INAPPROPRIATE ANTIBIOTIC PRESCRIPTION FOR TREATMENT OF ACUTE RESPIRATORY TRACT INFECTIONS IN PRIMARY CARE: BARRIERS, MISCONCEPTIONS, AND EVIDENCE BASED RECOMMENDATIONS FOR IMPROVEMENT

By

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A paper submitted in partial fulfillment of
the requirements for the degree of

MASTERS IN NURSING

WASHINGTON STATE UNIVERSITY
College of Nursing

MARCH 2013

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Abstract

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April 2013

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Antibiotic resistance is a major global threat. Bacterial infections once cured are causing more morbidity and mortality due to organisms developing resistance to commonly prescribed antibiotics. Inappropriate antibiotic prescribing puts patients at risk for unnecessary side effects and increases costs for an already burdened health care system in the U.S. Inappropriate antibiotic prescribing for acute upper respiratory tract infections in primary care is a specific factor leading to antibiotic resistant organisms. Primary care providers prescribe antibiotics inappropriately because of perceived barriers, such as having too little time for appointments and fear of decreased patient satisfaction with care due to no antibiotic prescription. Providers' misconceptions about the natural course of acute upper respiratory tract infection also leads to inappropriate prescribing. This paper explores barriers and misconceptions and how primary care nurse practitioners can incorporate evidence based guidelines in diagnosing and treating acute upper respiratory tract infection. By addressing provider barriers and misconceptions inappropriate antibiotic prescribing will be decreased.

To the Faculty of Washington State University

The members of the Committee appointed to examine the project of MICHELLE R. FROH find it satisfactory and recommend that it be accepted.

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Inappropriate Antibiotic Prescription for Treatment Of Acute Upper Respiratory Tract Infections in Primary Care: Barriers, Misconceptions and Evidence Based Recommendations for Improvement

Problem Statement

Inappropriate antibiotic prescribing is common among primary health care providers in America. In fact, Abbo et al.(2012) state that some studies indicate approximately 100 million antibiotic prescriptions are given every year for acute upper respiratory tract infection (ARTI), and of these, 50% are prescribed inappropriately for non-bacterial infections, or for groups of symptoms not necessitating an antibiotic. Inappropriate antibiotic prescribing almost wholly occurs during the treatment of acute upper respiratory tract infection (Werner & Deasey, 2009). Acute upper respiratory tract infection is defined by Werner and Deasey as, "several conditions, including the common cold, rhinosinusitis, pharyngitis, acute bronchitis, and acute otitis media" (p. 22). Inappropriate antibiotic prescription is defined as prescribing antibiotics for viruses or self- limiting bacterial infections that can cause acute respiratory tract infection (Colgan & Powers, 2001).

Inappropriate antibiotic prescribing poses a serious threat both nationally and globally due to the fact that many organisms have become resistant to commonly used antibiotics. The Center for Disease Control (CDC) and the World Health Organization (WHO) consider antibiotic resistant bacterial infections one of the biggest public health threats, and are predicting a day when antibiotics will no longer be useful for treatment of commonly cured, and serious bacterial infections (CDC, 2013). For example, according to the Center for Disease Dynamics, Economics and Policy (2009) S. pneumonia, which causes community acquired pneumonia and

bacterial meningitis and has traditionally been cured with narrow spectrum antibiotics, had a penicillin resistance rate in the U.S. of 8.4% in 2009. In 2010, rates of resistance in Washington State were 5.9%. To put this into perspective, first line treatment for meningitis caused by S. pneumonia will no longer be effective in about 8 out of 100 patients. Other serious bacterial infections, such as Mycobacterium tuberculosis, Clostridium difficile, and methicillin resistant Staphlococcus aureus that have historically been treated and cured with antibiotics are becoming drug resistant, and therefore causing higher morbidity and mortality rates (Abbo et al., 2012). Prescribing antibiotics to patients when they are not indicated also puts patients at risk for unnecessary side effects such as headache, thrush, abdominal pain, nausea, vomiting, and diarrhea, and often times, side effects can be worse than the actual infection itself (Mancini & Mandel, 2012. Patients taking antibiotics are potentially at risk for allergy and anaphylaxis, which is life threatening.

The definition of primary care as it applies to this paper comes from the World Health Organization (WHO), and is defined as "essential health care; based on practical, scientifically sound, and socially acceptable method and technology; universally accessible to all in the community through their full participation; at an affordable cost; and geared toward self-reliance and self-determination (University of Saskatchewan College of Medicine: Primary Health Care Research Group, 2011). Primary care settings are defined by the American Academy of Family Physicians (AAFP) as those first points of access into the health care system for a problem, as well as a home base for continued health care needs. Examples of primary care settings would be a family practice office or a pediatric clinic (AAFP, 2013). Primary care providers are the physicians, physician's assistants, and nurse practitioners that evaluate, diagnose, treat, and organize the care for patients in these settings.

Purpose

Primary care providers (PCPs) are responsible for correctly diagnosing and treating patients, but in the United States evidence regarding antibiotic prescriptive practice may be ignored in an attempt to maximize productivity and increase patient satisfaction. Other factors have been identified that contribute to inappropriate prescribing practices including patient demand and patient satisfaction (Lam & Lam, 2003). PCPs in primary care settings are perfectly situated to reduce inappropriate antibiotic prescription through two modalities. First, barriers to appropriate antibiotic prescription must be elucidated. Second, PCPs have several misconceptions about when antibiotics are indicated in ARTI which leads to inappropriate prescribing of antibiotics. If PCPs understand their prescribing practices are based upon misconceptions and not on evidence, inappropriate prescribing will likely be reduced.

