ANTIBIOTICS IN PRIMARY CARE: FACTORS LEADING TO INAPPROPRIATE PRESCRIBING

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ANTIBIOTICS IN PRIMARY CARE

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Abstract

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Purpose: The purpose of this paper is to explore common factors leading to inappropriate antibiotic prescribing in the primary care setting. The research demonstrated that nearly half of all antibiotic prescriptions given in primary care are unnecessary; and often there are extraneous factors influencing the decision to prescribe antibiotics. A discussion of antibiotic resistance, current research and a review of the literature assisted in an analysis of potential barriers to prudent antibiotic prescribing. This paper examines these barriers to judicial antibiotic prescribing and offers solutions to assist primary care providers in making the best choice for their patients based on current research rather than patient expectations.
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Antibiotics in Primary Care: Factors Leading to Inappropriate Prescribing

Since the discovery of penicillin in the early 20th century, antibiotics have played an integral role in the treatment of disease around the world (Ellis, 2010). The use of antibiotics has not only provided cures to many diseases, but has been instrumental in nearly doubling the average human lifespan compared to previous centuries (Owens, Shorr & Deschambeault, 2009). According to the Center for Disease Control (CDC, 2010) over the past 70 years antibiotics have been used to treat disease and when taken correctly have proven to be greatly beneficial to the patient. In 2010, the CDC identified antibiotic resistance as one of the top emerging global concerns of our time, specifying several common pathogens as potentially difficult to treat due to current antimicrobial resistance. Current trends in antimicrobial resistance include; methicillin-resistant *Staphylococcus aureus* (MRSA), multi-drug resistant *Klebsiella*, *Escherichia coli*, and antibiotic-resistant *Streptococcus pneumonia*. Some additional newly resistant pathogens also include bacillus; *anthracis*, *neisseria gonorrhoeae*, *group B Streptococcus*, *Salmonella Typhi*, and *Enterococcus* (CDC, 2010). While antibiotics are very effective against bacteria, they are often used unnecessarily against viral illnesses. The CDC (2010) stated that approximately 80% of antibiotics prescribed for respiratory illnesses were unnecessary. This increase in over prescribing is directly responsible for much of the current antibiotic resistance trends that is present today (CDC, 2010).

In an attempt to motivate patients and providers to change, the CDC implemented educational outreach programs to address the issue of antibiotic over prescription.

In 2010, the CDC launched the educational intervention “Get Smart” to raise awareness of the issue of antibiotic resistance. Get Smart is a multimedia educational campaign focused on patients and providers with the goal of reducing the use of antibiotics, especially for viral illness. The CDC reported that a 25% reduction in antibiotic use in ambulatory care patients with presumed viral illness had been achieved since the initiation of Get Smart, with an overall reduction of 8-26% in antibiotic prescriptions, reported by the National Ambulatory Medical Care Survey (CDC, 2010).

Many factors influence patients’ requests, providers’ actions and the decision to prescribe antibiotics. This paper explores these factors, examines the barriers to judicious antibiotic prescribing and
offers solutions to assist primary care providers in making the best choice for their patients based on current research, rather than patient expectations. A review of literature will assist in a discussion of potential barriers to prudent antibiotic prescribing.

**Literature Search**

Multiple databases were utilized as the primary search method and included; Cinahl, Healthsource, Medline/Pubmed and Google Scholar. Some of the key words used in the database searches included; antibiotics; resistance; over prescription; primary care; super infection; infection rates; viral illness; bacterial illness; pharyngitis; practice guidelines; over prescription; patient provider relationship; barriers; education; reduction of prescription; theoretical framework; patient expectations; patient demands; health promotion; prophylaxis; outpatient; ambulatory care; prevention; placebo effect; antimicrobial stewardship; global; and international. Research papers were selected initially based on age (greater than 10 years with specific exceptions were excluded) and articles published after 2007 were preferred. Inpatient or hospital setting, specialty populations, chronic illness, multiple co-morbidities, specialty practice and race and ethnicity specific literature were not included. All reputable professional peer reviewed journals were considered, however those of the medical and health care sciences were preferred. There was no discrimination by geography or country as antibiotic resistance is a global concern. Websites and internet sources were used readily, however only those of .gov, .edu, .int were considered, and those of .com and .net were excluded with the exception of one reference by Wikipedia. Non peer reviewed periodicals, books, websites and other publications were also not included.

**Magnitude of the Problem**

The National Institute of Allergy and Infection Disease (NIAID) stated that antibiotics are losing their effectiveness after years of overuse. Rather than becoming extinct, microbes evolve and adapt to new surroundings and change their genetic structure to withstand these new hostile environments. This evolution for survival results in the offspring of the microbes becoming resistant to antibiotics. The NIAID also stated that overuse and misuse of antibiotics has directly caused antibiotic resistance and is compounded by a “lack of diagnostic tests to rapidly identify infectious agents”, and poor infection
control in community and health care settings (NIAID, 2009). In 2005, the NIAID held a workshop to discuss the necessity of developing advanced diagnostic tools that would provide a comprehensive “one test” method of identifying disease. They acknowledge the need for rapid, highly specific testing in primary care and are working with product manufacturers to develop new diagnostic tests (NIAID, 2005).

