

DECREASING ANTIBIOTIC OVERUSE IN UPPER RESPIRATORY TRACT
INFECTIONS THROUGH AN EDUCATIONAL INTERVENTION AIMED AT
NURSE PRACTITIONERS

by

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ABSTRACT

The purpose of the study was to evaluate the effect of an educational intervention, aimed at nurse practitioners, on increasing knowledge and decreasing prescribing habits of antibiotics in upper respiratory tract infections. The Centers for Disease Control and Prevention currently estimates that nearly fifty percent of antibiotics prescribed in the outpatient setting are unnecessary. The world health organization states that antibiotic overuse is becoming a growing problem worldwide. Numerous studies have been completed targeting physicians and patients, but no long term decrease in antibiotic prescribing has been seen. As the number and role of nurse practitioners increase, this intervention was aimed to target a specially this specially educated group. Research has shown that nurse practitioners have equal outcomes and equal to higher patient satisfaction ratings when compared to physician counterparts. Thus, this group may help to decrease antibiotic overuse. Lewin's three step change theory served as the conceptual framework. The theory uses initial unfreezing, then finding a new equilibrium and finally refreezing, thus creating a new baseline for participants. A sample of fifty one nurse practitioners participated in the one group pretest/posttest/4-week posttest measuring knowledge and intention. Knowledge was measure using the questionnaire results; intention was measured by reviewing Likert-type rankings.

Change in knowledge was found to be statistically significant, demonstrating that education will affect knowledge. However, intention was not found to be statistically significant. Intention did increase during the study, but not enough to show that there was an overall statistically significant effect

CHAPTER ONE: INTRODUCTION

Problem

Currently, the Centers for Disease Control and Prevention (CDC) estimates that approximately fifty percent of antibiotics prescribed by primary care physicians are unnecessary. Upper respiratory infections (URI), a complaint in outpatient settings with nearly 50% of appointments made for URI, are a main culprit of antibiotic overuse (McCaig & Hughes, 1995). Research demonstrates that bacterial infections are responsible for 38% of acute rhinosinusitis, 6-18% of acute respiratory illness, and 5-15 % of pharyngitis; yet 53% of patients are prescribed antibiotics (Legare, Labrecque, Godin, LeBlanc, Launer, & Grimshaw, et al., 2011). In addition, research has demonstrated that antibiotics do not significantly shorten the duration of illness in acute bronchitis or acute sinusitis (McCaig & Hughes). Many patients have a concurrent complaint of disturbed sleep and increased cough with URI, antibiotics have been found to have little effect on decreasing cough or resolving sleep issues (Verheij, Hermans, Kaptein, Wijkkel, & Mudler, 1990). Statistics point to the fact that URI's are mainly viral in origin, thus deeming antibiotics unnecessary in their treatment.

Factors cited by Sivagnanam and Mohanasundaram (2004) for contributing to antibiotic overuse include: patient demand, decreased time spent with patients, perceived patient satisfactions, presenting chief complaint, duration of illness, fever, color of phlegm, and uncertainty of diagnosis. The CDC (2010) states that patient satisfaction related to acute bronchitis, is most dependent on the doctor-patient communication and not on whether an antibiotic is prescribed. Prescribers reported feeling unsure of diagnosis and unable to do further investigations based on time restraints. So in order to increase satisfaction and to suggest

competency, many prescribers state that they felt compelled to prescribe based on the uncertainty of the diagnosis (Sivagnanam & Mohanasundaram). The CDC reports that purulent secretions of the nares and throat are not indicative of bacterial infection. Further, the common cold can cause symptoms of sore throat, nasal congestion, and cough for up to 14 days with an average of 7-11 days (CDC, 2010).

Viral infections can be long and miserable infections, but antibiotics are generally not the answer when it comes to treatment. The CDC (2010) recommends the use of first-generation antihistamines and decongestants as a way to combat the common cold, along with increased fluids and cough suppressants at night to generate rest.

Studies have shown that physicians prescribe antibiotics 62 percent of the time when asked by patients, and only seven percent of the time when they think that the patient does not want antibiotics (Salahi, 2010). Furthermore, when patients ask for antibiotics and their symptoms subsequently improve as a result of the virus being self-eliminated, they are more likely to ask for antibiotics in the future when they may not be warranted, as they incorrectly associate the antibiotics with the cure (Salahi). Proper education to NPs will enable complete explanations to be passed on to the patient, in hopes of decreasing the assumed pressure to prescribe.

Issues associated with the overuse of antibiotics include resistance, allergic reactions, and even death from secondary infections and anaphylaxis. Methicillin-resistant *Staphylococcus aureus*, an infection exacerbated by the misuse of antibiotics, is estimated to kill 19,000 people each year, far more than HIV and AIDS (MSNBC, 2011). *Clostridium difficile*, another infection caused from the misuse of antibiotics, takes the lives of thousands of individuals each

year and increases medical costs by millions of dollars for hospitals and skilled nursing facilities. The misuse of antibiotics can cost patients their health and even their lives. There are consequences to overprescribing that generate a need to decrease antibiotic misuse.

Previously Tried Interventions

Numerous studies have been conducted as a means to reduce antibiotic overuse; however, after a short duration of decreased use, often no long lasting effects have been seen. Hemo Shamir-Shtein, Silverman, Tsamir, Heymann, and Tseheri, et al. (2009) found that a media campaign to increase public awareness of the risk associated with the misuse of antibiotics decreased antibiotic prescribing among participants, but lasted only for the duration of the campaign. In summary, patient education was ineffective for a long-term decrease in antibiotic overuse.

Siegel, Kiely, and Bein (2003) initiated safety-net antibiotic prescriptions (SNAP) for the treatment of uncomplicated otitis media, and decreased antibiotic use by 69% while keeping patient satisfaction at 78%. This certainly seems to be an area of exploration. Once again education must be provided to prescribers on how to discuss the illness and findings with the patients, so that the SNAP are filled correctly.

Cals, Schot, De Jong, Dinant, and Hopstaken, (2010) implemented a QuikReak CRP analyzer to reduce antibiotic overuse in URI and rhinosinusitis. The authors suggested no antibiotic prescribing when results were less than 20 mg/L, immediate prescribing when results were greater than 100 mg/L and delayed prescribing when results were between 20-99 mg/L (Cals). Objective data may help prescribers with making a more certain diagnosis. This seems

to be a good venue; however, first prescribers must be adequately educated in order to provide education to patients and to discuss reasons for needing to fill the antibiotic.

Patient education, SNAP prescriptions, and objective data may all help reduce antibiotic overuse. However, educating the prescriber will be an essential component to help target antibiotic overuse at the core of the problem. As the CDC reports, patient satisfaction is related to communication, rather than prescribing; educating first the prescriber and then subsequently the patients, may help to decrease antibiotic overuse.

Pathophysiology

Most URIs, approximately 80%, are viral in origin (CDC, 2010). Antibiotics have no effect on viral organisms as their mechanism of action and basic biological make-up are different than bacteria, rendering them unaffected by antibiotics.

Bacteria and viruses are the two main foreign enemies that attack humans. Bacterium is much larger in size than viruses, they are non-nucleated, single-celled microorganisms that are self-equipped to function independently (Sherwood, 2010). By contrast, viruses are not self-sustaining and consist of either DNA or RNA in an enclosed protein coat (Sherwood). Viruses are intracellular dependent, meaning that they must invade a host cell and sap the host cell's energy in order to replicate (Sherwood). Because viruses must use the enzymes of their host's cells, it has made development of anti-virals much less successful than antibiotics (Sherwood).

Since bacteria are self sufficient and do not invade the host cell, it is possible that in addition to the immune response, antibiotics that target cell wall synthesis, protein synthesis or nucleic acid synthesis can help to effectively kill the bacteria. However, since viruses are within the host cell and have no metabolism of their own, there is no way to treat the viral infection

without destroying the host cell. Therefore, antibiotics do not work for viruses because there is no mechanism of action that would be unique to just the virus.

Antibiotic therapies main goal is elimination of the pathogenic microorganism; this may occur via either bactericidal or bacteriostatic antibiotics. Bactericidal antibiotics kill the organism, whereas bacteriostatic antibiotics inhibit growth until the organism is destroyed by the individual's own protective mechanisms (Sherwood). The mechanisms of action in most antibiotics consist of: (1) inhibition of the function or production of the cell wall, (2) prevention of protein synthesis, (3) blockage of DNA replication, and (4) interference with folic acid metabolism (Sherwood).

Antibiotic resistance is usually a result of genetic mutation that is able to be transferred to another organism by plasmid exchange (Sherwood). Resistance has appeared due to the overuse of antibiotics that has lead to destruction of the normal flora, allowing for selective overgrowth of antibiotic-resistant strains (Sherwood). In addition, compliance concerning completion of the antibiotic allows for selective resurgence of organisms that are more relatively resistant to the antibiotic (Sherwood).

Since the development of anti-viral medications has been difficult, vaccines are often used to induce active immunologic protection before exposure to the risk of infection (Sherwood). Vaccinations exist for both bacterial and viral infections and help decrease one's risk of morbidity and mortality related to multiple infections. Most viral vaccines are live, but weakened (attenuated) and allow for continued expression of the appropriate antigens, yet are unable to produce more than a mild and easily controlled infection (Sherwood).

Purpose and Aims

The purpose of the PI will be to decrease antibiotic overuse through education to nurse practitioners. During the past five years, the number of nurse practitioners in the United States has increased by nearly 40 percent, to 125,000; this coincides with the shortage of primary-care doctors and general-practice physicians, as only 2 percent of medical students enter primary care (Rough, 2009). As NPs continue to gain a major foot hold in primary care, they will be a likely target for decreasing antibiotic overuse. Multiple studies have been completed demonstrating both patient satisfaction and health outcomes are higher or equal to those of physician counterparts.

Mundinger, Kane, Lenz, Totten, Tsai, and Cleary, et al. (2000) examined the outcomes of patients when randomly assigned to either a physician or nurse practitioner to assess their overall health outcomes and satisfaction. The study found that there were no significant differences in patients' health status at six months, no significant differences in health services utilization at six months or one year, and no significant differences in the initial appointment (Mundinger, Kane, Lenz, Totten, Tsai & Cleary et al., 2000). Overall, it was found that in an ambulatory care situation, given the same authority, responsibilities, productivity and administrative requirements patients' outcomes were comparable (Mundinger et al.).

Horrocks, Anderson and Salisbury (2002) sought to determine whether NPs are able to provide care at initial contact that is equal to doctors in a primary care setting. Through review of randomized controlled trials and prospective observational studies, data demonstrated that patients were more satisfied with care from a nurse practitioner (Horrocks, Anderson, & Salisbury, 2002). NP had longer consultations and made more investigations than did doctors;

furthermore, no differences were found in prescribing, return consultations, or referrals (Horrocks et al.).

As it has become evident that the role of the NP will continue to grow in outpatient care and that satisfaction and outcomes remain high, NPs will be a group to target for education that can be passed on to patients, thus decreasing antibiotic overuse. It has been found that NPs spend more time with patients and make more investigations, both essential components to decreasing antibiotic overuse. This study will aim to decrease antibiotic overuse through education presented to NP giving CDC guidelines and current research. As NPs are educated, patients will in turn be educated. The goal of the practice inquiry will be more judicious use of antibiotics.

Conclusion

As it becomes clear that NPs will play a pivotal role in primary care, it is time to see if an NP focused intervention can decrease antibiotic overuse. Antibiotic overuse has been a problem for decades, and according to the CDC, remains a threat to patients both now and in the future. URIs are a main culprit in antibiotic overuse; therefore, initial education will focus on URI antibiotic overuse. It is time to assess the NPs role in antibiotic overuse and start educating NPs at the frontline to reduce the use of inappropriate antibiotics through education.