By understanding the barriers and misconceptions regarding inappropriate antibiotic prescription for ARTI in primary care, PCPs can potentially reduce the number of antibiotic prescriptions for ARTI by half (Abbo et al., 2012). This would reduce antibiotic resistance, and therefore the risk for increased morbidity and mortality associated with antibiotic resistant bacterial infections. According to the CDC (2013), significant cost savings can occur individually for patients and for the larger health care system. This is a tremendous benefit for a financially strained health care system. The purpose of this paper is to disseminate information about the barriers and misconceptions causing inappropriate antibiotic prescription in ARTI in primary care, and to offer suggestions for improving the problem. Barriers, misconceptions, and suggestions for improvement will guide the literature review for this paper.

Method of Study

The literature search was completed using CINAHL, Pubmed, and Google Scholar. Primary inclusion criteria were the availability of full text in English and a publish date after 2002, except for those publications focusing on pathophysiology of infectious processes. This information does not change with the emergence of new research. Search terms and phrases included "respiratory infection antibiotics," "current antibiotic prescriptive practice," and "respiratory infection in primary care". The initial searches turned up 253 articles, and of these, 28 articles were reviewed. Since this paper focuses on the barriers and misconceptions about inappropriate antibiotic prescription in ARTI, as well as evidenced based recommendations, articles were sorted three groups: Barriers (6 articles), misconceptions (5 articles), and recommendations (17 articles). A general internet search was also conducted using Google and the search terms listed above. Patient education pamphlets were obtained from the AWARE website (6 articles) which was included in the improvement group. Current practice guidelines, which were included in improvement group, were obtained from the Infectious Disease Society of America website (2 articles) and the American Family Physicians website (2 articles). Barriers, misconceptions, and suggestions for improvement will all form the organizational framework for the literature review of this paper.

Literature Review

Introduction

The literature review revealed that inappropriate antibiotic prescription of antibiotics for ARTI in primary care occurs because of perceived barriers and misconceptions of PCPs. Barriers

stated by PCPs include worries of compromised patient satisfaction, patient demand for antibiotics, and lack of time to educate patients about appropriate antibiotic prescription. The misconceptions exist that lead PCPs to inappropriately prescribe including the presence of specific signs or symptoms such as pharyngitis, purulent nasal discharge or persistent cough.

Barriers

Three barriers leading to inappropriate antibiotic prescribing were identified in the literature review: patient satisfaction, patient demand and providers' time constraints. Providers stated inappropriate prescribing occurs because of the pressure to satisfy patients and meet their demands. PCPs also state pressure due to tight schedules and seeing many patients in a day. It is also thought that prescribing an antibiotic inappropriately for ARTI is faster than educating patients about why an antibiotic won't help. It is a way to stay on schedule for the day. These barriers were repeatedly listed by PCPs as reasons they knowingly prescribe antibiotics against best practice evidence for ARTI, but much of the literature showed that inappropriately prescribing an antibiotic for ARTI did not improve patient satisfaction, patient demand, or time savings.

Health care consumers in the United States want to be satisfied after spending money and time for a service. PCPs believe patients perceive value in the appointment by receiving something tangible, like a prescription, even when it is not indicated. The belief that patients associate antibiotic prescriptions for ARTI with value influences a PCPs prescribing practice in that they are more likely to prescribe inappropriately to maintain or increase patient satisfaction (Turnidge, 2001). This idea is not grounded in research, however. Turnidge identified a positive feedback loop that existed between the patient and PCP during ARTI visits in primary care. The provider believed the patient was expecting an antibiotic, perhaps because they had been treated

with an antibiotic in the past for ARTI and the infection resolved. Turnidge stated that this caused the PCP to inappropriately prescribe an antibiotic for fear of losing the patient's confidence, and possibly the client's business if he or she seeks another provider and receives an antibiotic there. In the end, the PCP inappropriately prescribed an antibiotic for ARTI with the assumption that the patient desired one, without actually knowing whether the patient wanted an antibiotic or not. This positive feedback loop is based solely upon a PCP's assumptions. The positive feedback loop Turnidge identified is evident in other research publications, although it is not labeled as such. Wong (2006) found that up to 1/3 of PCPs state that they believe their patients are seeking an antibiotic for ARTI, but none of these providers actually asked the patient what he or she wanted from the visit. Wong also found that when PCPs guessed what patients wanted from a visit for ARTI, most were wrong.

In a survey of patients and emergency physicians, Ong et al. (2007) investigated physician prescribing practices for ARTI in the emergency room and found that physicians were incorrect 73% of the time when guessing whether or not a patient wanted and antibiotic. Also, in most patients who did not receive and antibiotic, 92% still rated their satisfaction with the visit as high. These two findings illustrate how much the inappropriate prescription problem can be improved by abandoning the idea that patients link antibiotic prescriptions with satisfaction in a visit for ARTI. Emergency physicians and PCPs are likely to have different attitudes about prescribing based on the environment in which they practice. This must be taken into account before applying the findings of this study to primary care. Also, emergency room providers may site different stressors than PCPs, leading them to prescribe antibiotics inappropriately for ARTI.