Antibiotic resistance is not a new concern and multiple articles published in the 1990’s (Bradley, 1992; Gonzales et al., 1999; Macfarlane et al., 1997 & Wang et al., 1998) predicted bacterial resistance to antibiotics as a rising problem. There has been widespread concern about resistant bacteria for over twenty years (Neu, 1992). The World Health Organization (WHO) recognized antibiotic resistance as a rising threat to public health on the world-wide spectrum. In August 2010, the WHO published a news release identifying antibiotic resistance as a serious threat to world health. Their recommendations included that not only should antibiotic resistance be tracked and monitored, but also that further education of both the health care provider and the public be considered. They suggested that practices such as judicious prescribing, hand washing and basic preventative education be widely implemented.

Among other threats to public health, the WHO also recommended the elimination of over the counter antibiotic sales in countries where medications are available without prescription, so as to prevent their inappropriate use (WHO, 2010). In February 2011, the WHO published a fact sheet supporting these statements and also addressed the high morbidity, mortality and cost associated with hospital acquired MRSA infections and the threat they pose to those infected with human immunodeficiency virus (HIV), Malaria, Shigella, *Neisseria gonorrhoeae* and selected gram negative bacilli infections. The WHO (2011) stated “Inappropriate and irrational use of medicines provides favorable conditions for resistant microorganisms to emerge and spread” (para. 1). Incorrect spectrum, length of treatment, and patient compliance are also leading factors resulting in antibiotic resistance (WHO, 2011).

Fendrick et al. (2003) reported that $1.1 billion dollars was spent each year on unnecessary antibiotic prescriptions for adults with upper respiratory tract infections (URI’s). Meisler (2002), in an interview with Stuart B. Levy, MD, an expert on antibiotic resistance, claimed that 13 million fewer antibiotics would be prescribed each year if all unnecessary antibiotic prescriptions were eliminated. Dr.
Levy also stated that through "microbial competition" (p. 499) which is achieved by allowing susceptible strains to populate and replace resistant strains, resistance could be reversed with the reduction of antibiotic use (Meisler, 2002).

Even when a bacterial infection is present, antibiotics may not be necessary in every case. Richardson (2011) stated that even without antibiotics nearly 90% of patients with pharyngitis recovered from symptoms within 7 days regardless of bacterial or viral etiology. It is important however, to treat streptococcal pharyngitis ("strep throat") with antibiotics to prevent such complications as rheumatic fever which can affect up to 3% of the population infected (Richardson, 2011). Even when streptococcal infection is confirmed by rapid strep testing, McIsaac (2000) suggested that the provider may be able to delay antibiotic treatment several days and still receive the same protective benefits against rheumatic fever, thus providing time to culture streptococcal infections as the rapid strep test has a sensitivity of 82.9%, specificity of 99.1%, and negative predictive value of 93.4%. Allowing time to culture the bacteria may assist in reducing inappropriate antibiotic prescribing and offers no additional risk to the patient (McIsaac, Kellner, Aufricht, Vanjaka & Low, 2004). Providers need a reliable tool to assist with identifying streptococcal pharyngitis that is accurate and efficient, and the McIsaac scoring tool for pharyngitis may be helpful in triaging patients with possible streptococcal pharyngitis (See Appendix C).

In analyzing the risk versus benefit ratio regarding the decision to prescribe antibiotics, providers may be able to identify those patients who are at risk for complications and require antibiotic treatment or referral to specialty care. This is not always easy as patients may often appear mildly ill during the office visit, but then may experience rapid progression to more serious conditions (Schumann & Hickner, 2008). Often the provider may feel that the liability of a missed diagnosis and possible complications is too great to chance and will prescribe an antibiotic "just in case" (Enriquez-Puga et al., 2009).

The Journal of the American Medical Association (JAMA) (2007) estimated that the rate of antibiotic prescriptions for viral illness was far beyond what was considered acceptable. The JAMA reported that 12 million antibiotic prescriptions (21% of all antibiotics prescribed) were written for URI's (52%), colds (51%) and bronchitis (66%). These numbers are staggering and were found to be increased...
in rural practices and in female patients. Their bivariate analysis however, did not find age, Latino ethnicity, geography, ability to pay or specialty provider offices to have an impact on inappropriate prescribing. Lower prescribing rates overall however, were found in patients of African American descent (Gonzales, Steiner & Sande, 1997).

There is rising concern in primary care as infectious strains of bacteria that were previously thought to be hospital-acquired only infections are now present in the community. Resistant bacteria such as MRSA have posed a serious threat to the health of hospitalized patients in the past; however this threat now exists in the community also. The prominent transition of MRSA from a hospital acquired infection, to a lethal community acquired-MRSA (CA-MRSA) variety is just one example of the deadly evolution of bacteria as a result of over prescribing (Millar, Prendergast & Moore, 2007).

Similar trends of resistance are also evident in the community with other common pathogens also becoming resistant. In 1980 it was reported that over 99% of Streptococcus pneumoniae was susceptible to penicillin, (Gonzales et al, 1997) while in 2000 the percent of bacteria that were resistant to penicillin was reported in the New England Journal of Medicine to be as high as 35% in areas of the southern United States (Whitney et al, 2000). This is concerning, as research and development of new antibiotics is virtually non-existent and there is an increase of antimicrobial hygiene products and antibiotic treated meats and the availability of over the counter antibiotics in many countries. It is becoming more urgent than ever that this resource be safeguarded so as not to lose this powerful tool against bacterial disease (Meisler, 2002).