CHAPTER TWO: REVIEW OF THE LITERATURE

Statement

This chapter will include a thorough review of the literature as well as the search method utilized. An overall synthesis of the literature will be included in the summary of this chapter and will include the theoretical framework for this practice inquiry: Lewin's three-step change theory.

Little research has examined how nurse practitioners can help to effectively reduce the number of inappropriate antibiotics prescribed. While several articles mention that a lack of time spent with patients is a contributing factor to the overuse of antibiotics, others elude to the fact that NPs tend to spend more time with patients while having equal or better outcomes when compared to physicians. The role that the NPs play in antibiotic overuse needs to be further probed, as more and more primary care visits are to NPs, with expectations for this to expand. Reasons cited for the increased use of NPs in primary care include their cost effectiveness and high patient satisfaction (Conlon, 2010).

During the time frame of September 2009 through September of 2011, CINAHL, PubMed, UpToDate and EBM were searched for articles related to antibiotic overuse and antibiotic overprescribing in upper respiratory tract infections. Key search terms that were used included "antibiotics, overuse, misuse, overprescribing of antibiotics and upper respiratory infections." The number of articles found was 4,556; this was further limited to available full text, English articles yielding 568 articles. Of those 112 were reviewed as they pertained to antibiotic overprescribing in the United States or had relevance to the US, dealt directly with identifying the problem of antibiotic overuse, or combating the problem antibiotic overuse.

Literature Review

Objectives of this literature review were to: 1. Explore the problem of antibiotic overuse, 2. Examine previously studied methods used to decrease the overuse of antibiotics, 3. Examine which inherit ways antibiotic overuse was decreased in previous research. Many authors agree that a problem exists, several have tried interventions consisting of education in different modalities, and all agree that more is needed to be done to decrease this ever growing problem. The question of how nurse practitioners can positively affect the overuse of antibiotics needs thorough investigation. In this paper, a discussion of the findings will be done under themes. These themes include:

1. Antibiotic overuse as a problem
2. Potential strategies to reduce antibiotic use
3. Upper respiratory infections and antibiotic overprescribing

Antibiotic Overuse as a Problem

Colgan and Powers (2001) suggested that the introduction of antibiotics gave rise to more than just another way to fight infection; it also gave rise to antimicrobial resistance because antibiotics affect not only the pathogenic bacteria, but also one's normal flora. The "selective pressure" allows for colonization of bacteria to become resistant to the antibiotic prescribed, allowing the organism to evolve and become resistant making the bacteria stronger and smarter and the antibiotic an incompetent weapon. A study in Finland showed decreased prescribing of antibiotics (in this case erythromycin) decreased group A streptococci occurrence from 16.5% to 8.6% over a four year time frame (Seppala et al., 1997). Despite the correlation between increased antibiotics and increased resistance of bacteria, antibiotic use is on the rise. In the US

there was a 48% growth in antibiotic use from 1980-1992; further, the use of antibiotics is most common in young children and the elderly. One study showed that between 37-70% of infants between 3-6 months had been prescribed at least one antibiotic (Bergus, Levy, Slager & Kiristy, 1996). The CDC estimates approximately 100 million courses of antibiotics are prescribed by office based physicians each year, and approximately half of those are unnecessary. Studies show that nearly 50% of appointments made by patients for colds and URI and 80% of acute bronchitis visits are treated with antibiotics; however, multiple studies show that antibiotics do not significantly shorten the duration of illness in acute bronchitis (McCaig & Hughes, 1995). Reasons found for continued prescribing of antibiotics is simply that patients want antibiotics and are used to receiving prescriptions as a sort of receipt. In a study by Verheiji, Hermans, Kaptein, Wijkel and Mudler (1990), 90% of patients with URIs had chief complaints of a persistent cough and disturbed sleep and nearly 50% of patients were prescribed antibiotics; yet, antibiotics have been found to have little effect on decreasing cough or resolving sleep issues (Verheij, Hermans, Kaptein, Wijkel, & Mudler, 1990). Physicians tend to have a decreased amount of time to spend with patients, which also means decreased amount of time to educate patients. This study concluded that prescribers need to work toward increased time to diagnosis patients, educate patients, and evaluate the risk/benefit ratio of prescribing an antibiotic (Colgan & Powers, 2001).

Steinman, Yang, Byron, Maselli, and Gonzales (2009) discussed that each year antibiotics are prescribed and widely overused in common infections such as otitis media and upper respiratory infections. These infections tend to be viral, yet an estimated 40-50% of patients receive antibiotics. Antibiotics carry consequences that range from side effects to

complications such as *Clostridium difficile* and anaphylaxis. *C. diff* infections can lead to increased length of stay in a hospital setting and/or acute rehab, increased cost for treatment, including length of stay and antibiotic use, and lead to death if other co morbidities exist. In addition, *c. diff* is a spore that is able to live for a long period of times on surfaces, estimates are up to one week, and is easily spread, particularly in hospital settings where many patients may also be immunocompromised contributing to further expense and treatment needs (Steinman, Yang, Byron, Maselli, & Gonzales, 2009). Further, it was noted that community volume of use of antibiotics is linked to community resistance to pathogens. In 2005 the National Committee for Quality Assurance (NCAQ) tracked antibiotic utilization between different US health plans to help improve understanding of factors that contribute to differences in antibiotic usage. On average, high utilizing plans dispensed 70% more antibiotics than did low utilizing plans and high utilizing plans used broad-spectrum antibiotics 59% of the time as compared to low utilizing plans using broad-spectrum antibiotics 34% of the time. The danger in over-prescribing broad-spectrum antibiotics is that their effectiveness is decreased with each treatment course. When an individual is prescribed an antibiotic for a viral infection, selective pressures allow for resistance. Therefore, when serious and complicated infections presents, treatment options are limited creating an increased risk for treatment failure (Steinman et al.). This article concluded that antibiotic overuse is a problem, particularly when the antibiotics prescribed are broad-spectrum, in addition, there is a cost issues associated with not only the prescriptions, but also increased treatment needs.

Wigton, Darr, Corbett, Nickol, and Gonzales (2008) used 101 community practitioners and eight faculty members to examine the prescribing practices of the community practitioners

when compared to the eight faculty members using the CDC guidelines. Respondents were asked to read twenty case studies and then were asked if they would prescribe antibiotics (yes/no), how likely it was they would prescribe antibiotics (0-100 scale), how comfortable they were with their decision, and how strongly they would urge the patient to take antibiotics if the patient did not want to (0-100 scale). The eight faculty members were asked to evaluate the cases following CDC guidelines, rather than their own judgments. Practitioners prescribed antibiotics in 44.5% of cases, double what the faculty members using the CDC guidelines did (20%). In deciding to prescribe, no weight was given to patient expectation, but a heavy emphasis was placed on duration of the illness. When the duration of the illness was long and compounded with a cough the effect made on the prescriber was stronger, thus an antibiotic was more likely to be prescribed (Wigton, Darr, Corbett, Nickol, & Gonzales, 2008). Interestingly, the CDC guidelines state that patients presenting with a chief complaint of cough rarely have decreased duration of illness with antibiotics. In addition, the common cold may last up to 14 days, with an average of 7-11 days (CDC, 2010).

Wood, Simpson and Butler (2007) examined the prescribing of broad-spectrum and fluoroquinolone antibiotics among physicians in Wales over narrow spectrum antibiotics. Through interviews and information gathered from the Prescribing Audit Reports and Catalogues, the authors were able to identify factors leading to increased use of broad-spectrum antibiotics. Findings suggested broad-spectrum antibiotics use over narrow spectrum antibiotics use was dependent on clinical considerations, perceived patient expectations and organizational influences. The authors concluded “clinical considerations affecting antibiotic choice included the presenting condition, patient circumstances, the perceived need to treat the infection quickly

and effectively, the likely infecting organism, perceptions of resistance and treatment failure, a duty to give patients a chance to benefit and the likelihood of re-presentation” (Wood, Simpson, & Butler, 2007, p. 432). The study concluded that provider education must be increased so that in the midst of patient contact one is not swayed by information that does not deem treatment. Considering increased length of consult and added information to patients may help to demonstrate a caring demeanor while also conveying confidence in one’s medical approach (Wood, Simpson, & Butler, 2007).

Jaye and Tilyard (2002) looked at the prescribing habits and patterns of general practitioners in New Zealand. The purpose of the study was to investigate the non-quantifiable (qualitative) aspects that may explain variations in prescribing habits. The authors interviewed low, medium and high prescribers to look for patterns. Low prescribers were found to have more time in practice, more experience, and were more self-reliant; however, they did use clinical guidelines less frequently. These prescribers were more comfortable refusing patients antibiotics and less influenced by their requests. Medium prescribers were patient centered and placed a greater emphasis on listening and understanding the patient. High prescribers were more concerned with the business aspect of the transaction and saw patients as consumers and valued medical interventions (Jaye & Tilyard, 2002). The study stated that as a community, prescribers must first treat patients as such, patients. Providers must be cognizant of the fact that education can be just as effective as medical intervention. Listening can provide key components to diagnosis, and experience is invaluable in guiding prescribers to seek and give education, rather than medical interventions.

Sivagnanam and Mohanasundaram (2004) investigated attitudes and practices of antibiotic prescribers and suggested measures that may contain antibiotic resistance. Through a self-administered, anonymous questionnaire, general practitioners were asked to describe the deciding factors for antibiotic prescribing. Findings revealed that patient expectation, patient satisfaction, purulent discharge, and fever were deciding factors for antibiotic prescribing. Patient and time pressure, uncertainty over diagnosis and treatment, and incongruent utilization of resources were cited as urgent need for a multidimensional approach to contain antibiotic overuse (Sivagnanam & Mohanasundaram, 2004). By understanding factors that lead to antibiotic overuse, the study aims to provide insight for further investigations for where to consider appropriate interventions.

Potential Strategies to Reduce Antibiotic Overuse

Hemo and colleagues (2009) suggested that antibiotic resistance in communities is an emerging threat to public health. Antibiotic prescriptions are frequently written for viral infections particularly in upper respiratory infections and otitis media. Physicians may overprescribe because of patient demand and expectations. It has also been suggested that with high caseloads, particularly in the winter months, prescribers lack the time and/or skill to properly educate patients on why antibiotics are not necessary. Effective strategies to decrease the amount of prescribed antibiotics should include, but are not limited to, prescriber education and an effort to decrease patient demand through appropriate education. During January 2006 a media campaign to increase the public awareness of the risks associated with the misuse of antibiotics was initiated by the Maccabi Healthcare Service. A campaign based on television programming was found to be an effective way to provide adequate knowledge to a large

population regarding appropriate antibiotic use as antibiotic purchasing rates were less after the intervention than at baseline. Parents exposed to the media campaigns showed increased knowledge over parents that were not exposed and antibiotic use for viral infections decreased after the campaign period ($F=4.18$, $P=.04$). Not only was there a short-term change in antibiotic use, but also there was an effect on parents' attitudes in to antibiotic use after the campaign. Once again, the clinical problem of antibiotic overprescribing was articulated. High caseloads in the winter were suggested as a contributory factor. The study interventions consisted of radio and television advertisements and a 4-part television series targeted at parents with children along with written materials given out at pediatrician offices, but found that video presentations were more effective at decreasing demand. The education provided to patients in this study came from a media campaign and written information was also given at doctor visits. The campaign concluded that the video presentations were more effective in decreasing the demand for antibiotics than written materials (Hemo et al., 2009).