Many PCPs assume patients are more satisfied when they receive antibiotics for ARTI, and although sometimes this assumption is incorrect, research has shown that some patients

demand them during an office visit. For example, Wong found that up to 50% of pediatric patient caregivers do demand antibiotics for a child with ARTI. The demand for antibiotics can put pressure on a PCP to inappropriately prescribe in order to meet the patient's demands and keep them coming back to the clinic. Also, Stivers, Mangione-Smith, Elliott, McDonald, and Heritage (2003) found that patients who expected an antibiotic received one 45% more often than those patients not expecting one. Furthermore, PCPs have been found to fear losing a patient's confidence, especially if that patient has received an antibiotic for ARTI in the past (Turnidge, 2001). In summary, patient demand for antibiotics does exist and creates a barrier for PCPs prescribing practices for ARTI.

Patient demand can occur because of several factors including misinformation about the natural course of ARTI and receiving antibiotics in the past for ARTI. Imagine a patient is sick with ARTI and presents to their PCP on day 2 or 3 of the illness. If the ARTI runs its natural course the patient will continue to have worsening symptoms until about day 3 or 4 of the illness, and then will improve over approximately 10 to 14 days (DiPiro et al., 2008). When patients present to the PCP for ARTI and receive an antibiotic, the improvement expected due to the natural course of the illness will occur exactly with the initiation of antibiotics. Patients then believe that ARTI does improve with antibiotics. In fact, people have historically believed that ARTI will not improve without antibiotics. This belief was demonstrated in one study examining the effectiveness of antibiotics in treating bronchitis. In this study, 60% of patients randomized to the non-antibiotic arm of the drug trial actually dropped out of the study because they would not be given antibiotics (Colgan & Powers, 2001).

Demand for antibiotics is intergenerational. By studying college students with ARTI, Haltiwanger, Hayden, Weber, Evans, and Possner (2001) found a high rate of demand in college

age patients. This research reported that in a group of college students visiting the university health clinic for ARTI, 66% said they expected a prescription, and of those who said they expected a prescription, 85% said they wanted an antibiotic. Of those who expected an antibiotic, 20% had a specific one in mind.

The Rowbotham et al. (2012) research found that often times, patients demanding antibiotics for ARTI are not trying to treat the bacterial infection, but rather symptoms such as pain and lost sleep. Reasons why patients demand antibiotics for ARTI range from having a very bad cough, wanting a quick fix, pain relief, inability to go to work due to illness, or belief that the illness was bacterial in nature. Some patients assume only bacteria can cause the severity of symptoms they are experiencing (Rowbotham et al., 2012). PCPs are easily able to treat these symptoms without antibiotics by prescribing symptom control medications and non-medication symptomatic relief. PCPs can also avoid prescribing antibiotics inappropriately by educating thoroughly about the natural course of the illness, and how antibiotics are ineffective in ARTI.

Primary care providers routinely see more than 20 patients in a day, with 15 minutes or less spent with each patient (Chen, Hollenberg, Michelen, Peterson, Casalino, 2011). Prescribing antibiotics inappropriately for ARTI has been a method used by busy PCPs who perceive a lack of time to explain why antibiotics are not necessary, but one article in the literature review demonstrates exactly the opposite. When both types of visits were examined, those where patients received antibiotics for ARTI and those who did not, prescribing an antibiotic wasn't found to decrease appointment times (Hare, Gaur, Somes, Arnold, and Shorr, 2006). Lack of time has not actually been shown to be a barrier, but perceived lack of time is. This is very important information because if PCPs understood time was actually not saved by prescribing and antibiotic in ARTI they may forgo prescribing in exchange for educating patients about

ARTI. Patient education could include the usual viral etiology, natural course of the disease, comfort measures for home, and when to return to the clinic.

Misconceptions

Sputum color, whether produced nasally or from a cough, is thought by both patients and PCPs as an indicator of bacterial etiology for ARTI (Johnson, Hampson, & Hampson, 2008). Johnson et al. collected 288 sputum samples from patients presenting with ARTI. Of these, 144 were considered by the test laboratory to be sufficient samples for gram staining and culturing. They found that darker sputum color did not correlate with a higher likelihood of bacterial infection or of a specific type of bacteria. In fact, culturing the samples resulted in growth of Moraxella catarhallis, Streptococcus pneumonia, and Hemophilis influenza, all bacteria known to colonize the respiratory tract in healthy people. The sputum colors were compared to numbers of antibiotic prescriptions. It was found that the darker the sputum, the more likely the PCP was to prescribe an antibiotic, especially if the sputum was green. In reality, both viruses and bacteria are capable of producing colored sputum. The coloring in the sputum comes from sloughed epithelial cells, expended white blood cells, and from a reaction of inflammatory chemicals with tissue, all of which occur in both bacterial and viral infection (Johnson et al., p. 452). Sputum color, therefore, is not a reliable indicator of bacterial presence in ARTI. Differentiating between viral and bacterial sinusitis is difficult, as they both present with similar symptoms, including purulent nasal discharge.

Pharyngitis is also a common symptom of patients presenting to primary care for ARTI. Patients and PCPs both have a misconception that sore throat is an indication of bacterial infection, likely due to familiarity with “strep throat”. According to Choby (2009), up to 20% of patients from all age groups presenting with pharyngitis actually have Group A Beta-Hemolytic

Strep and can benefit from antibiotic treatment. The other 80% with pharyngitis are infected with a virus and will not benefit from an inappropriate antibiotic prescription. There are several viruses that cause 80% of pharyngitis cases, including rhinovirus, coronavirus, adenovirus, herpes simplex, influenza, parainfluenza, and Epstein-Barr (Dipiro et al., 2008).