Primary care providers are in a position to combat this crisis of antibiotic resistance by reducing the use of antibiotics as they are responsible for the majority of antibiotics prescribed in the United States (Meisler, 2002). By reserving the use of antibiotics for cases of necessity, providers can shepherd this precious resource and preserve it for the future (Owens et al., 2009). The risk of doing nothing is great and the WHO states that with current resistance patterns we are in danger of returning to a pre-antibiotic world if action is not immediately taken. The WHO has chosen antimicrobial resistance as the theme for World Health Day 2011, in hopes that international attention to this issue will motivate policy makers,
providers, pharmaceuticals and patients to take action against losing our most valuable tool against
disease (WHO, 2011). Until full awareness of the issue is achieved, providers must look for alternative
actions that are reasonably executed in the primary care office to help fight against resistance.

As bacteria become more resistant to current antibiotics, older antibiotics such as isepamicin,
polymyxins, and colistin-rifampicin have a renewed role in the treatment of infection. Maviglia et al.
(2009) suggested that antibiotic therapy for vancomycin resistant enterococci (VRE) could include
Fosfomycin as an alternative to the standard linezolid and quinupristin-dalfopristin therapy. The study
concluded that by implementing a combination therapy including standard and older antibiotics, a
synergistic effect may be possible and was more effective at treating the infection than standard treatment
alone. This study suggests that antibiotic resistance decreases over time when an antibiotic is not used,
and therefore older antibiotics are more effective because they have not been used recently and bacteria
are not longer resistant to them. This supports the hypothesis that reducing antibiotic use may over time
decrease microbial resistance (Maviglia, Nestorini & Pennisi, 2009).

The Decision to Prescribe

Researchers have identified many factors that impact the decision to prescribe antibiotics
including the patients’ expectations, ethnicity, internet and education level, as well as the providers’
knowledge of the patient’s history, providers’ feelings toward the patient, provider workload, degree of
purulence, communication limitations and the importance of the provider-patient relationship (Gonzales,
Steiner, Lum, & Barrett, 1999; McFarlane, 1997). Although these factors contribute to the providers’
decision making process, they may often become barriers to change and inhibit providers from
incorporating current research-based practice guidelines into their daily prescribing habits (Wigton et al.,
2008). Providers often allow these barriers to dictate their actions even in instances where it is clear
antibiotics are of no value.

McFarlane et al. (1997) conducted an observational study to assess the views and expectations of
patients when they presented with lower respiratory infections. Seventy-six physicians from urban,
suburban and rural practices were included and a total of 1014 patients with lower respiratory complaints
were recruited to participate in the study with a total of 787 completing the study. During the office visit the physician filled out a survey that delineated their certainty that antibiotics were necessary and any non-clinical factors that impacted their decision to prescribe. Following the office visit patients were given a confidential sealed questionnaire to complete at home and return by mail. The questionnaire asked if the patient thought antibiotics were necessary, if they wanted or had asked for antibiotics, and if antibiotics were prescribed. Physicians reported only one fifth of patients definitely needed an antibiotic however, antibiotics were prescribed 74% of the time. The physicians also reported there were non-clinical factors influencing this decision in 44% of patients and that in 54% of those patients', patient pressure and expectations were the primary reasons antibiotics were prescribed when not clinically indicated. Eighty-seven percent of patients indicated that they believed an antibiotic would help and 72% expected one to be prescribed. Twenty percent of these patients reported asking for an antibiotic directly (Macfarlane et al., 1997). Patient expectations and requests clearly impacted these physicians decisions to prescribe antibiotics more often that was clinically indicated, and were determined by the researchers to be the key non-clinical factors impacting the decision to prescribe.

This expectation by the patient and the providers’ concern for the provider-patient relationship is cited multiple times in the literature as being a strong barrier to change of practice (Enriquez-Puga et al., 2009; Kent, 1999; Meisler, 2002; Taylor et al., 2004; Turnidge, 2001). These factors are both modifiable and non-modifiable and may adversely influence the provider when making the decision to prescribe antibiotics (Bradley, 1992). Some of the non-modifiable factors identified in the above referenced literature include cultural heritage, age, gender (females are more likely than males to save and re-use antibiotics) and past experience. The patients’ behaviors are also non-modifiable; however the provider-patient relationship is easily manipulated by the provider and often is incorrectly perceived as negative (Enriquez-Puga et al., 2009). Factors that are modifiable include; pressure from family and friends, the patient provider relationship, lack of education and false assumptions about viral illnesses and the role of antibiotics (Taylor et al., 2004). By organizing these factors into these two categories, the provider can identify and address the factors and make appropriate changes to those within their control.
World Wide Web Influence

The availability of the internet today may be a factor that influences the patient and leads them to request antibiotics. Recent studies by Iverson et al. (2008) and Scanfeld et al. (2010) reported that 61% of Americans use the internet to acquire health information and 60% of them report that online information has made an impact on their healthcare decisions (Scanfeld, Scanfeld & Larson, 2010). While the internet can be a helpful tool, it may also lead to misconceptions of disease, inappropriate provider-directed demands and unnecessary worry by the patient (Iverson, Howard & Penney, 2008). Patients are less likely to arrive at the correct diagnosis themselves when using the internet and may often have an incorrect perception of their symptoms. The provider conversely, has the distinct advantage when using the internet with an estimated two million facts stored in their brains that help them sort and utilize the more than three billion articles on the internet today (Tang & Ng, 2006).