Siegel, Kiely, and Bein (2003) conducted a quasi-experimental study to reduce the use of antibiotic in acute otitis media of children. The aim of the study was to decrease antibiotic use by asking parents to wait at least 48 hours before filling a safety-net antibiotic prescription (SNAP) for the treatment of uncomplicated acute otitis media (Siegel, Kiely, & Bein, 2003). The study sought to decrease antibiotic overuse by giving parents the power to decide. Pain control was addressed with acetaminophen, ibuprofen and anesthetic otic drops. Patients were then contacted on day 10 and interviews were completed. Of the 175 participants only 31 percent had filled the prescription while the other 69 percent had waited, 78 percent were satisfied with the paracetamol treatment alone, and 63 percent would be willing to use the SNAP

intervention in the future (Siegel et al.). The study found that the use of SNAP may be able to have an effect on the overuse of antibiotics.

Wheeler, Fair, Simpson, Rowlands, Aitken, and Jacobs (2001) examined the impact of parent attitudes after viewing an educational videotape and receiving a pamphlet at the end of the appointment on the judicious use of antibiotics. The videotape was shown in the waiting rooms of a pediatrician's office. The videotapes were played over a 36 week time period and questionnaires were done at week 2 and week 36 to parents of children seen in the office. Self-administered patient questionnaires were used to gather data on parent attitudes towards the use of antibiotics. Parents who viewed the videos were less inclined to ask for antibiotics for viral infections. The study yielded three main results: videotapes can be an effective way to affect parent's attitudes, passing pamphlets was not effective, and changing attitudes did not translate into reduced prescribing of antibiotics for viral diseases (Wheeler, Fair, Simpson, Rowlands, Aitken, and Jacobs, 2001).

Legare, Labrecque, Godin, LeBlanc, Launer, and Grimshaw (2011) noted that acute respiratory infections (ARI) are the most commonly reported reason for patients presenting to a family practice. While research shows that bacterial infections are only responsible for 38% of acute rhinosinusitis, 6 to 18% of ARI and 5 to 15% of pharyngitis, 53% of patients are prescribed antibiotics (Legare, Labrecque, Godin, LeBlanc, Launer, and Grimshaw, 2011). Resistance for individuals is of concern, but the public health issue of the overall community population resistances has major public health concerns. Legare et al (2011) broached the idea of shared decision making with physician and patient in order to make the best decision with the most informed information (Legare). In a pilot clustered randomized control trial to examine

antibiotic prescribing for ARI in primary care setting, four family medicine groups were randomized into intervention groups and control groups. The intervention group used DECISION+, a multifaceted intervention for implementing shared decision making (SDM) in medical practices that included training, reminders and feedback (Legare et al). The use of this program decreased “immediate antibiotics” (those taken immediately after seeing the provider) by 20%; therefore, these researchers felt that the implementation of a SDM format may help to decrease antibiotic overuse in ARI. Working with patients in a shared-decision making format can help to decrease the amount of antibiotics used through additional education and perceived increased patient control.

Through a meta analysis, Belongia and Schwartz (1998) found that antibiotic overuse is a documented problem and unnecessary prescribing remains frequent. To achieve more judicious prescribing a two-fold approach was recommended (1) understanding the associated factors that promote overuse and the barriers to change and (2) understanding which implementation will be successful to change this behavior. The article lists four reasons for the overuse of antibiotics: (1) lack of education, (2) prior experience, (3) patient expectations, and (4) economics. The article states that “to write prescriptions is easy, but to come to an understanding with people is hard” (Belongia & Schwartz, 1998, p. 669). Sometimes, it is easier and quicker to prescribe, than educate. The authors recommend the use of education through public relations campaigns with simple messages; plus clinic based patient education and community outreach activities to decrease the use of antibiotics. Feedback to physicians on their prescribing habits along with peer education will also help to curb antibiotic overprescribing (Belongia & Schwartz).

Education must be met with organizational support in order to be effective and decrease the overuse of antibiotics.

Steinberg (2000) discussed the need for judicious use when prescribing antibiotics. Prescribing antibiotics on the first office visit tends to increase, not decrease, the cost of treatment and has a marginal impact on patient outcomes. The article also states the downside of prescribing antibiotics for self-resolving viral infections is that patients and clinicians alike make the connection that the antibiotic, and not the natural course of the viral infection, caused symptom resolution. Subsequent likelihood will be for similar issues is increased antibiotic prescribing. Steinberg (2000) suggests education is a key element in decreasing the number of antibiotics prescribed. In Finland a 50% decrease in use of antibiotics was seen after a three year national campaign consisting of education through a media campaign and written pamphlets. The study concluded that better differential diagnoses, correct use of antibiotics, increased education, and vaccination to reduce seasonal flu and childhood illness must be encouraged (Steinberg, 2000, p. S1186).

Finkelstein, Davis, Dowell, Metlay, Soumerai and Rifas-Shiman et al. (2001) designed an education outreach for families and physicians in order to decrease antibiotic prescribing. Education was provided to parents via mailed factsheet that contained a cover sheet signed by the pediatrician and reinforced with CDC educational material. In addition to the education provided to parents, pediatricians were lead by a practicing pediatrician at a CDC workshop with topics that included antibiotic resistance and potential ways to prevent the overuse of antibiotics. Education focused on the accurate diagnosing of acute otitis media from otitis media with an effusion. In addition, the discussion related to increased education to families about a viral

diagnosis and the importance of seasonal influenza vaccines to reduce the number of URI. The study concluded that the simultaneous educational outreach did reduce the number of antibiotics being prescribed; however, after the study's conclusion, prescribing rates went back to baseline (Finkelstein, Davis, Dowell, Metlay, Soumerai & Rifas-Shiman et al., 2001).

In a randomized control trial, Hickman, Stebbins, Hanak, and Guglielmo, (2003) examined an intervention program to decrease the use of inappropriate antibiotics by focusing of acute bronchitis as the diagnosis. Both adult and pediatric patients were included in this study. Physicians and other prescribers were given literature with information about the inappropriateness of antibiotics in the treatment of bronchitis from the CDC; in addition, cough and cold package inserts and newsletters intended to decrease the overuse of antibiotic prescribing for bronchitis were also included (Hickman, Stebbins, Hanak, & Guglielmo, 2003). Patient-directed information was placed in examination rooms and waiting rooms as well (Hickman). Over a six-month time frame a 20% reduction in antibiotic prescribing for bronchitis was seen, in the same time frame in a control group, where no intervention was initiated, no change was seen (Hickman). It was further noted by pharmacists that reduced antibiotic prescribing does not increase consumption of healthcare, but rather patients who did receive antibiotics for acute bronchitis were more likely to require subsequent doses of antibiotics (Hickman). Hence, once the antibiotics were initially prescribed, patient's tended to seek the use of antibiotics more in the future as they perceived that resolution of the illness was associated with antibiotic use rather than the body's immune system functions to combat the virus. The study concluded that patient's who did not receive antibiotics had less healthcare needs when compared to patients that did receive antibiotics.

Slama, Amin, Brunton, File, Milkovich, and Rodvold, et al. (2005) state the problem seen with antibiotic resistance stems from two main contributors: overuse and misuse of antibiotics. In the 1940s when antibiotics were first discovered, there was a great reduction in morbidity and mortality from infectious diseases. This led the US Surgeon general to declare it was time to “close the book” on infectious diseases (Slama, Amin, Brunton, File, Milkovich & Rodvold et al., 2005). However, over time we have seen antibiotics prescribed both incorrectly and at suboptimal doses (Slama et al.). The Council for Appropriate and Rational Antibiotic Therapy (CARAT) is an independent group of healthcare professionals that are comprised of both clinicians and scientists that advocate for the accurate use of antibiotics (Slama et al.). Currently, humans are being dosed with antibiotics similarly given to animals to increase growth patterns and then ingested by humans giving one another venue of antibiotic dosing through the consumption of these treated animals (Slama et al.). A confounding factor is that research and development of new antibiotics is stagnating, probably because this endeavor is not cost effective to pharmaceutical companies (Slama et al.). CARAT has developed 5 criteria to assist healthcare workers to use the most appropriate and accurate treatment regimens, these include: evidence-based results, therapeutic benefits, safety, cost-effectiveness, and optimal drug dose and duration (Slama et al.).

Upper Respiratory Tract Infections and Antibiotic Overprescribing

Reveiz, Cardona, and Ospina (2011) found that in two separate randomized control trials that examined the use of an antibiotic or placebo for the treatment of acute laryngitis, antibiotics appeared to have no treatment benefit. Symptoms most commonly associated with acute laryngitis include: hoarseness, fever, sore throat, postnasal drip and difficulty swallowing

(Reveiz, Cardona, & Ospina, 2011). Antibiotics are often prescribed based on physician and patient attitudes, demands and expectations (Reveiz et al.). The review found that the two studies (combined n=206) that penicillin V and erythromycin had no benefit in the treatment of acute laryngitis; however, erythromycin was found to reduce hoarseness in one week and cough in two weeks when measured subjectively (Reveiz et al.). Overall, the authors conclude that decreased hoarseness by subjective measure is not relevant to clinical practice and slight benefits do not outweigh their cost, adverse reactions, or negative consequences related to antibiotic resistance patterns (Reveiz et al.).

Cals, Schot, deJong, Dinant and Hopstaken (2010) aimed to reduce antibiotic overuse in respiratory tract infections and rhinosinusitis by using C-reactive protein point-of-care testing and delayed prescribing to reduce antibiotic prescribing. In a randomized controlled trial using 258 patients the primary outcome was reduced antibiotic use and the secondary outcomes consisted of antibiotic use during the 28 day follow-up, patient satisfaction and clinical recovery (Cals, Schot, de Jong, Dinant, & Hopstaken, 2010). Through a QuikRead CRP analyzer, results were available to providers within 3 minutes. The authors suggested no antibiotic prescribing when results were less than 20 mg/L, immediate prescribing when results were greater than 100 mg/L and delayed prescribing when results were between 20-99 mg/L (Cals et al.). Patients in the CRP-assisted group used fewer antibiotics (43.4%) than control patients (56.6%) and delayed prescriptions were used 23% of the time in the CRP-assisted group and 72% of the time in the control group (Cals et al.). CRP point-of-care testing to assist in prescribing behavior was a useful strategy in reducing the number of antibiotic prescriptions and there was an increase in patient satisfaction without compromising patient recovery (Cals et al.).

Huang, Rifas-Shiman, Kleinman, Kotch, Schiff, and Stille, et al. (2007) sought to impact community-wide education to reduce pediatric antibiotic overprescribing using parents as the target audience. Over a three year period, newsletters were mailed and educational materials were available at pediatric providers, pharmacies, and child care centers for parents (Huang, Rifas-Shiman, Kleinman, Kotch, Schiff, & Stille et al., 2007). A pre and post survey was done to see if knowledge increased among parents of children ages 6-16 (Huang et al.). Results revealed that more socially advanced populations' knowledge of appropriate use of antibiotics is improving without intervention; however, among Medicaid-insured children interventions may help to promote judicious antibiotic use (Huang et al.). Overall, there were no significant or lasting effects seen with this intervention on the reduction of antibiotic overuse (Huang et al.).

Hart, Pepper, and Gonzales (2006) conducted comprehensive interviews with 21 providers to examine the decision-making process about antibiotic prescribing. Two main theoretical concepts emerged: individual best practice and perceived patient satisfaction (Hart, Pepper, & Gonzales, 2006). Individual best practice described how each provider did what he thought was best for the patient and clinician, perceived patient satisfaction was the prescribers own perception of how the patient felt (Hart et al.). The authors developed an intervention that aimed to act as a balancing act, basic social process where clinicians could weigh individual best practice against perceived patient satisfaction when deciding to prescribe (Hart et al.). Balancing acts were comprised of four components: education of the patient, negotiation with the patient, giving in to patient demand and holding firm regardless of patient demands or beliefs (Hart et al.). These authors suggest it is imperative to discuss individual best practices with providers and work on integrating evidence-based research into everyday practice, even when this may

conflict with their own observations and/or training experiences. Also, patient satisfaction has not been linked to antibiotic prescribing, but has been linked to increased clinician time spent with the patient, respect for the patient, and concentration on patient concerns (Hart et al.).

Akkerman, Kuyvenhoven, van der Wouden and Verheij (2005) looked for determinants of antibiotic overprescribing in respiratory tract infections in general practice. 146 general practitioners were surveyed using 1469 patients with the diagnosis of sinusitis, tonsillitis and bronchitis (Akkerman, Kuyvenhoven, van der Wouden, & Verheij, 2005). Overprescribing was found to be highest in tonsillitis and bronchitis and lowest in sinusitis (Akkerman et al.). When not following guidelines, clinicians said patients had more signs of inflammation (i.e. fevers), were more severely ill, and had a higher expectation of prescription. Conclusions were that proper and updated education to providers is a necessary component to reduce antibiotic use as well as clearly understanding the expectation from a patient presenting with a chief complaint that includes an upper respiratory infection (Akkerman et al.). Providing the most recent information to clinicians related to patient satisfaction may help to reduce the level of overprescribing in relation to URIs, as increased time and education have been found to be just as effective in patient satisfaction levels.

Mangione-Smith, Stivers, McDonald, Hertiage, and McGlynn (2004) looked at racial and ethnic variations on parental expectations of antibiotic treatment. 543 parents were surveyed to examine parental beliefs about antibiotic necessity in respiratory infections (Mangione-Smith et al., 2004). Results revealed both Latino and Asian parents were 17% more likely to state antibiotics were definitely or probably necessary than non-Hispanic white parents (Mangione-Smith et al.). While physicians' correctly perceived Asian parents expected antibiotics more

often than non-Hispanic whites, they were unaware of the expectation from Latino parents (Mangione-Smith et al.). The authors conclude public health campaigns have affected non-Hispanic whites on the use of antibiotics, but racial and culturally centered education should be developed targeting Latino and Asian communities (Mangione-Smith et al.).

File and Hadley (2002) found respiratory tract infections (RTI) are the leading cause of acute illness in the U.S and that approximately three quarters of all antibiotic drug use resulting from a clinician visit is for RTIs. Factors contributing to antibiotic overuse for these viral infections are patient expectations, time constraints, and the practice of defensive medicine. A most prominent feature of viral infections is they self-resolve after two to seven days. The authors strongly recommend physicians use clinical guidelines and spend time educating their patients on appropriate antibiotic use. Studies show patients are generally not upset about being denied a prescription, but satisfaction is more positively affected by the time spent explaining the course of their illness (File & Hadley, 2002). Educational campaigns are helpful, however, time the clinician spends educating the patient is considered the most effective. The authors suggest educational efforts targeting clinicians as well as patients are necessary to encourage implementation of guidelines, to avoid the misuse of antibiotics for viral infections, and to prevent prescription of antibiotics that are ineffective for treating the most likely respiratory illnesses (File & Hadley, 2002).

Summary

This review utilized all three levels of evidence. Type I evidence, used in experimental randomized clinical trial or meta-analysis, type II examines quasi-experimental studies and type III evidence is non-experimental, qualitative studies or meta-synthesis (Newhouse, Stanik-Hutt,

White, Johantgen, Boss, & Zangaro, et al., 2008). Rating for the literature used ranked as high with sufficient sample, control, and definitive conclusion or good with reasonable results, sample, control and conclusions (Newhouse et al., 2008).

Antibiotic overuse as a problem was discussed as Colgan and Powers (2001) gave staggering numbers of the increase in antibiotic use in the outpatient clinical setting. Specific examples were reviewed as Steinman et al., (2009) discussed the issue of antibiotic overuse in OM and URI and gave mention to complications such as *c. diff* and anaphylaxis. Wigton and colleagues looked at community prescribers to examine prescribing practices and seek which subjective and objective complaints carried the heaviest weight for prescribing of antibiotics. Wood et al (2007) continued one step further to look at the difference between broad-spectrum and narrow-spectrum prescribing and why one is chosen over another. Jaye and Tilyard (2002) also investigated variation in prescribing habits in low, medium and high prescribing offices. Sivagnanam and Mohanasundaram (2004) examined attitudes of practitioners by giving questionnaires to seek better clarity of prescribing habits. Strengths of this section were the gained knowledge that patient satisfaction, time spent with patients, and experience all play a vital role on practitioners deciding to prescribe and what to prescribe. Weakness, no RCT in this section, and literature was ranked as good.

Potential strategies to reduce antibiotic overuse examined previously implicated interventions to reduce antibiotic overuse. Hemo et al., (2009) found that a video format was more successful than written literature in reducing the use of antibiotics in an outpatient setting. Belongia and Schwartz (1998) concluded that reducing antibiotics is difficult as often it is easier and quicker to prescribe rather than educate. Steinberg (2000) found that once antibiotics are

initially prescribed, the tendency for patients to request more in the future also increases. Finkelstien et al, (2001) concluded that simultaneous education to patients and practitioners was helpful in reducing antibiotic overuse. Wheeler et al., (2001), like Hemo et al., (2009) found that videotapes helped to change attitudes of parents related to antibiotic use, unfortunately this did not always lead to decreased use. File and Hadley (2002) reiterated previous findings mentioning that time constraints, patient satisfaction and defensive medicine all lead to increased prescribing; focusing on both provider and patient education was a key to these authors conclusion. Slama et al, (2005) concluded that using the 5 recommendation from CARAT were most effective in prescribers reducing antibiotic overuse. Legare et al., (2011) examined shared-decision making to decrease immediate antibiotic overuse. Hickman et al (2003) found that strategic placement of literature in waiting rooms and patient rooms helped to decrease antibiotic prescribing by 20% in bronchitis. Siegel et al (2003) found that decreasing antibiotic overuse in OM could be done with SNAP prescriptions and reduced antibiotic use by 69%. Strengths of this section were that RCTs along with several quasi-experimental studies found that video education was helpful in decreasing antibiotic overuse as well as combination education between providers and patients. Weaknesses were found as different studies gave differing conclusions related to written literature and prolonged decrease in antibiotic overuse.

URI and antibiotic overprescribing found that URI are the most often abused complaint for antibiotic use. Reveiz, Cardona, and Ospina found that in two RCTs penicillin V and erythromycin had no benefit in the treatment of acute laryngitis. Cals et al (2010) found that in a RCT using C-reactive protein analysis as a point-of-care testing was successful in reducing the amount of antibiotics prescribed. Huang et al (2007) found that socially advanced populations

responded to written education better than Medicaid-insured patients. Hart, Pepper, and Gonzales It patterns the most significantly and that a multidimensional approach using directing education at both patients and practitioners would be most successful. Akkerman, Kuyvenhoven, van der Wouden and Verheij (2005) found that overprescribing was highest in tonsillitis and bronchitis and lowest in sinusitis; these authors feel clinician education is imperative to reduce prescribing rates. Mangione et al, (2004) concluded that culturally centered education is needed to target Latino and Asian communities. Strengths of this section were the RCTs giving indications for interventions to decrease antibiotic overuse. A weakness of this section was that no specific interventions were named for education to prescribers.

Literature Critique

In the first category of the literature review, antibiotic overuse as a problem, strengths included studies that defined the problem well, clear statistical evidence provided to give an objective perspective to the problem, and the use of quasi-experimental trials to find which factors lead to the prescribing decisions of medical doctors, nurse-practitioners and physician assistants. In addition to describing the problem, this section also stated that increased experience often coincided with decreased prescribing of antibiotics for URI. Weakness of this section included the lack of any randomized-control studies (RCT) or Meta analysis. Grounded theory and descriptive studies lacked rigor.

In the second category of the literature review, potential strategies to reduce antibiotic overuse, strengths included the potential and feasible strategies employed to decrease antibiotic overuse, in addition to providing the statistical data. This section also used RCTs and quasi-experimental studies adding rigor and applicability to the research. Weakness of this section

included the fact that interventions demonstrated no lasting effects. Also, several studies took place over the course of several years leading to the potential of maturation as a threat.

Finally, the third section of the literature review, URI and overprescribing, had strengths that included the use of RTCs, studies that had statistically significant results for practice and larger sample sizes. Weakness of this section was that some studies, in particular Hart et al., discussed an intervention, in this case Balancing Acts, but never clearly described the intervention making implementation of this study impossible. Finally, convenience sampling was used giving an increased incidence to bias such as socioeconomic status, race, age, and education level of the sample.

Theoretical Framework

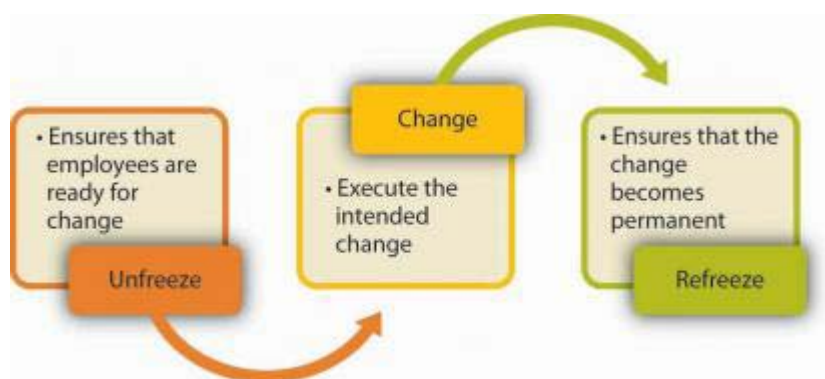
The theoretical framework for this practice inquiry is Lewin's three-step change theory. Kurt Lewin (1951) introduced this model to examine behavior as a dynamic balance of forces working in opposing directions where driving forces are able to facilitate change and restraining forces hinder change. The goal in this theory is to find a way to shift the balance in the direction of planned change (Lewin, 1958). This theory is relevant because the purpose of this PI is to change the prescribing behavior of clinicians.

The first step in the process is to unfreeze the existing situation in order to overcome the strains of individual resistance or group conformity (Lewin). Three methods can be used to achieve unfreezing: (1) increase the driving forces that are responsible for directing behavior away from the existing situation, (2) decrease the restraining forces that negatively affect movement, (3) find a combination of the two previous steps that allows for motivation and preparation while incorporating trust and need for change (Lewin)

The second step involves movement to a new equilibrium, three actions can help to achieve this goal: (1) persuading participants that the status quo is not beneficial and encourage a fresh perspective, (2) collaboration for a new equilibrium, and (3) find a powerful leader to support the change (Lewin).

The third and final step is refreezing so that the change can be sustained after implementation (Lewin). This step can be difficult to maintain as one may easily revert back to old behaviors and thus the old equilibrium; therefore, it is imperative that in this stage both driving and restraining forces are balanced to ensure a successful translation into the new equilibrium (Lewin).

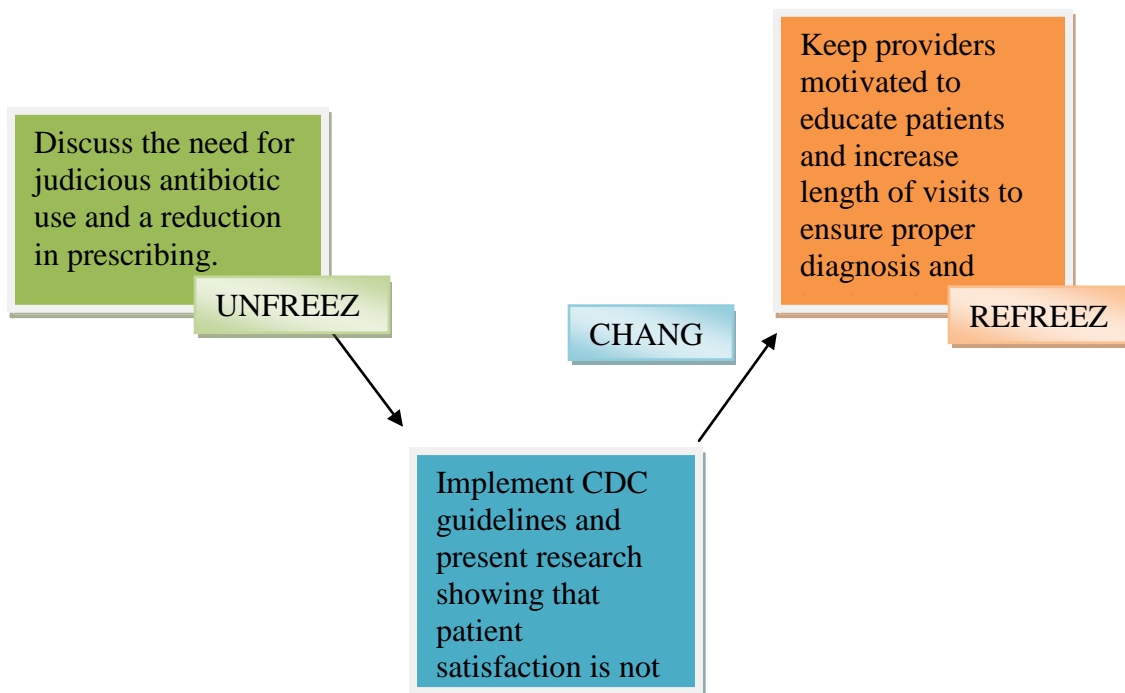
Figure 1.



As I aim to educate providers on the need for reducing antibiotic overprescribing, I will first need to be able to establish that they are ready for change and motivate them to being the change. Next, I must be able to provide adequate information and substantial educational materials in multiple modalities so that change can be made. Finally, I need to be able to show

providers that decreasing antibiotics will reduce the consequences of their unnecessary use while not endangering patients or hampering outcomes.

Figure 2



Conclusion of Literature Review

Antibiotic overuse has been seen as a problem for decades and overuse continues, particularly in outpatient setting. It is imperative that we begin to find venues to decrease the overuse of antibiotics so that we are able to treat infections that truly require their use. Several articles concluded that increased time with patients is essential to decreasing antibiotic overuse. Education was seen as a viable option; however, decreased antibiotic prescribing and demand seemed to be reduced only temporarily. This problem needs a permanent solution, not a temporary one. Upper respiratory infections are shown to be a common reason for visit to the

general practitioner and an area of antibiotic overprescribing. Lack of evidence-based research, unproven clinical experience and over-estimation of patient demand are all seen as factors contributing to antibiotic overuse.

Presenting the facts to practitioners with evidence-based research in multiple modalities may help to reduce antibiotic overuse at its core. Understanding the real reasons behind patient satisfaction and expectations is also at the cornerstone of beginning to combat this problem. It is imperative that we begin to reduce antibiotic overuse, so that our precious resources are not spent on unnecessary viral and self-eliminating infections.

CHAPTER THREE: RESEARCH QUESTIONS AND METHODS

This chapter details the research questions and describes the design, methods, sample, recruitment, setting, timeline, data collection and data analysis used to evaluate an educational intervention that targeted nurse practitioners' knowledge and intentions to prescribe antibiotics to patients diagnosed with URI in a primary care setting. The ultimate goal of this practice inquiry was to decrease antibiotic overuse through education provided directly to the nurse practitioners.

Antibiotic over-prescribing has been identified in the literature as a significant problem. Clinicians are an important parameter in the problem, as they are responsible for the care and treatment of their patients. Since NPs provide a significant percentage of primary care to patients in the US, it is assumed that they may contribute to antibiotic overuse in patients with URI diagnoses. The purpose of this practice inquiry was to determine the impact of an educational module, delivered to NPs practicing in a primary care setting, on knowledge about antibiotics for treating URIs and intentions to prescribe antibiotics for specific URI diagnoses (common colds, rhinosinusitis, acute bronchitis, and acute pharyngitis).

Research Questions

The three research questions for this practice inquiry were: (a) does an educational intervention change the knowledge scores of NPs related to antibiotic prescribing for URI; (b) does the educational intervention change intention to prescribe antibiotics for specific URI diagnoses; and (c) was there a relationship between demographic characteristics of the sample and knowledge and intention?

Methods/Design

A one group pre-post-test design was utilized to test the effectiveness of an educational module on knowledge related to antibiotic prescribing to patients diagnosed with URI in a primary care setting, as well as intention to prescribe for URI which include: rhinosinusitis, the common cold, acute bronchitis, and acute pharyngitis

Variables of Interest

The demographic variables included NPs age, gender, years in practice and specialty. Age and years in practice were both continuous variables, where as gender and specialty were both categorical level variables. The outcome variables of interest included knowledge and intention to prescribe antibiotics for rhinosinusitis, the common cold, acute bronchitis and acute pharyngitis. The independent variable was the educational intervention.

Sample

IRB approval was obtained for the study from both the College of Nursing and the University of Arizona. The sample was selected from currently practicing nurse practitioners in the state of Arizona. Recruitment was done by contacting individuals from the Arizona Nurse Practitioner (AzNP) website. Emailed recruitment was sent out to the listserve at the start of the recruitment process, at two weeks and again at four weeks in an effort to gain an adequate sample size. The AzNP newsletter, Today, was used as a recruitment tool as well. This bi-monthly newsletter is sent to current AzNP members. Debby Wood gave both verbal and written approval to use the newsletter as another source of recruitment. Finally, snowball recruiting was done in an effort to meet the sample goal. Inclusion criteria was a) currently practicing as an NP in a primary care setting, b) holds NP credentials as an FNP, ANP or PNP, c) have at least one

year of practice experience. Exclusion criteria were not currently practicing, or not practicing in a primary care setting. Sample size goal was 50 NPs.

Instruments

Demographic Questionnaire. The demographic questionnaire obtained information about the sample characteristics of age, gender, years of experience, and years in practice as a nurse practitioner.

Knowledge Questionnaire. The knowledge questionnaire obtained NPs antibiotic knowledge pretest, posttest and at 4 week follow-up. The questionnaire consisted of 10 true/false items. Items in the questionnaire were attained from current CDC guidelines and reverse wording was done in order to avoid report bias. Each correct answer received a score of 10 and each incorrect answer received a score of 0. The possible range of the total instrument score was 0-100 with higher scores representing more knowledge of antibiotic prescribing for URI conditions.

Intention Questionnaire. The intention questionnaire measured NPs' intention to prescribe antibiotics for rhinosinusitis, the common cold, acute bronchitis, and acute pharyngitis. These were measured at pretest, posttest, and at the 4 week follow-up. Scoring was done on the knowledge and intention sections only. The intention questions were answered by a 5 point Likert Scale from 1= strongly agree, 2 = agree, 3 = neutral, 4 = disagree, and 5 = strongly disagree. The questions appeared as "Antibiotics should be prescribed for (rhinosinusitis, the common cold, acute bronchitis, and acute pharyngitis)". Two of the questions were reverse worded to avoid response bias. To score the questionnaire, the two questions with reverse wording were re-coded. Higher scores represent greater intention to not prescribe

antibiotics. Total possible scores are 5 with a range of 0 – 5. Please see appendix 2 for the complete questionnaires.

Intervention

The intervention consisted of a 20 slide, narrated PowerPoint. Objectives and goals were discussed in the first few slides. Next, using research studies from Munding et al (2000), Horrocks, et al (2002) and Rough (2009), information was given as to why NPs were the target population of this research study. Slide five discussed the problem, as described by the Centers of Disease Control, followed by consequences of overprescribing further discussed by the CDC. Next, contributing factors found in a research study by Sivagnanam and Mohanasundarasm (2004) were presented. Latest statistical data from Legare et al (2011) was presented. Then, slides nine through twelve broke down the CDC current guidelines for treatment on the common cold, rhinosinusitis, acute bronchitis and acute pharyngitis. Information and statistical data was then presented related to antibiotic use when treating URI. Slide fourteen focused on the CDC guidelines for suspecting pneumonia. Slides fifteen and sixteen discussed two previously trialed attempts at decreasing antibiotic overuse to give NPs options to help decrease antibiotic overuse. Slide seventeen gave two other options, following CDC guidelines or making follow-up phone calls to assess patient progression. Slide eighteen was a conclusion slide used for summary. Lastly, a thank you slide followed by references was made available.

Data Management

Data was entered into a Statistical Package for the Social Sciences (SPSS) data form prepared *a priori*. Data was double-entered to check for accuracy. Following all data entry, data was cleaned by checking for outliers or inappropriate entries. Participants were identified by

participant number only for confidentiality. Data from participants who only completed the pre-test questionnaire was discarded. Data from participants who completed pre-test and post-test was analyzed for change scores to determine if the educational intervention immediately affected knowledge and intention. Data from individuals who completed the questionnaire from all three time points was analyzed to determine both immediate and longer term effects of the intervention on knowledge and intentions to prescribe antibiotics for URIs.

Data Analyses

The sample was described using descriptive statistics and measures of central tendency. Research question #1 was answered using ANOVA statistics of total knowledge scores at pre-test, post-test, and 4 weeks follow-up time points. For those who completed the pre-test and post-test knowledge questionnaires only, mean substitution was done, rather than pairwise deletion of missing data, so that an internally consistent set of results were produced. If only the pretest was completed, that information was deleted from the study. Question #2 was answered using ANOVA statistics of intention to prescribe total scores at pre-test, post-test, and 4-week follow-up. Again, mean substitution was used for missing data and if only the pretest was completed, that information was deleted from the study. Research question #3 was answered using Pearson's Product-moment Correlation Coefficients to determine the relationship between age, gender, and years of practice experience on knowledge of antibiotics and intention to prescribe antibiotics for URIs at each time point using the sample size of completed questionnaires. Chi-square statistic was calculated to determine a potential relationship between knowledge and intention to prescribe for the groups (FNP, ANP, PNP).

Procedures

The Principal Investigator (PI) emailed potential participants listed on the AzNP website to invite them to participate at the start of the inquiry, at two weeks and then again a final email for recruitment at a four weeks was sent. The email invitation briefly described the study, discussed generally how participation would occur, and asked those interested to contact the PI via return email that had included contact information. When the individual agreed to participate, credentials were sent with the email to verify that inclusion criteria were met. Then, via email correspondence, using survey monkey, participants took the pre-test. Next, participants viewed a narrated, 20 slide educational PowerPoint. Then, immediately following the PowerPoint presentation, participants took the post-test. In four weeks, participants were emailed the last 4-week follow-up test to see if knowledge and intention was retained.

Conclusion

In an educational attempt to decrease the amount of antibiotics prescribed in the outpatient setting, NPs were given pre and post tests to measure knowledge as it related to antibiotic use. After watching a short, yet informational PowerPoint presentation, participants once again took the same test to see if knowledge had been affected. Then, in four weeks another questionnaire was done to see if antibiotic prescribing has decreased, increased or stayed the same and to see if any tactics presented in the educational PowerPoint have been implemented.

CHAPTER FOUR: RESULTS

Introduction

The purpose of this study was to evaluate the effectiveness of instituting an educational module to increase knowledge and positively affect intention of nurse practitioners related to prescribing antibiotics for upper respiratory tract infections. This chapter will begin with the description of demographic characteristics of the sample and discuss knowledge and intention scores. Variables of interest were age, gender, years of experience and specialty. Results of the research questions will also be addressed. These questions are as follows: (a) does an educational intervention change the knowledge scores of NPs related to antibiotic prescribing for URI; (b) does the educational intervention change intention to prescribe antibiotics for specific URI diagnoses; and (c) is there a relationship between demographic characteristics of the sample and knowledge and intention? The results are organized by research question.

Demographic Data

Fifty-three nurse practitioners agreed to participate in the study. Participants were recruited using the Arizona Nurse Practitioner listserv, the Arizona Nurse Practitioner Today newsletter, and by word of mouth, also known as snowball recruiting. Five participants were removed from the dataset because they completed only the pre-test. One participant was eliminated because that participant did not take a pre-test, therefore, a baseline could not be determined. A total of six records were removed, leaving forty-seven participants in the study. All forty-seven were able to meet the minimum inclusion criteria (minimum of one year of experience, currently working in primary care, and holding NP credentials). Forty-seven participants completed both the pre and post test, however only 31 participants completed the 4-

week follow-up, showing a total attrition of 34.1%. A disclosure form was used in lieu of an informed consent, as approved by the IRB. Prior to completing the first survey via SurveyMonkey, participants read and agreed to participate in the study. If participants had disagreed, they would have been eliminated from the study. The information was downloaded from SurveyMonkey electronically with only identification numbers used for tracking.

Data on participant age, sex, specialty, and years of experience were obtained. The demographics includes central tendency for the continuous variables of age ($M = 41.68$ years, $SD = 9.21$ years) and years of experience ($M = 7.68$ years, $SD = 5.37$ years). The central tendencies for age and years of experience are in Table 1.

TABLE 1. *Overview of Study Participants and Central Tendencies*

Category	Results
Age	27-65 years ($M = 41.68$ years, $SD = 9.21$ years)
Years of Experience	1-24 years ($M = 7.68$ years, $SD = 5.37$ years)
Specialty	
Adult NP	9 (19.1%)
Family NP	35 (74.4%)
Pediatric NP	2 (4.3%)
Missing	1 (2.1%)
Sex	
Female	33 (70.2%)
Male	14 (29.8%)

In summary, there were forty-seven ($N = 47$) participant's whose data met the criteria for the study. The mean age of participants was 41.68 years, $SD = 9.21$ years. The mean years of experience was 7.68 years, $SD = 5.37$ years. There were 9 ANPs, 35 FNPs, and 2 PNPs. There

were 33 females and 14 males. Result of findings and correlations are discussed in the next section.

Research Findings

Does an educational intervention change knowledge scores of NPs related to antibiotic prescribing for URIs?

A within groups repeated measures ANOVA was performed to investigate differences in mean knowledge scores over the three time periods. Results indicated a significant within-groups main effect for time [$F(2,45) = 7.09, p = .002$]. The mean knowledge score increased over the three time periods, table 4 shows the overall change in knowledge based on participants average scores. The effect size was large, (partial eta-squared = .240). According to Cohen (1988) effect size guidelines are .01 = small effect, .06 = moderate effect, and .14 = large effect. All participants had a pre-test score so imputation was not needed. Values of the means from the descriptive tables were used to replace missing values on the knowledge and intention scores. The intention scores were scored as means, rather than sums so that more data could be preserved, thus allowing for the scores to be compared on the same metric. Ten true/false questions were scored on a 100 percent scoring system. Thus, scores showed a changed from 83.36% pretest to 85.78% on the post test, and 90.98% on the 4-week follow-up.

TABLE 2. *Overall Change in Knowledge*

Test	Mean	Standard Deviation
Pretest	.83617	.134407
Posttest	.85778	.159468
4 week	.90968	.11678

Does the educational intervention change intention to prescribe antibiotics for specific URI diagnosis?

A within groups repeated measures ANOVA was performed to investigate differences in mean knowledge scores over the three time periods. Results did not indicate a significant within-groups main effect for time [$F(2,45) = 1.65, p = .203$]. See table 5 for the mean intention scores. All participants had a pre-test score so imputation was not needed. Intention scores were based on a Likert-type 1-5 scale. The intention scores were used to determine whether the intervention influenced intention. A score closer to 5 would indicate that a participant had a higher intention to decrease antibiotic prescribing for the specified URI. The questionnaire specifically examined the intent to decrease prescribing for: rhinosinusitis, the common cold, acute bronchitis, and pharyngitis.

TABLE 3. *Overall Change in Intention to Prescribe Antibiotics*

Test	Mean	Standard Deviation
Pretest	3.01596	1.010190
Posttest	3.17037	1.090279
4 week	3.31989	1.009929

Relationship between demographic characteristics and knowledge and intention

Pearson's Product Moment correlations technique was used to investigate bi-variate relationships between the demographic and test score variables of the study. Significant findings are as follows:

- a) Age with years of experience ($r = .634, p < .0005$). The direct relationship indicates that as a nurse practitioners age increases, so does years of experience.
- b) Knowledge pre-test score with knowledge post test score ($r = .311, p = .033$). The direct relationship indicates that the participants' scores on the pre and post-knowledge tests demonstrate that higher pre-test scores are associated with higher post-test scores, and lower pre-tests scores are associated with lower post-test scores.
- c) Knowledge pre-test score with knowledge 4th week test score ($r = .337, p = .021$). The direct relationship indicates that the participants' scores on the pre and 4th week knowledge tests demonstrate that higher pre-test scores are associated with higher 4th week post-test scores, and lower pre-tests scores are associated with lower 4th week post-test scores.
- d) Knowledge post-test score with knowledge 4th week test score ($r = .512, p < .0005$). The direct relationship indicates that the participants' scores on the post-test and 4th week post-test knowledge tests move in a similar manner. Higher post-test scores are associated with higher 4th week post-test scores, and lower post-tests scores are associated with lower 4th week post-test scores.
- e) Age was significantly correlated with intention pre-test score ($r = .467, p = .001$). The direct relationship indicated that older ages are associated with higher intention pre-test scores, and younger ages are associated with lower pre-test intention scores.
- f) Age was directly significantly correlated with intention post-test score ($r = .365, p = .012$). The direct relationship indicated that older ages are associated with higher intention post-test scores, and younger ages are associated with lower post-test intention scores.

7.Intention Pre-test	.467**	.312**	.743**
8.Intention Post-test	.365**		
9.Intention 4 week		.432**	.425**

** $p < .01$ (2-tailed test)

Non-significant finding related to demographics are as follows:

- a.) No correlation was seen related to sex and knowledge or intention to prescribe. A mixed ANOVA was done to confirm that there was no correlation. There were no significant interactions between gender and test scores ($r = 1.389$, $p = .215$), and also no significant between groups effect for gender alone.
- b.) No correlation was seen related to years of experience and knowledge or intention to prescribe. Although, age did correlate with increased years of experience and overall higher scores throughout the study, the results were not significant in stating that years of experience was a factor in knowledge or intention.
- c.) Due to the high percentage of FNPs and low percentage of PNs correlation between specialty and knowledge was not able to be determined; this will be discussed in chapter 5 as a limitation of the study.

Summary

The educational intervention aimed at affecting knowledge was found to be significant. The mean knowledge score increased over the three time periods, with a large effect size (partial eta-squared = .240). The intention to prescribe antibiotics scores did not yield a significant effect. However, the intention scores did increase slightly from the pretest to 4-week follow-up. Finally, participants who scored higher on the pretest also scored higher on the post test and 4

week follow up for both the knowledge and intention portion of the surveys, demonstrating that knowledge and intention move in a similar manner. While demographics showed little correlation with knowledge or intention, a higher baseline score equated to higher post and 4 weeks scores. In addition, age was significantly correlated with years of experience and intention to reduce antibiotic prescribing for URI.

CHAPTER FIVE: DISCUSSION

Introduction

This chapter reviews the research results presented in Chapter 4 from the perspective of the literature review and Lewin's three-step theory of change. This chapter will also address the strengths and limitations of the study and the application of the findings. Additionally, a section on future research recommendations is included and a brief conclusion will summarize study.

Review of Results

Based on the literature review, antibiotic overuse is a growing problem and is recognized by both the CDC and WHO (CDC, 2010). Numerous studies have shown that education is helpful, but there have been no lasting effects in decreasing antibiotic overprescribing. URIs, with nearly 50% of appointments made for in outpatient settings, are a main culprit of health problems (McCaig & Hughes, 1995). Rather than seeing a decrease in antibiotic prescribing for URIs, health care providers continue to prescribe antibiotics at a higher rate. In the US, there has been a 48% growth in antibiotic overuse from 1980-1992; often these are given to children and the elderly, two vulnerable populations (Colgan & Powers, 2001).

The literature demonstrates that there is little guidance related to the types of educational intervention, sample population targeted, and information retention methods used to decrease antibiotic misuse. Many studies have trialed educational intervention; most have been aimed at patients or medical doctors. Some have included NPs in the group, but none have targeted them specifically. As it becomes apparent that NPs will play an increasingly larger role in primary care, since only 2% of medical school graduates go into primary care (Rough, 2009), NPs are an excellent group to provide an educational intervention to, in an effort to change practice. It is

time that we become leaders in the medical community. Many have tried educational videos, pamphlets, and prescribing feedback, these have helped short term, but no studies have shown a lasting effect.

The results of this study did indicate that NPs were able to retain knowledge when an educational intervention, using CDC guidelines, was targeted to them. While demographic variables showed little statistical significance, the group as a whole was able to retain and gain knowledge. It is also noted that while not statistically significant, intent scores did increase.

Many researchers recommend further research in the areas of education to providers and patients, but are not clear on how to achieve this. The recommendations by researchers for more data to fill the gaps in the literature provided the impetus for this study.

Instruments

The instrument used in this study was a questionnaire. It was adapted from a study by (Paluck, Katzenstein, Frankish, Herbert, Milner & Speert, et.al. 2001) who had given pediatricians a 14 point fact sheet from the CDC in an effort to decrease antibiotic overuse in children for URIs. The study found that pediatricians gained knowledge from the fact sheet, however, on chart review it was not seen that there was a significant change in prescribing.

For this study, four questions were eliminated that pertained only to pediatrics, leaving ten total items for the educational portion of the questionnaire. Reverse wording was done to decrease bias. All questions were still based upon CDC guidelines, as was the intervention, to see if participants gained evidence based knowledge as it relates to antibiotic overuse.

The intention questionnaire was created specifically for this study in an effort to evaluate provider's future intention to prescribe antibiotics for a particular URI. By doing this on a Likert-type scale, we were able to quantitatively measure intention change throughout the study.

Demographic Findings

The demographics of interest for the study included age, years of experience, sex and specialty. Participants entered this information, along with an assigned participation number, into each test completed on SurveyMonkey, so that this information could be accurately tracked. Age and years of experience had a direct relationship, thus indicating that older NPs had more experience. Age was found to affect post-test intention scores. Older age equated to decreased intention to prescribe. In a study by Jaye and Tilyard (2002), it was found that older providers were lower prescribers of antibiotics as they felt more comfortable refusing them to patients. The same is seen here in regards to age. Sex did not statistically affect outcomes. A mixed ANOVA was conducted to confirm that no correlation existed. Finally, no conclusion was reached to determine if specialty played a role in knowledge or retention as 35 of the 47 participants were FNPs. The unequally distributed specialties in participants will be discussed in the limitations of this study. The FNP specialty is the most prevalent, so that may be why they were such a large portion of the sample.

Knowledge

Through repeated measures ANOVA it was found that there was a significant within-groups main effect. The mean knowledge score increased over the three time periods. On the pretest the mean score was an 83.6%. After the educational intervention was watched the post-test was taken, showing a mean score of 85.8%. After 4 weeks, the second post-test was taken to

look at retention, and showed a mean score of 91%. The effect size was large. It is important to note that values of the means from the descriptive tables were used to replace missing values on the knowledge scores to allow for preservation of the data and for comparative scoring. In the 4-week follow-up two participants each missed answering two questions, since surveys were able to be completed with missing data, this was able occur twice. While the demographics did not have a statistical significance associated with knowledge, the group as a whole did show an increase in knowledge, thus showing that NPs are an appropriate group to target. It has been seen in numerous studies that education affects knowledge and it is promising to see that NPs are able to gain knowledge as a group. This will make NPs a likely target for future research.

Intention

The within groups repeated measures ANOVA did not indicate a significant main effect. Participants were asked to choose a number on a 1-5 Likert-type scale to see how likely they were to prescribe antibiotics for a particular URI. The specific URIs were rhinosinusitis, the common cold, acute bronchitis, and pharyngitis. A score closer to 5 would have indicated that a participant would be less likely to prescribe an antibiotic for a particular URI. The mean pretest score was 3.02 with a standard deviation of 1.04. The mean post-test score was 3.17 with a standard deviation of 1.09. The mean 4-week follow up score was 3.32 with a standard deviation of 1.01. While the results are not statistically significant, it is noted that the intention scores did increase from the pretest to the 4 week follow-up, thus indicating that participants did increase their overall intent to decrease antibiotic prescribing in URIs, but not to a statistically significant extent. However, while not statistically significant, the change may be able to be seen as

clinically significant. As NPs begin to be more judicious in their prescribing habits, we may begin to see a decrease in overall antibiotic overuse, thus curbing the problem.

Strengths and Limitations of the Study

Strength of this study, according to Burns and Grove (2009) is that initial studies can improve the strength of future study designs, development, and implementation of future major studies. There are no studies currently that include this specific population related to decreasing antibiotic overuse. This population may be an extremely interested group in gaining knowledge, as they tend to spend more time with patients and continue to gain an increased presence in primary care. Because the group studied initially is the same group studied post intervention, some confounding variables and threats to validity, may be reduced (Burns & Grove, 2009). For example, if several groups were compared, there may be some factors that contribute to the outcome and are unequally distributed among the groups, such as feelings about antibiotic prescribing and region of practice. This confounding factor may affect the outcome. In a single group design, confounding factors are limited because the pretest group is the same as the posttest group.

The study was the first of its kind to target only NPs. The results showed that knowledge was significantly affected, demonstrating that NPs have ability to gain and retain knowledge. While intention was not statistically significant, there may be some clinical significance as intention scores increased in both the post-test and 4-week follow-up.

The intervention had much strength, and one important one is that it is free. The educational intervention followed and cited CDC information, allowing for participants to have

access to evidence-based results. The intervention also had specific and quantitative information to help NPs consider the likelihood that a particular illness was bacterial or viral.

There are several limitations to this pre- post- test single group design. For example, there is the history threat (“Single group threats,” n.d.). The history threat occurs when there may be some other event in the participants’ lives that accounted for changes in the scores after the intervention. Maturation is also a potential threat to this design in that all the events that transpire in one’s life during the study time may affect the outcome of the study. For example, perhaps there was a pharmaceutical representative that presented a new antibiotic or a participant attended an educational seminar or conference that discussed antibiotics or URIs.

The testing threat may also be a factor. Testing threat is commonly described as “priming” the participants with the pre-test so that the intervention takes a higher value to the participants because they know they will need to complete the survey again. The history, maturation and testing threat may be reduced by adding a control group to the research design (“Single group threats,” n.d.).

Other limitations of this study have been identified and are related to the sample, the data collection procedures, and the instrumentation. This study utilized a homogenous convenience sample of NPs who are currently practicing in primary care with a minimum of one year of experience. They were recruited using the AzNP listserv, Today newsletter, and snowball recruiting. Snowball recruiting is not used often in quantitative research as it can increase bias. These techniques also lead to a very high rate of FNPs participation as many AzNPs have a family specialty and so few are pediatric. Therefore, accurate results could not be attained when looking at the demographic characteristic of specialty. Because of these recruitment conditions,

the external validity (generalizability) of the data is limited to those who fit into these criteria and were able to be recruited under the previously mentioned techniques. To increase external validity, one may add in more means of recruitment and include any provider prescribing antibiotics. External validity may also be of concern for this study due to the sample size; while the sampling goal was achieved, the sample size was still not high enough to establish power. This lack of appropriate sample size yields an inability to establish power and significance (Burns & Grove, 2009). In addition, as the purpose of the intervention was to increase knowledge, the finding that the pre-test knowledge was strongly related to post test and 4 week follow-up may suggest that the intervention was not a determining factor in the results.

The data collection procedure is also a limitation of the study. The participants were asked to complete the surveys online, without supervision. There is a possibility that the surveys were not taken seriously, or the questions were not read with care. Further, the intervention occurred online as well, participants may not have watched the educational intervention, but rather skipped this and emailed that it was completed; this would be subject to report bias. Having participants take pre and post tests at one location would have decreased report bias and allowed for questions and answers to provide added support to the educational intervention.

Mean substitution was used as a way to replace the missing data; therefore, attrition was not taken into account. Mean substitution can artificially decrease the variation in scores and thus, decrease individual variables in proportion to the number of missing data (Burns & Grove, 2009). Further, it substitutes missing data with artificially created average data points, which may change the values of correlations. Total attrition for this study was 34.1%. This may be attributed to time restraints on the study.

Link to Theoretical Framework

Lewin's three-step theory of change was used as the theoretical framework of this study. The theory seeks to facilitate change and restrain forces that hinder change (Lewin, 1951). The goal of this theory is to find a way to shift the balance in the direction of the planned change (Lewin, 1958). The three steps include unfreezing, changing, and then refreezing the change so that it becomes permanent.

For this study, the unfreezing process was done as participants agreed to participate in the study. The change was expected to occur as participants watched the educational intervention that was designed using evidence based data. Refreezing was examined by assessing four week post test scores to see if the education had changed the knowledge and intention of NPs to prescribe antibiotics for URIs. Many studies have been able to initiate a proposed change, but none have shown the capability of refreezing that change in providers, as antibiotic prescribing has continued to increase in URIs.

This intervention did show that there was a statically significant increase in knowledge. This however, did not equate to a statistically significant effect in decreasing intention to prescribe antibiotics. While scores of intention did increase over the course of the intervention, they were not statistically significant, suggesting that the refreezing of knowledge may not have been achieved, even though knowledge was gained.

Recommendations for Nurse Practitioners

The CDC and WHO both state that education must be given to providers to decrease antibiotic overuse. Often, antibiotic overuse is not seen as a serious problem, yet it has been noted that methicillin-resistant *Staphylococcus aureus*, an infection exacerbated by the misuse of

antibiotics, is estimated to kill 19,000 people each year, far more than HIV and AIDS (MSNBC, 2011). Making providers aware that there are side effects, some potentially lethal, associated with antibiotics is important. Antibiotics are very helpful when dealing with bacterial infections; however, using antibiotics when not indicated leads to resistance. Providers need to use antibiotics only when needed and choose the most specific antibiotic for the infection, rather than defaulting to broad-spectrum antibiotics.

This study may heighten the awareness among providers when considering antibiotic use for a URI. Discussing the difference between viral and bacterial infections and the potential side effects of overuse may also relay information to patients, thus decreasing demand in the future and creating a cycle of decreased use.

Recommendations for Future Research

There are several recommendations for future research identified by this researcher. The first is replicating the study on a larger scale. To decrease antibiotic overuse, knowledge and intention to prescribe must be provided. Targeting NPs was an appropriate group as they did show an increase in knowledge. However, having the intervention take place in a formal setting would have decreased report bias, allowed for a question and answer session, and decreased attrition. Participants were told that they could send emails with any questions, but none were received. Placing a session at an AANP or AzNP conference would have allowed for access to a large group of NPs and the question and answer session.

Another recommendation is to consider a control group for comparison so that external validity may be increased. Control groups decrease threats that were mentioned, such as maturation, history and testing (“Single group threats,” n.d.). Additionally, developing a survey

that is specific for antibiotic overuse and URIs may provide more accurate results. Quota sampling should also be done in an effort to make sure that sex and specialties are represented at an equal level.

A subsequent study comparing provider consultations to an educational intervention may be a benefit as literature shows that satisfaction is related to time spent and explanation, rather than a prescription. Examining which techniques are best used to increase the use of research into practice may provide a valuable component.

Finally, the study tool should be strengthened. Perhaps using multiple choice questions would be a better indication of knowledge. Case studies, as was done in Wigton et al. (2008), may be helpful to use as change in knowledge is evaluated. There may also be a way to link the intention into the multiple choice questions.

Discussion

Despite the limited external validity of this study due to the sample size and inability to randomize (this was a convenience sample), the results do support an increase in overall knowledge of NPs. The study intervention appears to have significant effect on NPs knowledge. While, intention was not affected in a statistically significant manner, clinical significance may be able to be appreciated as the scores did increase throughout the study. It is also noted that demographics did not play a large role in knowledge or intention to prescribe. Only age was found to play a role on post-test intention scores. NPs may need more help putting the research into practice, to thus decrease antibiotic prescribing, but they are certainly an appropriate group to target as they are able to gain and retain new information and showed the ability to increase intention.

Lewin's three-step theory of utilized as a framework to develop this study and analyze the findings. Unfreezing and change did occur, but based on results refreezing may be questionable. While the knowledge increased, without intention to decrease antibiotic prescribing for URIs the evidence does not translate into practice. Research should focus more on methods and techniques to increase translation into practice as the change is effective in increasing knowledge.

Summary

In summary, antibiotic overuse in URIs is an ongoing and increasing problem. An educational intervention aimed specifically at NPs was able to affect knowledge. However, support needs to be given to NPs and other providers, so that the research is able to be transitioned into practice. These results demonstrate that intention was not statistically significant, even though knowledge was increased. Letting providers know that patient satisfaction is linked to time spent listening and educating, rather than prescribing ,is an important premise to communicate to NPs. Continuing to promote CDC guidelines and patient safety is important to patient outcomes. NPs can be a valuable piece to the puzzle when it comes to changing and refreezing provider and patient's knowledge alike related to antibiotics and URIs.

APPENDIX A: HUMAN SUBJECTS PROTECTION PROGRAM



Human Subjects
Protection Program

1618 E. Helen St.
P.O. Box 245137
Tucson, AZ 85724-5137
Tel: (520) 626-6721
<http://ocr.vpr.arizona.edu/irb>

HSPP Correspondence Form

Date: 07/18/12

Investigator: Mary Montes, Student

Department: Nursing

Advisor: Judith Berg, PhD

Project No./Title: 12-0558-00 Decreasing Antibiotic Overuse through an Education Intervention Aimed at Nurse

Current Period of Approval: 07/18/12 – no expiration

IRB Committee Information

Administrative Action

Administrative Review – New submission

FWA Number: FWA00004218

Documents Reviewed Concurrently

F200: Application for Human Research

Consenting Instruments: Online disclosure form

F107: VOIF

Site Authorizations: Arizona Nurses Association

Recruitment Materials: Scripts (embedded in application)

Data Collection Instruments: Pre/post questionnaire, educational intervention powerpoint

Other (define):

- COI letter
- CV Montes

Determination

Approved as submitted effective 07/18/12

Regulatory Determination(s)

- **Exempt Approval 45 CFR 46.101(b)(1)(i):** Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as research on regular and special education instructional strategies.
- **Exempt Approval 45 CFR 46.101(b)(2):** Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior.

07/18/12

Sheryl Wurl, PhD
Chair Designee, IRB2 Committee
UA Institutional Review Board

Date


SW:mm
cc: Scientific/Scholarly Reviewer

Reminders: No changes to a project may be made prior to IRB approval except to eliminate apparent immediate hazard to subjects.

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T106: HSPP Correspondence Form
Form version: 03/30/2012





02/24/12

Jamie L. Goodwin, PhD
Vice-Chair, IRB1 Committee
UA Institutional Review Board

Date

JLG:les

For New Projects:
cc: Scientific/Scholarly Reviewer

APPENDIX B: INSTRUMENTS

DEMOGRAPHICS

Age: _____

Years of experience as an advance practice nurse: _____

Specialty: Family Adult Pediatric

Gender: Male Female

KNOWLEDGE

1. **True or False:** The CDC estimates that 50% of antibiotic prescribed in outpatient setting are unnecessary.
2. **True or False:** Approximately 80% of upper respiratory infections (URIs) are viral and therefore, antibiotics are not recommended for their treatment.
3. **True or False:** Antimicrobial agents should be given for nonspecific upper respiratory symptoms.
4. **True or False:** Purulent rhinitis (thick, Opaque, or discolored nasal discharge) frequently accompanies common colds. It is not an indication for antimicrobial treatment unless it persists for more than 14 days along with other symptoms, such as fever, facial or dental pain, or facial swelling.
5. **True or False:** Regardless of duration, cough illness or bronchitis warrants antimicrobial treatment.
6. **True or False:** Thick purulent or discolored nasal discharge, in the absence of other symptoms, indicates bacterial infection.
7. **True or False:** Diagnosis of bacterial sinusitis requires either prolonged nonspecific upper respiratory symptoms or presence of more severe upper respiratory symptoms.
8. **True or False:** Antimicrobial treatment of acute sinusitis with 7-10 days of augmentin is still successful for initial treatment of uncomplicated sinusitis in most patients.
9. **True or False:** Most cases of pharyngitis are not bacterial and will not benefit from antibiotic therapy
10. **True or False:** If laboratory results indicate streptococcal infection, a 10-day course of oral penicillin remains the treatment of choice.

INTENTION

Please circle your prescribing practice for the following using the Likert-scale:

0: Strongly agree, 1: agree, 2: rarely, 3: neutral, 4: disagree, 5: strongly disagree

As a currently practicing NP, I prescribe antibiotics rhinosinusitis more often than not:

Rhinosinusitis 0.....1.....2.....3.....4.....5

In my practice, I feel that the common cold can benefit from antibiotic therapy:

The common cold 0.....1.....2.....3.....4.....5

I prescribe antibiotic more often than not for acute bronchitis:

Acute bronchitis 0.....1.....2.....3.....4.....5

In my practice, I feel that acute pharyngitis requires antibiotics for resolution:

Acute pharyngitis 0.....1.....2.....3.....4.....5

APPENDIX C: RECRUITMENT EMAIL/NEWSLETTER

The email included the following:

Hi, my name is Mary Montes and I am a 4th year DNP student at the University of Arizona. I am completing a research study on NPs knowledge and intention to prescribe antibiotics for URIs.

I am seeking NPs to participate in my study. You must meet the following minimum requirements: 1) be a currently practicing adult, family or pediatric NP, 2) have a minimum of one year of experience, and 3) have email and internet access, and be willing to take 3 short questionnaires (pretest, post-test and 4 week follow-up) and watch a 20 minute educational PowerPoint presentation.

Please email me at mmontes@nursing.arizona.edu if you are interested!

Thank you!
Mary Montes

The Today paragraph stated the following:

Currently, the CDC reports that approximately 100 million course of antibiotics are prescribed each year, of those, nearly 50% are deemed unnecessary. Antibiotic resistance has been called one of the world's most pressing public health issues by the CDC and WHO. As a 4th year DNP student at the University of Arizona, I am seeking to recruit currently practicing NPs in the areas of adult, family and pediatrics with a minimum of one year of experience to participate in an educational intervention. Participants will need to have access to email, take 3 short questionnaires and watch a 20 minute educational PowerPoint presentation. Participants will be given a certificate of completion. Please email mmontes@nursing.arizona.edu if you are interested.

APPENDIX D: PARTICIPANT CONSENT FORM

Participant Disclosure Form

Project Title: Decreasing Antibiotic Overuse in Upper Respiratory Tract Infections through an Educational Intervention Aimed at Nurse Practitioners

Investigator: Mary Montes, RN, MSN

You are being invited to take part in a research study that is being conducted by the University of Arizona. The purpose of this research is to see if an educational presentation will have an effect on knowledge and intention to prescribe antibiotics for respiratory tract infections. Also, demographic factors will be examined to see if they have a relationship to knowledge or intention to prescribe. You are being asked to participate in this study because you are currently an Adult, Family or Pediatric Nurse Practitioner practicing in a primary setting, have at least one year of practice experience and have email and internet access.

If you agree to participate, your participation will involve completing a pre-test via Survey Monkey. You will then be asked to watch a 20 slide, narrated PowerPoint presentation. At the completion of the presentation, you will be asked to complete a post-test in Survey Monkey. In four weeks you will be emailed a link to the final questionnaire. It will take about 10 minutes to complete each questionnaire and 20 minutes to watch the presentation.

Your participation in this study is voluntary. You may refuse to participate. If you decide to participate, you may leave the study at any time. No matter what you decide, there will be no penalty to you and you will not lose any of your usual benefits.

There are no known risks from your participation. You may benefit of increased knowledge related to antibiotic use in upper respiratory tract infections. There is no cost to you except for your time. You will not be compensated for your time.

Every effort will be made to keep your study related information confidential. Computer files will be protected by encryption.

For questions, concerns, or complaints about the study you may contact Mary Montes mary.montes12@gmail.com For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or online at <http://ocr.vpr.arizona.edu/irb>.

By participating in the survey, you are giving permission for the investigator to use your information for research purposes.

I have read and agree to the above provisions as outlined.

“Agree”

APPENDIX E: Educational Intervention

- Decreasing Antibiotic Overuse in Upper Respiratory Tract Infections
- Mary Montes
- University of Arizona
- BSN-DNP student
- Objectives
- To provide nurse practitioners (NPs) education on upper respiratory tract infections
- To provide NPs with literature and statistics related to antibiotic overuse
- To allow NPs the ability to gain new knowledge as it relates to the treatment of upper respiratory tract infections

Goals

- To decrease the overuse and misuse of antibiotics through an educational PowerPoint aimed at NPs
- To give NPs other treatment options in an effort to help combat the overuse of antibiotics
- Why Target NPs?
- Munding et al (2000) found that in an ambulatory care situation, given the same authority, responsibilities, productivity and administrative requirements patients' outcomes were the same when compared to physician counterparts.
- Horrocks, Anderson & Salisbury (2002) found that NPs had longer consultations and made more investigations than doctors resulting in higher patient satisfaction.
- Only 2% of medical students will be entering private practice, NPs have increased in number by 40% in the last 5 years (Rough, 2009)
- Problem

- Currently, the CDC reports that approximately 100 million courses of antibiotics are prescribed in an outpatient setting each year.
- Of those, the CDC remarks that nearly 50% are unnecessary.
- Antibiotic resistance has been called one of the world's most pressing public health issues.
- Consequences of overprescribing
 - Organisms become resistant leading to future treatment failure
 - Secondary infections may occur, such as *Clostridium difficile*
 - Drug-drug interactions may occur
 - Allergic reactions may occur
- Patient demand for antibiotics in the future as they may correlate antibiotics with the cure
- Increased cost in treatment
- Contributing factors to antibiotic overuse
 - Patient demand
 - Decreased time to spend with patients
 - Patient satisfaction
 - Presenting chief complaint
 - Duration of illness
 - Cough
 - Color of sputum
 - Uncertainty of diagnosis
- (Sivagnanam & Mohanasundaram, 2004)

- URI facts
- Research has shown that bacterial infections are responsible for:
 - 38% of acute rhinosinusitis
 - 6-18% of acute respiratory infections
 - 5-15% of pharyngitis
 - 53% of these patients are prescribed antibiotics
 - (Legare et al 2011)
- URI: the common cold CDC facts
- Nearly 50% of all appointments are made by patients for colds and URI
- Bacterial rhinosinusitis complicated only about 2% of nonspecific URI
- The common cold is a virus that is capable of lasting up to 14 days with an average of 7-11 days
- Purulent nasal secretions do not predict bacterial sinusitis unless complicated by other symptoms
- Antibiotic treatment DOES NOT shorten the duration of the illness or prevent bacterial rhinosinusitis.
- First generation antihistamines and decongestants may be beneficial in symptom management, as well as influenza vaccination
- URI: rhinosinusitis CDC facts
- Most cases are due to uncomplicated viral infections
- Bacterial vs Viral rhinosinusitis is difficult to differentiate on clinical grounds.
- Sinus x-rays are not recommended in diagnosis

- Antibiotic therapy should be reserved for patients meeting the following criteria:
 - Symptoms lasting >7 days
 - Maxillary facial/tooth pain or tenderness (esp when unilateral)
 - Purulent nasal secretions
 - Initial treatment should be narrow-spectrum
- URI: Acute Bronchitis CDC Facts
- >90% of cases of acute cough illness are non-bacterial
- The presence of purulent sputum is not predictive of bacterial infection; >95% of patients with purulent sputum do not have pneumonia
- Evaluation should focus on excluding pneumonia
- Empiric antibiotic treatment is not recommended unless pertussis is suspected
- Influenza therapy should be initiated within 48 hours to have clinical benefit
- URI: Acute pharyngitis CDC facts
- Group A beta hemolytic streptococcus (GABHS) is the etiologic agent in approximately 10% of adult cases of pharyngitis, these are generally self-limiting and patients to well with supportive care.
- If treatment is required, penicillin or erythromycin for a penicillin-allergic patient is recommended
- Patients should be offered analgesics, antipyretics and supportive care
- Clinically screen patients with pharyngitis for:
 - Fever
 - Tonsillar exudates

- No cough
- Tender anterior cervical lymphadenopathy
- URI and Antibiotics
- Antibiotics have been found to have little effect on decreasing cough or resolving sleep issues.
- Every time a person takes antibiotics, sensitive bacteria are killed; however, resistant germs may be left to grow and multiply. Repeated and improper use of antibiotics are primary causes of the increase in drug-resistant bacteria.
- \$1.1 billion is spent annually on unnecessary adult URI prescriptions
- (Fendrick, Monto, Nightengale & Snares, 2003)
- When to Suspect Pneumonia-CDC facts
- According to the Journal of American Medicine, pneumonia is unlikely if all of the following are not present:
 - Fever ≥ 38 C
 - Tachypnea ≥ 24 breaths/min
 - Tachycardia ≥ 100 beats/min
 - Evidence of consolidation on chest exam: rales, egophony, fremitus
 - Consider chest x-ray for patients with any of these findings or cough lasting >3 weeks.
- Options to Decrease Antibiotic Overuse-Objective Measurement
- Cals et al (2010) implemented QickRead CRP analyzers to reduce antibiotic use
 - CRP < 20 mg/L no antibiotics prescribed

- CRP 20-99 mg/L delayed antibiotic prescribing
 - CRP >100 mg/L immediate prescribing
 - Patients in the CRP-assisted group used fewer antibiotics (43.4%) than control patients (56.6%)
 - Delayed prescriptions were used 23% of the time in the CRP-assisted group and 72 % of the time in the control group
- Options to decrease antibiotic overuse
 - Siegel et al (2003) initiated safety-net antibiotic prescriptions (SNAP)
 - Prescriptions are given, but patients are asked not to fill them immediately, but rather wait a few days to see if symptoms improve.
 - Decreased antibiotic use by 69% and kept patient satisfaction at 78%.
 - Options to decrease antibiotic overuse
 - Follow the CDC guidelines and spend time educating patients on the difference between viral and bacterial infections.
 - Offer a follow-up phone call to be made in 2-4 days to check on patient improvement and prescribe only if patients are having no symptom resolution
 - Conclusion
 - Antibiotic overuse is a problem and a pressing public health issue
 - Antibiotic should not be given for the treatment of viral infections
 - Implementation of SNAP, CRP testing, CDC guidelines, or follow-up phone calls may help to decrease the overuse of antibiotics
 - Take a few minutes to educate patients

- THANK YOU
- Thank you for your time and attention!
- Please send me an email with your personal identification number assigned at the beginning of this study, so that I can now send you the appropriate test. Thanks!
 - mmontes@nursing.arizon.edu

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