Ear pain and ear pulling lead parents to suspect their child has an ear infection, but these findings are non-specific for otitis media (Mancini & Mandel, 2012). Although otitis media doesn't always necessitate an antibiotic, this diagnosis is still the cause of over 50% of antibiotic prescriptions in children (Mancini & Mandel, 2012). This problem occurs also because PCPs frequently diagnose otitis media with effusion as acute otitis media. The distinction is important because only certain cases of acute otitis media (AOM) warrant an antibiotic prescription. This is problematic because of the growing concern for increased bacterial resistance in S. pneumonia, a common organism in AOM. For example, Dipiro et al.(2008) states that in research conducted in 2001, 35% of all S. pneumonia isolates were penicillin resistant. Inappropriate antibiotic prescriptions for ear pain, a common symptom in ARTI, can be reduced by better understanding of how to correctly diagnose and treat otitis media.

An injected or dull tympanic membrane and middle ear effusion are other misconceptions held by some primary care providers that bacterial infection is present in children with ARTI. In children, the eustachian tube is not angled, so when fluid collects in the middle ear, as it often does during ARTI, it cannot drain. The fluid accumulation in the middle ear is to be expected, as part of the natural course of viral ARTI. Ear pulling, also assumed to be a clinical indicator of otitis media has been found to be a non-specific symptom of otitis media and otalgia (Ramakrishnan, Sparks, & Barryhill, 2007). Many factors can cause injection in the tympanic membrane, such irritation by the accumulation of fluid, presence of a virus, and crying.

Nonetheless, the warm, dark space is a perfect growing medium for bacteria, usually M. catarrhalis, H. influenza, or S. pneumonia, all bacterial infections that even when they are present, will resolve spontaneously without treatment in 80% of patients (Dipiro et al., 2008).

Cough lasting longer than three days has historically been a misconception leading PCPs to believe ARTI is caused by bacteria (Colgan & Powers, 2001). Coughing due to acute bronchitis is a response to irritation of the bronchioles or trachea by mucus or tissue inflammation from local infection. When infection is present it is usually caused by the same viruses that cause pharyngitis and sinusitis. In the absence of super-infection or obstructive lung diseases, bronchitis is always self-limiting (Dipiro et al., 2008). Infection of the airway causes edema, epithelial shedding, and mucus accumulation (Johnson et al., 2008). The cilia usually responsible for mobilizing secretions become impaired, and so coughing is the only way to clear the secretions. In order for healing to occur, secretions must be cleared, edema has to resolve, and the cilia have to start functioning properly again. Not surprisingly, prolonged coughing, sometimes for as long as three weeks, is the natural progression of acute bronchitis in ARTI because repair of the tissues lining the airway takes this long. During the healing time, the airway tissue is hyper-responsive and the cough reflex is induced easily, for example by dust particles, or by cool or dry air. Since viruses are usually the cause of acute bronchitis, antibiotic prescription is unnecessary.

The findings from published literature are important revealing that some patients have been prescribed antibiotics for ARTI inappropriately in the past, which reinforces the patients' beliefs that antibiotics are always necessary in ARTI. These beliefs cause desire for antibiotics, and therefore the demand PCPs experience in the primary care setting. Lack of understanding about indications for antibiotic use compounds the problem. This creates a barrier for PCPs to

prescribe antibiotics appropriately because meeting patients' demands is as easy as writing a prescription inappropriately. The fact that parents associated antibiotic prescriptions as validation that their child was sick, or that patients assume only bacterial infections can cause uncomfortable symptoms also creates a barrier. PCPs who do not prescribe inappropriately in those circumstances could be viewed by parents and patients as uncaring, or worse, viewing the decision as malpractice.

In summary, the current state of the science does not support that lack of time and decreased patient satisfaction are really barriers to appropriate prescribing, but rather are perceived to be barriers by PCPs. Furthermore, PCPs have misconceptions that lead to inappropriate antibiotic prescribing in ARTI. This is due to a poor understanding of basic pathophysiology of ARTI. Understanding the barriers don't actually exist and reviewing the basics of pathophysiology of ARTI for providers and using the information to educate patients could lead to fewer inappropriate antibiotic prescriptions for ARTI in primary care.

Recommendations.

Evidence based treatment guidelines. Treatment guidelines have been developed for PCPs to use when deciding to prescribe antibiotics for patients presenting to primary care with ARTI. In a data analysis of 16,899 office visits for ARTI, Murphy, Bradley, and Byrne (2012) found that 76% of PCPs prescribed antibiotics inappropriately, although most stated knowledge that guidelines existed. The study also showed that when PCPs did prescribe inappropriately, wide spectrum antibiotics were chosen as treatment, making the development of bacterial

resistance more likely. Decreasing inappropriate antibiotic prescription can be accomplished by PCPs who adhere strictly to guidelines when treating a patient with ARTI, because none of the treatment guidelines support use of antibiotics except for secondary complications as listed by Werner and Deasey (2009).

Guidelines from the American Academy of Family Physicians are discussed in this clinical review because of the specific focus on primary care. The AAFP uses the strength of recommendation rating system for its treatment guidelines. Evidence rating A means the guideline is supported by consistent, high quality evidence. Evidence rating B means findings in large studies have been inconsistent or the studies completed are not of adequate quality or rigor to support the recommendation. Evidence rating C means that the practice is not supported by evidence, but that in some cases, the recommendation is used in the clinical setting based upon consensus, disease-oriented evidence, usual practice, or expert opinion (Ebell et al., 2004).