In 2006, the British Medical Journal published an internet based study that assessed the effectiveness of using Google to diagnose patients. The study included 26 diagnostic cases from the 2005 New England Journal of Medicine. The researchers used Google to diagnose each case study and were blinded to the correct diagnoses and differential lists. Of the 26 cases, 15 were correctly diagnosed with a small number of cases correctly diagnosed but too non-specific to be considered accurate. Researchers concluded that Google was useful in diagnosing conditions with unique, specific symptoms and less useful for conditions that had vague non-specific symptoms. Overall however, researchers felt that Google may be the new diagnostic tool of the current generation of providers and that diagnoses could be readily obtained in certain circumstances. Both providers and patients may benefit from the use of the internet; patients may obtain general education, definitions and participate in support groups and the provider may quickly access information regarding diagnosis and current treatment guidelines (Tang & Ng, 2006).

Barriers to Effective Prescribing

As discussed above, the factors that contribute to the inappropriate prescribing of antibiotics often become barriers to change and may negatively impact the providers’ decisions to prescribe antibiotics.
Provider barriers are less easily categorized and often differ by practice specialty, location and care model. According to Kent (1999), communication was an important potential barrier to appropriate prescribing. Communication is foundational and the provider must be able to effectively educate with clarity, simplicity and efficiency. Often the patients or their parents may simply require reassurance that they or their child is not seriously ill and effective communication may often be able to accomplish this without prescribing antibiotics. Kent even suggests that using such techniques as a “nonprescription prescription pad” (p. 892) to assist in communicating patient education on the management of symptoms, expected duration and over the counter remedies.

The providers’ personal experiences and opinions can also be barriers to change. It is important that providers acknowledge these factors and perceive change as superior to current practice in order to see a positive impact on prescribing habits. Simpson et al., (2006) conducted a qualitative interview in a grounded theory study of 40 primary care physicians; 26 of which were from practices that prescribed a high rate of fluoroquinolones and 14 from average prescribing level practices. The goal was to understand physicians’ perceptions of antibiotic resistance and their role in prescribing. Post interview, the researchers concluded that the physicians’ knowledge of antibiotic resistance was only one of many barriers to appropriate prescribing. Often the physicians were skeptical about the issue of resistance in general and felt unsure that over prescribing was contributing to antibiotic resistance or that it resulted in poorer outcomes in their patient population. Therefore the researchers concluded that if the provider did not see improved patient outcome as a direct result of a change in practice, it was unlikely that any intervention would be successful in initiating practice changes resulting in a reduction in the number of superfluous antibiotic prescriptions (Simpson, Wood & Butler, 2006).

According to Turnidge (2001), approximately 50% of all primary care office visits are for URI’s with about half of those visits resulting in antibiotic prescription. Even when providers are aware of current prescribing guidelines for common primary care complaints, change of practice is not always expedient. It was concluded that providers were hesitant to change their antibiotic prescription practice for several reasons even when new evidence was presented to them, and that they were primarily afraid
that the confidence of the patient would be shaken if the provider were to suddenly stop treating URI’s with antibiotics as before. Turnidge (2001) challenged providers to practice their “professional integrity” (p. 2066) and with each office visit make it a priority to educate the patient and explain the change in practice. Turnidge (2001) noted the following:

The combination of ‘routine’ antibacterial prescribing and belief that the patient expects to be prescribed an antibacterial has created a positive feedback loop whereby the prescriber may feel reluctant to discuss not using antibacterials with many patients. This feedback loop must be broken, and it requires the application of a general practitioner’s professional integrity to take this step with each new consultation (p. 2066).

This fear of losing the patients’ confidence in the prescribers’ knowledge and abilities may be the most influential barrier to appropriate prescription of antibiotics. This loss of provider confidence is perceived by the provider as negatively impacting the patient-provider relationship and is therefore a barrier to change.

Conceptual Framework

Conceptual frameworks assist researchers in outlining the preferred approach to an idea or thought and serve as a map that connects the paths toward all aspects of the desired outcome (Wikipedia, 2011). It is important to utilize conceptual frameworks when attempting to alter the prescribing habits of primary care providers. To achieve practice change an assessment of providers’ behaviors and influences must occur. By using a conceptual framework it is possible to categorize the providers’ behaviors and their elements. Often the greatest barriers to change are innate and subconscious (Ajzen, 1991). Ajzen’s Theory of Planned Behavior explores the relationship between attitude and behavior and suggests that if the attitude towards the desired outcome is positive then there is a higher likelihood that behavior will change to incorporate the interventions necessary to reach the desired outcome. Also according to the Theory of Planned Behavior, if an attitude of negativity surrounds the outcome of a behavior then the behavior may change based on this anticipation of negative outcome (Ajzen, 1991). In application of this theory to behavior change in prescribers, Ajzen suggests that intention may be the strongest advocate for
change of behavior and if the provider views the outcome of unchanged behavior as negative or the outcome of changed behavior as positive it may be successful in facilitating change towards the desired goal. When the provider has the intention of changing they are more likely to do so and often will use available tools to execute this change. Intention again, is “the immediate determinant of behavior” and “attitude is the subject’s favorable disposition to adopt a given behavior” (Allaire, et al., 2011, p. 3).

