin
   Cefuroxime
   Cefprozil

4. Do you feel that the current guidelines for antibiotics are appropriate?
   Yes
   No

5. Do you feel that antibiotics are been over prescribe for Otitis Media?
   Yes
   No

6. Do you believe that prescription of antibiotics should be delayed for Otitis Media?
   Yes
   No

7. Do parents often demand antibiotics during the visit even when it is not recommended? Do you feel compel to prescribe antibiotics?
   Yes
   No

8. Are you aware that antimicrobial-resistant infections are associated with increased morbidity, mortality, and cost?
   Yes
   No

9. Have you ever prescribed prophylactic antibiotics to reduce the frequency of episodes of AOM?
   Yes
10. Would you ever prescribe a child that has a history of allergic to penicillin?
   Yes
   No

11. On a scale of 1-5, with 1 being the least, and 5 being the most, how do you rate your
    comfort level at diagnosing otitis media?

12. On a scale of 1-5, with 1 being the least and 5 being the most, how do you rate your com-
    fort level at utilizing the otoscope?

13. On a scale of 1-5, with 1 being the least and 5 being the most, how do you rate your com-
    fort level at utilizing tympanometry?

14. How many cases of otitis media do you estimate that you see each week?

15. On a scale of 1-5, with 1 being the least and 5 being the most, how do you rate your
    knowledge of AAP/AAFP guidelines for diagnosing and treating otitis media?

16. On a scale of 1-5, with 1 being the least and 5 being the most, how do you rate how ade-
    quately your education has prepared you for diagnosing and treating otitis media in chil-
    dren?
Appendix B

Provider Interventions: Results

How long have you been a Nurse Practitioner?

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
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<td>37.9%</td>
<td>11</td>
</tr>
<tr>
<td>6 - 10 years</td>
<td>10.3%</td>
<td>3</td>
</tr>
<tr>
<td>11 - 15 years</td>
<td>24.1%</td>
<td>7</td>
</tr>
<tr>
<td>16 and over</td>
<td>27.6%</td>
<td>8</td>
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answered question 29
skipped question 1
Appendix C

Provider Interventions: Results

Do you follow current AAP/AAFP guidelines for the diagnosis and treatment of otitis media?

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>86.7%</td>
<td>26</td>
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<tr>
<td>No</td>
<td>13.3%</td>
<td>4</td>
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answered question 30
skipped question 0
Appendix D

Provider Interventions: Results

What is the first-line antibacterial agent to treat acute otitis media?

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<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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<tbody>
<tr>
<td>Amoxicillin</td>
<td>93.3%</td>
<td>28</td>
</tr>
<tr>
<td>Penicillin</td>
<td>6.7%</td>
<td>2</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Cefprozil</td>
<td>0.0%</td>
<td>0</td>
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answered question 30
skipped question 0
Appendix E

Provider Interventions: Results

Do you feel that the current guidelines for antibiotics are appropriate?

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<th>Response Count</th>
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</tr>
<tr>
<td>No</td>
<td>10.3%</td>
<td>3</td>
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</table>

answered question 29

skipped question 1
Do you feel that antibiotics are been over prescribe for Otitis Media?

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
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<tr>
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<td>29</td>
</tr>
<tr>
<td>No</td>
<td>3.3%</td>
<td>1</td>
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</tbody>
</table>

answered question: 30
skipped question: 0
Appendix G

Provider Interventions: Results

Do you believe that prescription of antibiotics should be delayed for Otitis Media?

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<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
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<td>16.7%</td>
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answered question 30
skipped question 0
Appendix H

Provider Interventions: Results

Do parents often demand antibiotics during the visit even when it is not recommended? Do you feel compel to prescribe antibiotics?

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<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
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<td>Yes</td>
<td>53.3%</td>
<td>16</td>
</tr>
<tr>
<td>No</td>
<td>46.7%</td>
<td>14</td>
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</table>

answered question 30
skipped question 0
Appendix I

Provider Interventions: Results

Are you aware that antimicrobial-resistant infections are associated with increased morbidity, mortality, and cost?

<table>
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<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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</thead>
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<td>30</td>
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<tr>
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<td>0.0%</td>
<td>0</td>
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answered question 30
skipped question 0
Appendix J

Provider Interventions: Results

Have you ever prescribed prophylactic antibiotics to reduce the frequency of episodes of AOM?

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<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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<td>20.0%</td>
<td>6</td>
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<tr>
<td>No</td>
<td>80.0%</td>
<td>24</td>
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answered question 30
skipped question 0
Appendix K

Provider Interventions: Results

Would you ever prescribe a child that has a history of allergic to penicillin?

<table>
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<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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</thead>
<tbody>
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<td>0</td>
</tr>
<tr>
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<td>100.0%</td>
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answered question 30
skipped question 0
Appendix L

Provider Interventions: Results

On a scale of 1-5, with 1 being the least, and 5 being the most, how do you rate your comfort level at diagnosing otitis media?

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<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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<td>2</td>
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<td>3</td>
<td>23.3%</td>
<td>7</td>
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<tr>
<td>4</td>
<td>36.7%</td>
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<td>5</td>
<td>36.7%</td>
<td>11</td>
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</table>

answered question 30
skipped question 0
Appendix M

Provider Interventions: Results

On a scale of 1-5, with 1 being the least and 5 being the most, how do you rate your comfort level at utilizing the otoscope?

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<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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<tr>
<td>3</td>
<td>23.3%</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>30.0%</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>46.7%</td>
<td>14</td>
</tr>
</tbody>
</table>

answered question 30
skipped question 0
Appendix N

Provider Interventions: Results

On a scale of 1-5, with 1 being the least and 5 being the most, how do you rate your comfort level at utilizing tympanometry?

Answer Options

<table>
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<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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<td>6.7%</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>43.3%</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>20.0%</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>30.0%</td>
<td>9</td>
</tr>
</tbody>
</table>

answered question 30
skipped question 0
Appendix O

Provider Interventions: Results

How many cases of otitis media do you estimate that you see each week?

<table>
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<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 10</td>
<td>46.7%</td>
<td>14</td>
</tr>
<tr>
<td>11 - 20</td>
<td>46.7%</td>
<td>14</td>
</tr>
<tr>
<td>21 - 30</td>
<td>6.7%</td>
<td>2</td>
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<tr>
<td>31 - 50</td>
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answered question
skipped question
Appendix P

Provider Interventions: Results

On a scale of 1-5, with 1 being the least and 5 being the most, how do you rate your knowledge of AAP/AAFP guidelines for diagnosing and treating otitis media?

<table>
<thead>
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<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>13.3%</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>10.0%</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>30.0%</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>46.7%</td>
<td>14</td>
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</table>

answered question 30
skipped question 0
Appendix Q

Provider Interventions: Results

On a scale of 1-5, with 1 being the least and 5 being the most, how do you rate how adequately your education has prepared you for diagnosing and treating otitis media in children?

<table>
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<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
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<td>0.0%</td>
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</tr>
<tr>
<td>2</td>
<td>3.3%</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>10.0%</td>
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</tr>
<tr>
<td>4</td>
<td>13.3%</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>73.3%</td>
<td>22</td>
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answered question 30
skipped question 0
Appendix R AAP/AAFP Guidelines

1A: Clinicians should diagnose AOM in children who present with mild to severe bulging of the tympanic membrane (TM) or new onset of otorrhea not due to acute otitis externa.

1B: Clinicians should diagnose AOM in children who present with mild bulging of the TM and recent (less than 48 hours) onset of ear pain or intense erythema of the TM.

1C: Clinicians should not diagnose AOM in children who do not have middle ear effusion (MEE) (based on pneumatic otoscopy and/or tympanometry).

2: The management of AOM should include an assessment of pain. If pain is present, the clinician should recommend treatment to reduce pain.

3A: The clinician should prescribe antibiotic therapy for AOM in children 6 months and older with severe signs or symptoms.

3B: The clinician should prescribe antibiotic therapy for bilateral AOM in children 6 months through 23 months of age without severe symptoms.

3C: The clinician should prescribe antibiotic therapy or offer observation with close follow-up based on joint decision-making with the parent(s)/caregiver for unilateral AOM in children 6 months to 23 months of age without severe signs or symptoms. When observation is used, a mechanic must be in place to ensure follow-up and begin antibiotic therapy if the child worsens or fails to improve within 48 hours to 72 hours of onset of symptoms.

3D: The clinician should either prescribe antibiotic therapy or offer observation with close follow-up based on joint decision-making with the parent(s)/caregiver for AOM in children 24 months or older without severe signs or symptoms. When observation is used, a mechanic must be in place to ensure follow-up and begin antibiotic therapy if the child worsens or fails to improve within 48 hours to 72 hours of onset of symptoms.
4A: Clinicians should prescribe amoxicillin for AOM when a decision to treat with antibiotics has been made and the child has not received amoxicillin in the past 30 days or the child does not have concurrent purulent conjunctivitis or the child is not allergic to penicillin.

4B: Clinicians should prescribe an antibiotic with additional β-lactamase coverage for AOM when a decision to treat antibiotics has been made, and the child has received amoxicillin in last 30 days or has concurrent purulent conjunctivitis, or has a history of recurrent AOM unresponsive to amoxicillin.

4C: Clinicians should reassess the patient if the caregiver reports that the child’s symptoms have worsened or failed to respond to the initial antibiotic treatment within 48 to 72 hours and determine whether a change in therapy is needed.

5A: Clinicians should not prescribe prophylactic antibiotics to reduce the frequency of episodes of AOM in children with recurrent AOM.

5B: Clinicians may offer tympanostomy tubes for recurrent AOM.

6A: Clinicians should recommend pneumococcal conjugate vaccine to all children according to the schedule of the Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention, American Academy of Pediatrics (AAP), and American Academy of Family Physicians (AAFP).

6B: Clinicians should recommend annual influenza vaccine to all children according to the schedule of the Advisory Committee on Immunization Practices, AAP, and AAFP.

6C: Clinicians should encourage exclusive breast-feeding for at least 6 months.

6D: Clinicians should encourage avoidance of tobacco smoke exposure (American Academy of Pediatrics, 2013).
Appendix S – Mnemonic Tool

B – Bulging of the tympanic membrane > Diagnose with AOM.
E – Ear pain in the last 48 hours > Diagnose with AOM.
E – Effusion of the middle ear > Diagnose with AOM.
P – Pain must be assessed/treated.
P – Severe symptoms, 6-23 months old > Treat with antibiotics.
S – Bilateral AOM, 6-23 months old > Treat with antibiotics.
O – Observation or antibiotics if non-severe unilateral AOM, 6-23 months old.
O – Observation or antibiotics if non-severe AOM, older than 24 months.
A – Amoxicillin as first-line antibiotic if appropriate.
T – Assessment if symptoms worsen.
R – Tympanostomy tubes can be offered for recurrent AOM.
Appendix T Short Guidelines for Nurse Practitioners

Children with AOM (defined by a bulging TM) who are febrile (≥102°F) and moderately ill, middle ear effusion (MEE) or children who have severe otalgia or have been significantly ill for 48 hours should be medicated with antibiotics.

Children with acute symptoms of fever, ear pain or respiratory symptoms and TM air-fluid levels, MEE, and moderate or marked bulging of the TM, and erythema or hemorrhage, or a yellow TM, also needs to be medicated with antibiotics.

Children who have a mild or moderately bulging TM, and are mildly ill, alert, and have a low-grade fever (<102°F) and mild otalgia can be managed with observation of 24 to 48 hours. As long as the patient is reassess and make a decision based on clinical circumstances.
MEMORANDUM

To: Jose Silva, Nursing  
From: Human Research Protection Office  
Date: December 20, 2016

Project Title: An Evaluation of the Use of Antibiotics in Children with Otitis Media using Evidence Based Guidelines

IRB Number: 16-161

The Human Research Protection Office (HRPO) has evaluated the above named project and has made the following determination:

☐ The activity does not involve research that obtains information about living individuals.

☐ The activity does not involve intervention or interaction with individuals OR does not use identifiable private information.

☒ The activity is not considered research under the human subject regulations. (Research is defined as “a systematic investigation designed to develop or contribute to generalizable knowledge.”)

☐ The activity is determined to meet the definition of human subject research under federal regulations and requires submission of applicable materials for IRB review. Please submit a protocol to the IRB for review. The protocol should be submitted as:

☐ Exempt, Category # 2

☐ Expedited, Category #

☐ Full Board