Common cold. The American Academy of Family Physicians (AAFP) provides guidelines for the treatment of common cold, which falls under the umbrella of ARTI, and is a collection of symptoms including rhinorrhea, sinus congestion, and cough. The AAFP treatment guidelines for common cold have been compiled into a clinical review by Simasek and Blandino (2007). The only evidence rating A clinical recommendation regarding common cold was that due to the viral etiology of the disease, antibiotics will not improve symptoms or decrease symptom duration. Also, there are no antivirals to treat rhinovirus which is the usual culprit of common cold. Several level B recommendations were made for alleviation of symptoms such as saline nasal spray to alleviate nasal congestion and dextromethorphan to suppress cough in adults. There are several symptomatic treatments that are not recommended by AAFP including using codeine or other narcotics for cough suppression, or the use of antihistamines for sneezing.

Cough and acute bronchitis. If a patient presents with cough as a chief complaint, the diagnosis is most likely acute bronchitis (Albert, 2010). Albert states that although viruses are largely responsible for acute bronchitis, 2/3 of patients with the diagnosis still receive an inappropriate antibiotic prescription. Other more serious disease processes also present with a chief complaint of cough including pneumonia, pertussis and asthma, and so these must first be ruled out during the history of presenting illness and physical before treatment for acute bronchitis commences. Although viruses are responsible for up to 90% of all bronchitis cases, the AAFP recommends not using antibiotics with acute bronchitis with an evidence rating B. Their recommendation includes that people at risk for developing pneumonia secondary to the bronchitis should receive antibiotics at the time of diagnosis. These patients are those over 60, and the immune compromised.

Symptomatic relief for bronchitis depends on the specific clinical findings within a patient. The use of Echinacea, inhaled beta agonists, episodic corticosteroids, and dextromethorphan are recommended with an evidence rating B. The use of dark honey as a cough suppressant in children over a year old has shown in studies to cause modest improvement in symptoms over those who don't use it. Although many of these therapies are not shown to improve symptoms in all patients in all studies, these therapies do have a place in treatment for acute bronchitis

Acute otitis media. Acute otitis media is the most common diagnosis of children ages 3-6, and the reason for 30 million primary care visits annually, with annual costs over $3.5 billion dollars (Mancini & Mandel, 2012). Although up to 80% of cases of AOM will resolve spontaneously, most patients with the diagnosis still receive antibiotics. The reason for this is multifactorial, but because AOM occurs almost always in children, and parents do not like to see

their child uncomfortable, demand for antibiotics is high with this diagnosis. Mancini & Mandel state that in their research, up to 90% of parents demanded antibiotics for their child with presumed AOM. PCPs also misdiagnose AOM frequently.

Acute otitis media (AOM) is a secondary complication of ARTI. Although AOM is caused by bacteria most of the time, antibiotics are not indicated for all cases because up to 80% of cases will resolve spontaneously (Mancini & Mandel, 2012). In an attempt to decrease inappropriate antibiotic prescription in AOM, the CDC released strict guidelines for the diagnosing and treatment of AOM. The process has been divided into two categories: Otitis media with effusion and acute otitis media. Otitis media with effusion is never an indication for antibiotic treatment and AOM is sometimes an indication for antibiotic treatment (CDC, 2004). Since PCPs have a difficult time differentiating AOM with other ear findings, the CDC recommends always using pneumatic otoscopy or tympanometry to determine if effusion is present. If no effusion is present, no antibiotic treatment is necessary, even if the tympanic membrane is erythematous, or the child has been pulling on his or her ear. If effusion is present, several other factors must be considered to help the PCP diagnose AOM or otitis media with effusion. If effusion is present, and the tympanic membrane is immobile but other signs of infection are not, such as sudden onset of symptoms, fever, dull and immobile, and otorrhea, the patient is diagnosed with otitis media with effusion. Antibiotics are not recommended by the CDC for otitis media with effusion (2004). The CDC has three requirements for the diagnosis of AOM: acute onset of symptoms, middle ear effusion, and signs and symptoms of middle ear inflammation. Otorrhea is a common middle ear finding during an ear exam for AOM, as are air-fluid levels, or the presence of bubbles. The sudden onset of fever and otalgia are also present in AOM, although fever will not present in all patients. Finally, signs or symptoms of

middle ear inflammation will be present in AOM, such as an erythematous tympanic membrane or otalgia.

Certain cases of AOM do not require antibiotics but some should receive treatment due to the risk for complications such as choleasteatoma and mastoiditis. For any patient less than 6 months with AOM should be treated with antibiotics. For patients between the ages of 6 months and 2 years of age, if the diagnosis of AOM is certain (meaning it meets the three criteria during diagnosis), antibiotics should be prescribed. For any patient over age 2, observation and symptomatic relief is recommended in all but severe illness. The CDC defines severe illness as a fever above 39 degrees Celsius and moderate to severe otalgia. Observation is a reasonable management plan for certain patients due to the high spontaneous resolution rate of AOM (up to 80%).