Allaire et al. (2011) utilized Azjen’s theory as a conceptual framework for their descriptive qualitative study on the effectiveness of a continuing education program called DECISION+ and its ability to decrease the rate of inappropriate antibiotic prescription for URI’s in Quebec, Canada. DECISIONS+ was a continuing medical education program that was designed to improve the primary care providers’ shared decision making skills and knowledge in an attempt to improve the prescription accuracy of antibiotics for URI’s. In this qualitative study based on the Ottawa Model of research, the educational intervention was successful in reducing unnecessary prescriptions; however the effect was not generalizable. Thirty nine physicians from five primary care practices participated in this continuing medical education program focused on limiting antibiotic prescribing. The effectiveness of DECISION+ was measured by a self administered questionnaire that assessed the barriers and facilitators related to a change of practice with consideration of the new information presented. Success was also measured by the willingness of the physicians to participate in a similar continuing education program in the future. Although change in practice and intent to complete future education was evident, the results were not generalizable and it was concluded that this qualitative study should be replicated on a larger scale before these results can be generalized to all providers. The reported changes in practice were, according to the researchers, likely based on the perception that a change of practice would produce a positive result and therefore they intended to prescribe less antibiotics for URI’s (Allaire et al., 2011).

Guidelines for Prescribing

In a 2008 fractional factorial design study, researchers asked 100 community providers in Omaha, Nebraska to examine hypothetical case studies of 20 patients with respiratory infections and determine if they would prescribe antibiotics for these patients. A control group of eight faculty members
also examined each case study and determined antibiotic necessity based on the CDC’s guidelines for antibiotic prescribing. The results were significant as providers stated that they would treat 44.5% of the patients with antibiotics compared to 20% by the control group who were using the CDC guidelines. The duration of illness was identified as the most significant determinants of antibiotic prescribing (Wigton, Darr, Corbett, Nickol & Gonzales, 2008).

Owens et al. (2009) described the benefits and barriers to the implementation of antimicrobial stewardship programs (ASP). While ASP programs vary between establishments, most focus on reducing the number of inappropriate antibiotic prescriptions and seek to improve practice by overseeing antibiotic prescribing. Typically an infectious disease (ID) physician and an ID specialty pharmacist assist in choosing the correct spectrum, length of treatment and dose of the antibiotic. ASP’s consist of two basic components; prior authorization strategies and prospective chart audits with feedback strategies. Historically ASP’s required providers to obtain authorization by an ID pharmacist before antibiotics were administered in the hospital however, this is often not realistic in the primary care setting. ASP’s may improve outcomes in the inpatient setting; however the typical primary care office does not have the necessary resources to implement formal ASP interventions. The primary care provider may be able to utilize this information and focus antibiotic prescribing on avoiding broad spectrum antibiotics, identifying the likely pathogen, knowing local resistance patterns and choosing the correct length of treatment. Attention to these details may be the best interventions for primary care providers in the office setting (Owens et al., 2009).

**Patient Behavior and General Knowledge**

Even with the use of ASP’s and other quality measures, the patients’ behavior and awareness frequently impact physicians’ decisions in the primary care office. Often patient behavior is based on personal experience or friends’ recommendations with little insight into the disease process and the implications of their demands. In 2003, The Specialist Advisory Committee on Antimicrobial Resistance (SACAR) launched an antibiotic survey in the United Kingdom (UK). They sought to identify the level of public awareness regarding antibiotic use, characteristics that may explain variations in attitudes and
the effectiveness of a National Public Awareness Campaign launched in 1999. Surveys were distributed to families across the UK and 7120 responses were included. The surveys were comprised of multiple statements regarding several antibiotic topics and respondents marked “Agree or Disagree” to each statement. Researchers found that the public’s knowledge of antibiotic resistance and the importance of limiting the use of antibiotics were substantial with only 8% disagreeing with the statement “If taken too often antibiotics are less likely to work in the future”. However, 43% agreed with the statement “Antibiotics can kill viruses” and 42% denied that flora naturally live on the skin and in the gut.

Surprisingly 20% disagreed with the statement “Antibiotics can kill bacteria” (p. 64), 87% of those who reported they did not finish their last course of antibiotics had also indicated that they knew that they should always finish a course of antibiotics. Those that were less knowledgeable overall were the young (ages 16-24), the elderly (age >75) and those with lower levels of education. This may suggest that educational deficits surrounding viral versus bacterial illness are a significant determinant of patient behavior (McNulty, Boyle, Nichols, Clappison & Davey, 2007). Assessing the patients’ attitudes and general knowledge of antibiotic use is important when providing patient education during the office visit, so as to be as effective as possible.