Primary care providers have a great opportunity to decrease inappropriate antibiotic prescription for ARTI during the diagnosis and treatment of AOM. Many caregivers and parents are apprehensive about observation as a management approach to a child with AOM. For these patients, a safety net prescription approach can be taken, whereby the caregiver is given a post-dated prescription for an antibiotic with instructions to fill it only if there is no improvement in symptoms, or if symptoms become worse by a specified date. A safety net prescription approach has been shown to maintain patient (caregiver) satisfaction, and decrease inappropriate antibiotic prescriptions by 20% in AOM (Mancini & Mandel, 2012). In their research Mancini and Mandel found that otalgia was actually the most distressing symptom for patients with stated AOM and caregivers were found to be satisfied after the patient was treated using Tylenol or ibuprofen. The safety net prescription also gave parents a sense of security knowing the antibiotic was available if the patient worsened or did not improve. Mancini and Mandel do

recommend that the prescription be dated within 3 days of the office visit to prevent future use. Pain relief, observation, and safety net antibiotics should only be used in caregivers capable of monitoring and interpreting symptoms of the patient.

When antibiotic treatment is indicated for AOM, the AAFP recommends narrow spectrum antibiotics as first choice therapy. Amoxicillin is the first line choice due to its appropriate coverage, safety profile, and low cost. A dose of 80-90 mg/kg given in two divided doses per day for 10 days is the standard treatment. When PCPs adhere to the guidelines for prescribing, only with certain cases of AOM, and use only narrow spectrum antibiotics there will be less risk for antibiotic resistance than if a wide spectrum antibiotic is used. In fact, if the guidelines for treating AOM were adopted by PCPs across the country, the CDC estimates that inappropriate antibiotic prescription could be decreased by 8 million prescriptions per year (CDC, 2004).

Pharyngitis. Sore throat, or pharyngitis, is another common ARTI chief complaint of patients presenting to primary care. As with other specific ARTI complaints, viruses predominate as the causative agent in pharyngitis. Viral pharyngitis most often presents with other signs and symptoms such as coryza, conjunctivitis, rhinorrhea, vesicles on the oral mucosae, cough, nausea, vomiting, or diarrhea. Causative viruses include rhinovirus, coronavirus, adenovirus, herpes virus, influenza virus, parainfluenza virus, and Epstein-Barr virus (Dipiro et al., 2008). One common bacteria responsible for pharyngitis is Group A Beta Hemolytic Streptococcus (GABHS), also known as S. pyogenes. It is responsible for up to 30% of pharyngitis in patients aged 3-15, and up to 15% in those over age 15 (DiPiro et al., 2008). The illness often occurs in clusters, with transmission occurring between family members and groups of kids at school. Pharyngitis can rarely be caused by other organisms, such as N. gonorrhea C. pneumonia,

Epstein-Barr, and diphtheria, and because of this, a good review of systems is paramount when diagnosing patients.

Pharyngitis with other signs or symptoms of viral illness can be presumed viral. There are several findings that do increase the likelihood of a GABHS diagnosis such as swollen tonsils or tonsils with exudate, absence of cough, erythematous oropharynx, palatal petechiae, strawberry tongue, cervical adenopathy, and abrupt onset of fever. As stated, none of these signs is evidence alone, or with others that GABHS is the causative agent. Also, the CDC warns that many cases of pharyngitis with tonsillar exudates or adenopathy are viral (2012).

Some PCPs might be tempted to use rapid antigen detection testing (throat swabs) in all patients with pharyngitis, but this presents some problems. First, it increases cost and uses resources that could be saved by using sound clinical judgment and the Centor scoring. Second, "strep swabs" have a high sensitivity, around 90-99%, but a very low specificity, around 70% (Choby, 2009). To decrease inappropriate antibiotic prescription due to over-diagnosis of GABHS from swabs, the AAFP recommends using Centor Criteria when diagnosing and treating patients with pharyngitis (Vincent, Celestin, & Hussain, 2004). This can decrease inappropriate prescribing by maximizing the likelihood that a case of pharyngitis is caused by GABHS.

Centor Scoring can be completed on patients with pharyngitis by adding up points from the following: Temperature greater than 38 degrees Celsius (1); absence of cough (1); swollen, tender anterior cervical nodes (1); tonsillar swelling or exudate (1); age 3-14 (1); age 15-44 (0); age 45 or older (-1). Patients with a score of zero to 1 are at lowest risk for having GABHS (1-10% infection in this group). A throat swab is not recommended for these patients, and antibiotics are never prescribed. Patients with a score of 2 or 3 have a moderate likelihood of having GABHS (11-35%). A throat swab should be performed on these patients, and a positive

result is an indication for antibiotics. A negative result should be sent for a culture due to low sensitivity. The PCP must make a decision to treat this patient with antibiotics while awaiting culture results. This decision should be based upon the patient's exposure to other people diagnosed with GABHS, as well as other symptoms indicating a viral pathology, such as conjunctivitis or diarrhea. Patients with a score of 4 or higher are at the highest risk for GABHS (51-53%). The Centor criteria state swabbing is still necessary, but that empiric treatment can also be considered if awaiting culture results.

The AAFP recommends the use of penicillin for confirmed cases of GABHS with an evidence rating of A. Penicillin is the first line therapy because of its narrow spectrum, effectiveness, safety profile, and low cost. The AAFP suggests using amoxicillin in children due to palatability (Choby, 2009). Choby (2009) states that treatment failure rates have increased for penicillin-treated GABHS. In the 1970s treatment failure was around 10%, but in the last decade it is closer to 30%. For this reason the AAFP recommends the use cephalosporins in patients who have failed penicillin treatment. Use of broad spectrum antibiotics in GABHS is not recommended because of the risk of causing greater antibiotic resistance.

For those patients not meeting Centor criteria for a throat swab, or testing negative, the diagnosis is almost always viral pharyngitis. Driel et al. (2006) found that patients are most concerned about relief of throat pain, and not necessarily eradication of possible bacteria. For this, non-opiod analgesics can be prescribed or recommended over the counter.

Sinusitis. Acute sinusitis is the 5th most common reason antibiotics are prescribed in primary care and the estimated annual cost of acute sinusitis for testing and treatment is around $3 billion (Aring & Chan, 2011). One in 7 adults will be diagnosed with acute sinusitis each year.

Acute sinusitis, also known as rhinosinusitis, is usually concurrent with a cold, and therefore is caused by a virus. Acute sinusitis can last up to 4 weeks which is important information for PCPs to know because antibiotic treatment decisions are often made based upon the duration of the sinusitis. The inflammation and edema in the nasal mucosae can block drainage of the sinuses, which provides a perfect breeding ground for viruses, but also for bacteria. The buildup of fluid and the edema of the sinuses can lead to significant pressure. The symptoms of sinusitis are perceived nasal obstruction, rhinorrhea, and facial pain, especially with forward bending (DiPiro et al., 2008). Differentiating between the types of sinusitis is important because not all should be treated with antibiotics.

Many PCPs inappropriately prescribe antibiotics for a patient with acute sinusitis because he or she has purulent nasal discharge, but this has not been found in the research to correlate with bacterial etiology (Aring & Chan, 2011). If the acute sinusitis continues past 10 days, and if it progresses to any other classification of sinusitis the AAFP recommends the PCP treat the patient with antibiotics. This has been recommended with an evidence rating B. The reason the evidence rating is B and not A is because in most cases of common cold with acute sinusitis, mild rhinorrhea will occur for up to 14 days, but other symptoms of sinusitis will be absent. Acute sinusitis also occurs most frequently during the winter months along with other types of viral ARTIs, so the presence of rhinorrhea for up to a month could also be due to superimposed viral infections. Often times, a patient will have cold symptoms for a few days before developing acute sinusitis. When presenting to primary care, the patient will state they have had the sinusitis for 10 days, instead of 5 when the actual sinusitis symptoms began. It is very important then, to elicit accurate information from patients before misdiagnosing bacterial sinusitis, and inappropriately prescribing antibiotics.

For those cases of cute sinusitis caused by bacteria, the most common organisms are S. pneumonia. H. influenza or M. catarrhalis. In these circumstances treatment is the same as AOM. The AAFP recommends amoxicillin with an evidence rating A as first line treatment for sub-acute, recurrent, or chronic sinusitis.

Acute sinusitis can be quite bothersome for patients, and for this reason the AAFP recommends symptomatic relief with an evidence rating of A. Analgesics, oral decongestants, intranasal corticosteroids, and saline nasal irrigation are all recommended for relief of congestion, inflammation, and drying of the mucosae respectively. As with any ARTI, the AAFP recommends rest and adequate fluids for acute sinusitis to assist the immune system when ill.

Patient validation. The literature review identified that patient satisfaction was not increased with an inappropriate antibiotic prescription (Ong et al., 2007). This is important information to disseminate to PCPs because if patient satisfaction is not at risk, and PCPs do not fear losing business, inappropriate prescriptions could decrease. Ong et al. found that patient satisfaction was actually greatest when patients left the visit with a better understanding of ARTI, as opposed to having been given an antibiotic prescription. This research is evidence for PCPs that thorough patient education could be one of the best tools for decreasing inappropriate antibiotic prescription while increasing patient satisfaction.

Many patients may be seeking value for their money and time spent on an appointment for ARTI, only to leave without feeling satisfied. This value can be different for all patients, but it basically means the patient feels like they received something from the visit, whether it is empathy, the PCPs patience, or giving them full attention and time. One way PCPs can educate patients and give them something tangible without prescribing an antibiotic is by sending the patient home with what the CDC calls “cold kits”. Cold kits can be made by clinic staff and can

include CDC Get Smart pamphlets, cough drops, and a small bottle of Gatorade. Cold kits can increase satisfaction in patients desiring something tangible from the visit.

The approach PCPs take with patients when educating about ARTI can direct patient satisfaction through what Colgan & Powers (2001) called "patient validation". They found that often times when patients received an antibiotic for ARTI it was validation that they were sick and that the illness could be treated. In order to decrease inappropriate antibiotic prescriptions, PCPs can use patient validation in other ways. Colgan and Powers suggested specific things to say when conducting an office visit for ARTI that increases patient validation. When a patient complains of ARTI symptoms, PCPs should not discount the illness as "just a virus", as this gives the patient the impression that they should recover faster than if the infection was caused by bacteria. Some patients may then believe they've just wasted time and money on "just a virus", a trivial matter. Colgan and Powers suggest personalizing the visit and not lumping single patients into a whole population when educating. This helps the patient feel the PCP is concerned about them and wants to help. For example, "antibiotics won't work for a viral infection" lumps the patient into a whole population, whereas "we know antibiotics won't work for you because…" personalizes the visit. Personalization can also occur by prescribing symptomatic relief such as pain relief, decongestants, and humidification. This assures a patient the PCP believes they are sick and wants to help. Finally, patients are familiar with common medical diagnoses such as bronchitis and sinusitis. Explaining their illness and attaching descriptive words can help a patient better understand that viruses do cause illnesses as bad as the one he or she is experiencing. For example, explaining to a patient that he or she has "viral bronchitis" can offer validation.