Social Pressures

Educational deficits that exist within the community may also be compounded by cultural influences. In 2009 a community based interventional study in South Carolina found that despite educational interventions in local Latino communities, Latinos were more likely to trust the experience and recommendations of their friends and family when it came to self treating with imported over the counter antibiotics. During this 9 month study of 250 Latino adults, researchers evaluated the effectiveness of a Spanish language multimedia intervention including Spanish radio programs, printed pamphlets and newspaper articles aimed at educating the Latino population on antibiotic resistance and judicial use. Over 1000 pamphlets were distributed among 34 community sites including physician offices, churches, Mexican restaurants and grocery stores, and contained educational information on antibiotics and the dangers of overuse and self medication. Two hour radio programs on the topic were
aired on Spanish radio stations and 3x5 inch advertisements were placed in two Spanish newspapers for 3 months each. Site based interviews by bilingual Latino immigrants were used to collect data from participants in neighborhoods, migrant camps, community and retail establishments. Researchers also included a control group of 250 Latino residents from another South Carolina town approximately 200 miles away where no interventions were implemented. Unfortunately the interventions achieved limited success and the study found that within this Latino community, imported over the counter antibiotics from Mexico and other countries were used unnecessarily even though 69% of those interviewed admitted to having exposure to at least one of the interventions (57.6% print and 41.9% radio). The researchers' analyses were that education alone was not sufficient in this population and that the pressures of the culture and social peers were stronger than the researched based recommendation of healthcare professionals (Mainous III, Diaz & Carnemolla, 2009).

Taylor et al. (2003), in a randomized controlled trial from the Northwestern United States, stated that 96% of the participating pediatricians reported that parents had asked for antibiotics for their children in the past month. Three hundred and fifty eight parents of children 2 years and younger that were seen in pediatric primary care offices completed the study from an original sample size of 499. Initially each parent was given a set of 9 statements concerning appropriate antibiotic use and 7 statements concerning injury prevention (control group) to which they “agreed or disagreed”. After randomization each parent received both printed and video educational interventions on appropriate antibiotic use or only printed education on injury prevention. Six weeks later they received the same educational intervention as well as an identical copy of the original 16 statement questionnaire. The responses of the follow up questionnaires were compared to the initial responses and results were arranged into an ordinal scale.

Taylor et al. concluded that a simple educational intervention did positively impact parental attitudes toward antibiotic use in their children however, they found that the intervention was less likely to change their attitudes regarding global or abstract issues such as antibiotic resistance, preventing super infections, and other potential dangers resulting from over prescription.
Seventy eight percent of the providers stated an understanding of the issue and that patient education would be the most efficacious process for change of practice. They did however, admitted to writing prescriptions for viral illness 52% of the time when parents asked, compared to 9% when there was no specific request. This evidence may reflect the impact that the patient or those accompanying them have on the decision to prescribe antibiotics and the intense need for patient education as part of the solution to the issue of the over prescription of antibiotics (Taylor, Kwan-Gett & McMahon, 2003).

**Viral Illness and Antibiotics**

In the literature there are countless studies supporting the symptomatic, non-antibiotic treatment of respiratory illnesses and the understanding that the majority of these will improve without antibiotics. Rosenfeld et al. (2007) completed a meta-analysis of 13 randomized controlled trials evaluating placebo versus oral antimicrobial therapy for uncomplicated sinusitis. The inclusion criteria included patients who were not seriously ill (high fever, severe facial pain, periorbital swelling or erythema) and had a confirmed diagnosis of sinusitis by x-ray or computed tomography (CT). There was found to be a minimal reduction in days of symptoms with antibiotics and cure rates increased by a mere 15% with symptom improvement rates of 14%. Rosenfeld concluded that providers must treat 7 patients with antibiotics in order shorten the duration of symptoms for one patient. Additionally this study reported 80% of the patients treated with an antibiotic experienced diarrhea compared to those who received a placebo (Rosenfeld, Singer & Jones, 2007).

A meta-analysis by Young et al. (2008) also included placebo versus antibiotic trials to evaluate if there was any benefit to treating acute sinusitis with antibiotics. Nine trials with a total sample size of 2547 were included and again did not include patients who were seriously ill (high fever, severe facial pain, periorbital swelling or erythema) or those who had been diagnosed with x-ray or CT. It was reported that 64% of patients treated with placebo had relief of symptoms between 8-15 days compared with 70% of patients who received an antibiotic. Therefore 15 patients would need to be treated with antibiotics to shorten the duration of symptoms for one patient. The analysis concluded that even when the duration of symptoms is greater than 7-10 days, unless symptoms of serious illness are present,
antibiotics are not justified (Young et al., 2008). In addition, when antibiotics are used inappropriately the placebo effect is considered more effective than antibiotics for viral illnesses (Campbell, 2009).

Schumann et al. (2008) in their article citing Rosenfeld and Young’s meta analyses, concluded that nasal rinsing and pain medication were more likely to relieve symptoms and cost less overall, and that providers should focus on the importance of educating patients with sinusitis and suggesting supportive non antibiotic treatments to alleviate discomfort (Schumann, & Hickner, 2008; Appendix D). Although these studies found patient education and over the counter symptom management to be beneficial, the following study found that education alone was not sufficient to satisfy the patient and providers continued to prescribe antibiotics even though they knew they would not improve symptoms.

In 2009, a Scandinavian randomized controlled provider trial assessed the effectiveness of an educational intervention and identified barriers to change. Of the 151 primary care practices invited to participate, 28 agreed and completed the two year study. The 28 practices were divided into two groups with a mean of 3.3 providers per practice for the 14 practices receiving antibiotic prescribing interventions and 2.2 providers per practice for the 14 practices receiving antidepressant interventions. Researchers provided a 20-40 minute face to face educational outreach intervention with the providers who were blinded to the targeted study drugs. Education to the provider about either antibiotic resistance and judicious prescribing or antidepressant prescribing was implemented. Both groups were given information on other drugs that were not being studied to serve as a control group. The purpose was to provide awareness of the barriers to change of practice and to ultimately change the prescribing habits of the providers. At the end of the face to face intervention the provider was asked to agree to modify their prescribing practices with consideration of the new information provided. Some of the barriers encountered were provider concerns about complications of infection if narrow spectrum antibiotics were used and the fear that the provider-patient relationship would be damaged. After the two year follow-up study; prescribing trends were obtained from a national prescribing analysis and cost tabulation database (PACT). Researchers concluded that direct on site education alone was insufficient to alter practice and reduce the prescription of broad spectrum antibiotics. When the same intervention was implemented with
antidepressant prescribing however, there were modest results and the physicians altered their prescribing of antidepressants for patients with depression as advised by the educational intervention. It is not clear why this same intervention was not effective for antibiotic prescription however, it does identify multiple barriers to the reduction of antibiotic use including: “lack of information on drug resistance or concern to treat a patient with co-morbidities effectively and the doctors’ and patients’ perception of risk” (p. 200). These factors potentially influenced the providers’ decisions and contributed to the results (Enriquez-Puga, Baker, Paul & Villoro-Valdes, 2009).

Llor et al. (2010) published the results of two (2008, 2009) non-randomized before-after controlled studies evaluating the effectiveness of multiple interventions in primary care practices across Spain. The study measured the success of these interventions in reducing antibiotic prescriptions for pharyngitis. One group of 210 primary care providers was given the full set of interventions, while a second group of 70 primary care providers was given a partial set of interventions and a third control group of 59 primary care providers were given no interventions. Altogether 6849 current cases of pharyngitis were registered in a 3 week timeframe before and after the selected interventions. Full intervention included a discussion of prior research, treatment and diagnosis of respiratory tract infections, current treatment guidelines, patient education pamphlets and workshops on the use of rapid antigen detection tests which were provided for use in their primary care offices. The physicians in the partial intervention group did not participate in the workshops and were not provided rapid antigen detection tests, but received all other interventions. Three weeks prior and three weeks post intervention all cases of pharyngitis were documented by the physician as well as the incidence of antibiotic prescription. Researchers reported that physicians who received the full intervention statistically significantly reduced their prescription of antibiotics for pharyngitis with an odds ratio of 0.52 compared to the partial intervention group odds ratio of 0.23. All three groups showed similar prescribing habits prior to the interventions and there was found to be no change in the control group throughout the study. Use of the rapid antigen screening tests as evident by the partial intervention groups’ lack of statistical
significance suggests that these and similar tests may reduce over prescription of antibiotics in the primary care setting (Llor et al., 2010).

In a similar study ten years earlier, Gonzales et al. (1999) had concluded that a combination of patient and provider educational interventions could significantly reduce the prescription of antibiotics for acute bronchitis in a group-model health maintenance organization. This was a nonrandomized prospective controlled trial consisting of both full and partial intervention groups and two control groups with 56 physicians, 28 physician assistants or nurse practitioners and 9 registered nurses (RNs) participating. Four Kaiser Permanente (KP) primary care practices in Denver, Colorado participated and a total of 2027 patients were included. RN’s were included in this study because of their authority by KP to conduct “nurse visits” and write prescriptions for patients with the approval of a supervising physician. Providers receiving the full intervention received a 30 minute face to face session on patient education interventions, location specific prescribing trends for bronchitis from statistics obtained from the prior years, evidence based education on bronchitis and guidance on how to effectively advise patients when a prescription is not necessary. The sessions were concluded with the providers as a group setting goals to reduce antibiotic prescribing in the future. The limited intervention group received a variety of printed patient education materials including refrigerator magnets, pamphlets, letters from the medical director and other full color informational publications. The two control groups received no interventions and were from different clinical practices than those receiving either full or partial interventions. The full intervention group had a statistically significant reduction in the number of antibiotics prescribed for acute bronchitis (from 74% to 48%), but there was limited change in the partial intervention group (78% to 76%) and the control groups (82% to 77%) (Gonzales et al., 1999).

Discussion

As evidenced by the literature, the majority of respiratory illnesses are self limiting and do not require antibiotic treatment and that in most cases there will be minimal if any improvement in the length, severity or morbidity of the illness with the use of antibiotics. While studies have differing conclusions
on the effectiveness of education as a singular intervention to reduce the use of antibiotics, it is unanimously cited as an important aspect of a multidimensional approach to change.

Educating patients on the differences between bacterial and viral infections and the use of antibiotics has shown to be effective in certain environments and simple direct education targeted toward the current symptoms is more likely to impact the patients’ or their parents’ attitudes, then general education or theoretical discussions on antibiotic resistance (Taylor et al., 2003). Providers must educate patients on their diagnosis; provide reassurance and symptom management strategies during each office visit to improve the likelihood that the patient will grasp the intended message (Emanuele, 2010). The practice of prescribing antibiotics simply because the patient expects them should be eliminated, perhaps even at the risk of damaging the provider-patient relationship (Turnidge, 2001). Education should be the foundation of the office visit and all interventions should stem from current research and best practice (Appendix B). It is the responsibility of the provider to be aware of current research and standards of practice that aid in evidence based prescribing. Ultimately it will be up to the provider to simply say “No” and not prescribe antibiotics unless clinically indicated (Schumann & Hickner, 2008; Turnidge, 2001; Appendix A).