Patient education. ARTI is also the cause of missed school and work for parents with sick children. Patients should be educated that normal adults develop 4-6 ARTIs per year, and that normal children will develop 6-12 ARTIs per year (CDC, 2013). All patients with ARTI should be encouraged to wash hands frequently because the best way to prevent the illness is through vigilant hand hygiene. Avoiding sick people is also another way patients can avoid getting ARTI. Finally, PCPs should recommend pediatric patients be vaccinated against S. pneumonia as recommended by the vaccine schedule. This is important for prevention of acute otitis media and sinusitis caused by S. pneumonia.

The CDC (2012) states that multidimensional patient education can reduce inappropriate antibiotic prescribing by up to 18.5%. Not all patients benefit from face to face education in the exam room, and some may need visual tools to help them understand the material. Patient education can be facilitated with the use of handouts, or posters in waiting rooms of primary care clinics. The CDC offers take home pamphlets for patients from the Get Smart campaign, which can be found at http://www.cdc.gov/getsmart/. The pamphlets describe ARTI briefly, what to do at home for treatment, and when to return to primary care if improvement is not occurring. Similar one page educational sheets can be printed as well, and posters can be printed free of charge for use in clinic waiting rooms and exam rooms. The Alliance Working for Antibiotic Resistance Education (AWARE) offers similar tools for office use. Both the CDC and the AWARE materials are offered in English and Spanish. The AWARE tools can be accessed online at www.aware.md. If a patient sees a poster explaining why antibiotics are not indicated for ARTI before the visit, he or she might have different expectations for the outcome of the visit, which might decrease patient demand. The CDC and AWARE tools are all written at an 8th

grade level, but if it is determined that a particular patient desires more in depth knowledge about ARTI, he or she could certainly be referred to other research based websites.

Through a survey of patients at a primary care office, McNulty, Boyle, Nichols, Clappison, and Davey (2007) found that 79% of patients understood that antibiotic resistance was a problem. These researchers found that 37% of patients did not know that the common cold is not cured by antibiotics. These findings demonstrate that patient education about the cause of ARTI is necessary.

During an acute ARTI visit in primary care, patient education should include the viral nature of ARTI, and the ineffectiveness of antibiotics for viral illness. The difference between bacteria and viruses should be stressed. Of crucial importance is to educate patients that the body's immune system is very capable of curing a viral infection in most healthy people. Patients will be reassured that although antibiotics are not prescribed the illness will resolve eventually and will not cause significant harm or death.

Implications for Advanced Practice Nursing

Advanced practice nurses are educated to base their practice, and therefore prescribing patterns on evidence. In 2011 there were 1,717 nurse practitioners practicing in primary care roles in Washington State (Office of Financial Management, 2012). As nurse practitioners continue to emerge as leaders in primary care, and as their influence continues to shape and change how health care is delivered, they have a potential to decrease inappropriate antibiotic prescribing by following the clinical guidelines discussed in this paper. The evidence in the literature review shows that improvements can be made through the use of evidence based guidelines when diagnosing and treating every patient with ARTI, and by understanding the research about the misconceptions and barriers leading to inappropriate prescribing. Advanced

practice nurses in primary care settings can reflect on their own prescribing habits for antibiotics and apply the findings of this paper to their practice. Using this evidence in practice will reduce antibiotic resistance, as well as morbidity and mortality associated with resistant infections.

Inappropriate antibiotic prescribing affects quality of care, patient safety, and health care costs, all of which are goals of advanced practice nurses as stated by the American Academy of Nurse Practitioners (2012). The World Health Organization defines quality care as effective, efficient, accessible, acceptable, patient centered, safe, and equitable. The literature review reports that symptomatic relief can maintain quality care while avoiding prescribing inappropriately. Spending adequate time with patients, educating about the illness, handing out take home educational pamphlets, and prescribing symptom relief all show the patient the advanced practice nurse is empathetic and supportive. Withholding antibiotics for when they are only truly indicated reduces the risk that a patient will have a reaction, and therefore increases patient safety while minimizing antibiotic resistance. Finally, advanced practice nurses are perfectly positioned on the frontlines to decrease cost associated with inappropriate antibiotic prescribing, and this benefits the financially stressed American health system. Instant cost savings for the health care system comes from the judicial prescription of antibiotics for ARTI. It could be said that prescribing antibiotics for ARTI based upon guidelines is an indicator of quality health care.

Conclusion

The problem of inappropriate antibiotic prescribing for ARTI in primary care can be improved as noted by the National Ambulatory Medical Care Survey from 2010. Their data showed that overall antibiotic prescribing dropped from 13.8 prescriptions per 100 office visits to

12.0 prescriptions per 100 office visits comparing 1997-98 to 2005-06 with a 13% reduction in overall antimicrobial prescribing (CDC, 2012). Although improvements have been made, inappropriate prescribing still persists. The author of this paper was surprised at the lack of research conducted in the U.S. for the problem relative to its pervasiveness in primary care and threat to global health. A large body of research exists which was conducted in other countries. Those findings were omitted from this paper because other countries that have a different pay structure for health care would have made the research conducted in these countries difficult to apply to the U.S. Many countries leading the way in research for inappropriate antibiotic prescribing in ARTI provide universal coverage for their citizens, such as England and Canada. People's expectations, beliefs, and demands may be affected by how they access and pay for health care. For this reason, further research should focus on the relationship of patient finances, satisfaction and demand for antibiotics in ARTI. This research should be completed in the U.S..

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