Conclusion

Many factors lead to over prescribing of antibiotics such as patient expectations, the provider-patient relationship, misconception of disease and infection and others that were not addressed by this paper. There are several simple interventions that if implemented during the primary care visit can positively influence the encounter by providing education, insight and guidance for the proper treatment of illness. In the literature the most effective intervention for providers was multifaceted with a combination of onsite education and rapid diagnostic testing being most efficacious for change. Marginal improvement in practice was seen with simple printed educational interventions or prospective chart audits. Patient education alone is unlikely to solve this dilemma but it is an important component of this process that should be included in each office visit. It would also appear that providers are more likely to change their prescribing practice if the change is perceived as positive (Allaire et al., 2011).
The literature suggests that patients have multiple misconceptions regarding antibiotics and often assume that antibiotic treatment will improve the symptoms of a viral illness. These misconceptions are more apparent in the young, elderly and less educated populations. Patients of many ethnic backgrounds hold cultural and family opinions in high regard and often are not willing to incorporate information beyond what they have known in the past, posing a barrier to reducing over prescription in these populations (Manious III et al., 2009). Patients often request antibiotics specifically and the literature suggests that patient expectations often drive prescribing practices (McFarlane et al., 1997). Antibiotics are a helpful and necessary element of primary care. To protect antibiotic efficacy, providers must prescribe only when appropriate in the presence of bacterial infections that are unlikely to be self limiting. By limiting antibiotic prescribing providers can participate in the reduction of resistant bacteria and preserve antibiotics for the future of medicine (Owens et al., 2009).

The goal overall is to reduce the use of antibiotics, particularly those that are ill chosen or unnecessary and to prevent further antibiotic resistance. Therefore the strategy must be to change the behavior of the providers who are making these decisions to prescribe as they have the ultimate power to facilitate change. The provider must be aware of the factors that lead to inappropriate prescribing in order to avoid common pitfalls such as patient demands and expectations. It is important for the provider to not only identify patient centered barriers to change but to also critically analyze their own biases and perceptions surrounding antibiotic prescribing. The factors that lead to the over prescribing of antibiotics in primary care and the barriers that inhibit change of practice, must be constantly identified and acknowledged by providers. These and other issues surrounding antibiotic resistance and over prescribing should be at the forefront of future research.
References


**How can I say no to patients when antibiotics won’t help?**

1. Ask your patients why they feel they need an antibiotic

2. Ask your patients to wait one week without a prescription, and to call back after that time if they are still experiencing symptoms

3. Offer your patients educational materials they can take with them on the differences between viruses and bacteria

4. Spend some time educating your patients about why antibiotics aren’t helpful against viruses

5. Offer your patients alternative methods of symptom treatment, such as sample cold care kits, or a prescription for symptomatic remedies

### APPENDIX B

**Printable Online Resources for Primary Care Providers**

<table>
<thead>
<tr>
<th>URL</th>
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<tbody>
<tr>
<td><a href="http://www.cdc.gov/getsmart/campaign-materials/brochures.html">http://www.cdc.gov/getsmart/campaign-materials/brochures.html</a></td>
</tr>
<tr>
<td><a href="http://www.tpchd.org/files/library/58fc05d5c999f551.pdf">http://www.tpchd.org/files/library/58fc05d5c999f551.pdf</a></td>
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<tr>
<td><a href="http://www.idsociety.org/Content.aspx?id=16201">http://www.idsociety.org/Content.aspx?id=16201</a>  IDSA guidelines for PDA &amp; iPhone</td>
</tr>
<tr>
<td><a href="http://www.idsociety.org/Content.aspx?id=15733">http://www.idsociety.org/Content.aspx?id=15733</a></td>
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## Table 1 The McIsaac scoring system for identifying bacterial throat infections

<table>
<thead>
<tr>
<th>Scoring method</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add one point</td>
<td>Patient’s temperature is 38°C or greater.</td>
</tr>
<tr>
<td></td>
<td>Patient has no cough.</td>
</tr>
<tr>
<td></td>
<td>Patient has tonsillar swelling or exudates or both.</td>
</tr>
<tr>
<td></td>
<td>Patient has tender anterior cervical lymph nodes.</td>
</tr>
<tr>
<td></td>
<td>Patient is aged 15 or under.</td>
</tr>
<tr>
<td>Subtract one point</td>
<td>Patient is aged 45 or over.</td>
</tr>
</tbody>
</table>

### Total score

<table>
<thead>
<tr>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 or 1</td>
</tr>
<tr>
<td>2 or 3</td>
</tr>
<tr>
<td>4 or 5</td>
</tr>
</tbody>
</table>

(McIsaac et al., 2000)
**APPENDIX D**

**Treat Sinusitis ONLY if 3 or more of the following are present:**

1. Persistent mucopurulent nasal discharge > 7 days
2. Poor response to decongestants
3. Facial pain
4. Tenderness over the maxillary or frontal sinuses
5. Tenderness on percussion of maxillary molar or premolar teeth that cannot be attributed to a single tooth

Adapted From: