Effect of Patient Antibiotic Education on Provider Perceived Patient Expectation for Antibiotics

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Abstract

Antibiotic resistance is a global concern that costs the world thousands of lives and the United States billions of dollars annually in healthcare expenditures and missed work. One reason that providers prescribe antibiotics unnecessarily is to fulfill the perceived expectation that the patient wants antibiotics. The purpose of this antibiotic education project was to determine if providing evidence based patient education about antibiotic use decreased the provider perceived patient expectation for an antibiotic prescription in adult patients with upper respiratory symptoms at a family practice clinic. The project had a total of 295 patient encounters, 146 pre-intervention and 149 post intervention. Providers were educated to use the content in the Center for Disease Control's *Get Smart: Know When Antibiotics Work* patient education brochure. The providers completed a survey about if they perceived that the patients wanted an antibiotic prescription in the pre-intervention and post-intervention groups. The perceived patient desire for an antibiotic did not decrease after the intervention, but data collected did validate that if a provider perceives that a patient desires an antibiotic prescription, then they are more likely to receive one. Additional studies are needed to determine if the Center for Disease Control patient education brochure could be used with clients in the clinic to decrease the pressure placed on providers to provide antibiotic prescriptions which could improve patient quality of care.

Keywords: patient expectation, antibiotic, antibiotic stewardship, patient education, primary care, and respiratory tract infections

Adult Patient Antibiotic Education on Provider Perceived Patient Expectation for Antibiotics

Antibiotics have dramatically changed healthcare within the last century. Diseases that once claimed the lives of thousands can be cured with a medication taken over a few days. Though antibiotics have transformed healthcare, they do not come without complications and risks.

Significance of Problem

Prescribing unnecessary antibiotics and patient incompletion of an antibiotic course increase the prevalence of antibiotic resistant strains of bacteria (The Joint Commission, 2016; World Health Organization, 2016). Antibiotic-resistant strains of common bacteria have dramatically impacted nearly every country throughout the world (Llor & Bjerrum, 2014). Many bacteria, particularly those producing carbapenemases, have no effective antibiotics on the market today (Llor & Bjerrum, 2014).

Antibiotics carry tremendous physical risks for patients. Antimicrobial drugs can cause anaphylaxis, Steven Johnson's syndrome, secondary infections of Clostridium difficile, and death due to antibiotic resistant bacteria (Demirjian et al., 2015; Nambudiri VE, 2014). According to the Centers for Disease Control and Prevention (CDC), antibiotic resistant bacteria infect millions of people, claim the lives of 23,000 people annually, and complicate many other deaths ultimately attributed to other causes (Demirjian et al., 2015, p. 871). Guidos (2011) cited that Methicillin-resistant Staphylococcus aureus (MRSA) kills around 19,000 people a year in the United States. Additionally, 99,000 Americans die each year of healthcare associated infections with most infections being antimicrobial resistant strains of bacteria (Guidos, 2011).

Antibiotics increase healthcare costs through a variety of means. Antibiotics cause 142,000 emergency rooms visits per year and unnecessary incidences of *Clostridium difficile*

infections (Demirjian et al., 2015). The CDC Grand Rounds estimate that resistance costs the U.S. system $55 billion annually; $20 billion in healthcare dollars, and $35 billion in lost work (Demirjian et al., 2015, p.871). Guidos (2011) states that the cost is even higher at $21 to $34 billion dollars in direct healthcare costs annually and over 8 million additional hospital days (p. S397).

Local Issue

According to the CDC, in Missouri, 941-996 outpatient antibiotic prescriptions were written per 1000 persons (Center for Disease Control, 2013a). That is nearly one antibiotic prescription per resident of Missouri. One can also infer the level of problem severity at a regional level by analyzing the reported incidence of drug resistant organisms that cause device associated-infections. According to the CDC, 3.2% of healthcare facilities in the Midwest region, including Missouri and Kansas among other states, reported that they had a device associated infection caused by Carbapenem-resistant *Enterobacteriaceae* (Center for Disease Control, 2013b). The Midwest region was the second highest incidence, topped only by the Northeast region with an incidence of 9.6% (Center for Disease Control, 2013b).

Diversity Considerations

Studies have shown that the desire for antibiotics varies depending on cultural background and geographic location. For example, Hispanic cultures have a higher desire for antibiotics (Larson et al., 2009). One compounding factor for this culture is that antibiotics are over the counter in many Latin countries. When a person is feeling ill, the individual can just go and pick up an antibiotic from the pharmacy (Larson et al., 2009). Also, people in rural communities tend to wait longer before presenting to the provider for treatment for upper respiratory symptoms; the patients commonly refer to this practice as *Cowboying up* (Morgan &

Hart, 2009). In addition, rural populations were more accepting of the provider's recommendation to treat with supportive care and not antibiotics (Morgan & Hart, 2009).

At the current family clinic project site, the patient population is not diverse. The community is primarily Caucasian with minority populations representing less than 5% (U.S. Census Bureau, 2015). Therefore, cultural difference did not play a major role in this setting. However, the clinic does serve the rural community and this may have affected the study by patients waiting longer to seek medical care. This limited the external validity of the project but did not affect the project implementation.

Problem and Purpose

Problem Statement

Antibiotic overuse can lead to patient harm, increased antibiotic resistant strains of bacteria, and increased healthcare costs. A main reason in the literature for the overuse of antibiotics is perceived patient desire for an antibiotic prescription for their upper respiratory symptoms (Broniatowski, Klein, & Reyna, 2015; Huttner, Goossens, Verheij, & Harbarth, 2010; Macfarlane, Holmes, Macfarlane, & Britten, 1997; Northey, McGuren, & Stupans, 2015; Price, MacKenzie, Metlay, Camargo Jr., & Gonzales, 2011; Stearns, Gonzales, Camargo, Maselli, & Metlay, 2009). Providers want to meet the patients' needs and want the patients to feel satisfied with their visit (Stearns et al., 2009; Van Driel et al., 2006; Welschen, Kuyvenhoven, Hoes, & Verheij, 2004). Providers also fear that the patient may become ill without the antibiotics (Arnold & Straus, 2006; Lopez-Vazquez, Vazquez-Lago, & Figueiras, 2012). However, literature shows that patients do not know the proper treatment for viral illnesses, and patients are unfamiliar with proper clinical management of acute illnesses (Northey et al., 2015; Price et al., 2011; Van Driel et al., 2006). Verbalization and sharing of uninformed patient expectations of

antibiotic prescriptions for upper respiratory conditions can pressure providers to prescribe antibiotics against clinical guideline recommendations in the primary care setting.

Providers at the project site reported that their patients frequently request antibiotics for conditions that should be treated with supportive care. The nurse practitioners at the site were interested in adopting new tools to help defer antibiotic prescriptions. The purpose of this antibiotic education project was to determine if providing evidence based patient education about antibiotic use decreases the provider perceived patient expectation for an antibiotic prescription in adult patients at a primary care clinic.

Facilitators and Barriers

There were several facilitators for this proposed project. First, the providers who worked with this project requested more resources to support their prescribing decisions. Second, the CDC's *Get Smart about When Antibiotics Work* tools had already been created and utilized in national and regional public health campaigns and in individual clinical trials (Huttner et al., 2010; Metlay et al., 2007). One barrier for this project was approving the project through the physician group. The physicians were not involved directly in the project but have ultimate power of deciding what occurs at the clinic. After two months, the project was approved by the providers. Another barrier was that the student investigator would have no direct contact with patients in reference to the project. Therefore, the project relied heavily on the participating nurse practitioners to implement and collect data for this project. Another barrier was time to address the educational tools during a patient visit and the availability of printed material for the providers. The cost for this project was moderately low, and there were minimal economic barriers for project implementation. Also, after the initiation, the only ongoing cost was the printing or purchase cost of patient educational brochures which allows for project sustainability.

Review of the Evidence

PICOT

This project investigated the following clinical question: In adult outpatients with upper respiratory symptoms, does receiving the Center For Disease Control's *Get Smart: Know When Antibiotics Work* patient education compared to usual care or no antibiotic education decrease the clinician's belief that the patient expects an antibiotic during an acute outpatient visit in the primary care setting (see Appendix A for Definition of Terms)

Search Strategies

A search was conducted to review the current literature. The following search terms were used: antibiotic, patient education, respiratory tract infection, primary care, patient expectations, patient knowledge, provider knowledge, provider attitudes, interventions, and adult (18 years of age and older). The databases used were Cumulative Index to Nursing and Allied Health (CINAHL), Medline, and Proquest. This search produced over 500 articles published from 2000 to 2016. Additionally, a hand search of the cited references of the articles was conducted. The investigator excluded studies that were not comparable to the project population. With this inclusion and exclusion criteria, 44 studies were included in this synthesis of evidence: eleven systematic reviews (Level of Evidence [LOE] 1), eleven randomized trials (LOE 2), two nonrandomized trials (LOE 3), seven observational studies (LOE 4), one secondary review of randomized trial and two systematic reviews of qualitative studies (LOE 5), nine qualitative studies (LOE 6), and one research support article (LOE 7; see Appendix B for a detailed review)

Evidence by Sub-Topics

Antibiotic indications for upper respiratory infections. Indications for antibiotics were reviewed within four clinical practice guidelines pertaining to bronchitis (Albert, 2010),

common cold (Werner, 2012), rhinosinusitis (Fashner, Ericson, &; Rosenfeld et al., 2015), and streptococcal pharyngitis (Shulman et al., 2012). Throughout these guidelines, themes for antimicrobial treatment were noted. First, the guidelines for bronchitis and rhinosinusitis refer to the duration of symptoms for treatment decisions (Albert, 2010; Rosenfeld et al., 2015). Additionally, guidelines indicate that a bacterial infection should be considered if a patient experiences double worsening (Demirjian et al., 2015; Rosenfeld et al., 2015). Double worsening is defined as deteriorating symptoms after an overall improvement. Purulent discharge was once accepted always as a sign of bacterial infection, but now only the rhinosinusitis guideline lists purulent drainage as an indication for antibiotic treatment (Albert, 2010; Fashner et al., 2012; Rosenfeld et al., 2015). Last, the guidelines for streptococcal pharyngitis and bronchitis suggest diagnostic testing for suspected bacterial infections before an antibiotic prescription (Albert, 2010; Shulman et al., 2012).

Reasons for variance from guidelines. Some studies suggest that providers prescribe antibiotics outside of guidelines due to patient request or perceived patient desire for antibiotics (Dosh, Hickner, Mainous III, & Ebell, 2000; Lopez-Vazquez et al., 2012; Macfarlane et al., 1997; Stearns et al., 2009; Tonkin-Crine, Yardley, & Little, 2011). Primary care practitioners may prescribe antibiotics more often if they perceive that the patient wants them or if the patient specifically asks for them (Lopez-Vazquez et al., 2012; Macfarlane et al., 1997; Stearns et al., 2009). Providers are more inclined to prescribe antibiotics in these instances due to their desire to achieve patient satisfaction with provider care (Stearns et al., 2009). However, provider's perception of desire for antibiotics commonly exceeds the patient's true expectation for an antibiotic prescription (Stivers, Mangione-Smith, Elliott, McDonald, & Heritage, 2003).

Additionally, providers are more inclined to prescribe antibiotics outside of clinical guidelines when the duration of symptoms is longer or they have a fear that symptoms will worsen (Lopez-Vazquez et al., 2012; Wigton, Darr, Corbett, Nickol, & Gonzales, 2008). Also, if the providers fear that the patient's symptoms could worsen due the patient's age, comorbidities, or timing of the visit, they may prescribe antibiotics (Lopez-Vazquez et al., 2012). For these more complex patients, providers must be able to articulate alternate treatment plans other than antibiotics with their patients (Altiner et al., 2007; Beckett, Elliott, Richardson, & Mangione-Smith, 2009; Mangione-Smith et al., 2015). Inability to communicate a management plan leads to decreased patient satisfaction and increased patient revisit rate (Altiner et al., 2007; Mangione-Smith et al., 2015).

Public knowledge of antibiotic use and antimicrobial resistance. Patients do not understand antibiotic risks (Larson et al., 2009; McCullough, Parekh, Rathbone, Mar, & Hoffmann, 2016; Northey et al., 2015; Price et al., 2011). Patients surveyed in studies thought that not having an antibiotic prescribed to them held more risk to their health than an antibiotic prescription (Broniatowski et al., 2015). The public demonstrates a knowledge deficit in antibiotic risks such as anaphylaxis, antimicrobial resistance, and Steven-Johnson's syndrome (Larson et al., 2009; McCullough et al., 2016). These life threatening risks are not considered by the public when they request an antibiotic.

Also, the public also does not understand the differences between bacterial and viral infections (Larson et al., 2009; McCullough et al., 2016; Northey et al., 2015; Price et al., 2011). Patients commonly believe that they should always receive antibiotics when visiting a doctor or clinic (Broniatowski et al., 2015; Larson et al., 2009; McCullough et al., 2016; McDonnell Norms Group, 2008; Stearns et al., 2009). Some patients think that antibiotics work for all

illnesses whether bacterial or viral, and that antibiotics are necessary to cure or improve their illness (McDonnell Norms Group, 2008).

Public perception of antibiotic resistance is that antibiotics will stop working on a person if they take too many or stop taking antibiotics mid-course and that the resistance effect occurred within the human body (McCullough et al., 2016). The public does not realize that antibiotic overuse can create antibiotic resistant strains of bacteria that can affect everyone, not just the people taking the medication (McCullough et al., 2016). Patients also do not believe that antibiotics contribute to the problem of antimicrobial resistance (Larson et al., 2009; McCullough et al., 2016; Northey et al., 2015).

Provider knowledge and attitudes about antibiotic prescribing. A few studies suggest that misprescription of antibiotics is due to a provider knowledge deficit or lack of confidence in their communication skills (Dempsey, Businger, Whaley, Gagne, & Linder, 2014; Grossman et al., 2012; Tonkin-Crine et al., 2011). Providers may not know about antibiotic prescribing guidelines or are practicing according to their personal prescribing history using outdated guidelines or non-evidence based practices (Tonkin-Crine et al., 2011). Also, providers state that they prescribed antibiotics when they were not confident in their diagnosis of the patient's condition (Dempsey et al., 2014). Some antibiotic prescriptions can be attributed to lack of knowledge or belief about the impact of antibiotic resistance (Anthierens et al., 2014; McCullough, Rathbone, Parekh, Hoffmann, & Mar, 2015). Last, some providers do not feel confident in their communication with patients about their diagnosis and treatment plan (Altiner et al., 2007; Mangione-Smith et al., 2015; McCullough et al., 2015). When patients request an antibiotic, some providers prescribe it because of their lack of confidence in communicating a supportive care plan (McCullough et al., 2015).

Interventions to improve antibiotic stewardship. Several studies in the reviewed literature used clinician education as an attempt to decrease antibiotic prescription rates (Drekonja et al., 2015; Harris, 2013; Huttner et al., 2010; Meeker D, Linder JA, Fox CR, & et al, 2016). Studies varied with their methods of education. Some studies used written education materials mailed or given to providers (Ranji, Steinman, Shojania, & Gonzales, 2008). Other studies gave instruction to providers through individual verbal counseling and peer accountability (Altiner et al., 2007).

Patient education has been another modality of reducing antibiotic prescription rates. Educational initiatives have been verbal counseling, pamphlets, electronic just-in-time education, and public awareness campaigns. Educational pamphlets have been the most common patient education strategy to decrease antibiotic prescription rates. The pamphlets are geared towards teaching patients the differences between bacterial and viral infections and also giving clinicians a supportive tool to help avoid unnecessary antibiotic prescriptions (Agnew, Taaffe, Darker, O'Shea, & Clarke, 2013; Angoulvant et al., 2013; Bont, Alink, Falkenberg, Dinant, & Cals, 2015; Francis et al., 2009; Little P, Rumsby K, Kelly J, & et al, 2005; MacFarlane et al., 2002; Macfarlane et al., 1997; Metlay et al., 2007).

Studies have shown that educating patients about the differences between viral and bacterial infections as well as when antibiotics are appropriate leads to a decrease in antibiotic prescription rates (Agnew et al., 2013; Anthierens et al., 2014; Bont et al., 2015; Francis et al., 2009; Huttner et al., 2010; Little P et al., 2005; MacFarlane et al., 2002; Macfarlane et al., 1997; Metlay et al., 2007). Metlay et al. (2007) utilized the CDC's brochures for patient education and found a decrease in antibiotic prescription rates. However, Metlay et al.'s (2007) study had

multiple interventional arms running simultaneously. So, all results cannot be attributed to the brochure intervention alone.

Delayed antibiotic prescribing was also shown to significantly reduce the number of filled antibiotic prescriptions (Agnew et al., 2013; Edwards, Dennison, & Sedgwick, 2003; Undeland, Kowalski, Berth, & Gundrum, 2010). Delayed antibiotic prescribing means that the provider writes a prescription during the patient visit but gives instructions to not fill the antibiotic for a set amount of time, commonly three to five days. Studies suggest that this is because the patient feels validated from the provider because they received a written prescription and empowered to attempt to manage the illness independently (Agnew et al., 2013).

Theory

Roy's Adaptation theory was applied to this project. This theory has numerous major concepts. First is the system. The system is an accumulation of parts to create an environment. For this application of the theory, the system is the healthcare system including the patient, provider, and clinic setting. There is also a stimuli that acts upon the patient which would be the acute illness. When the illness effects the patient, the patient interprets this stimuli within four adaptive modes: physiological-physical, self-concept, role function, and interdependence (Alligood & Marriner-Tomey, 2010). Physiological-physical is the way the person interacts with the environment to continue basic health such as making the medical appointment or trying over the counter medications. Self-concept is how the person believes an individual should act as a patient and what one must do for the provider such as allowing the provider to exam them at the medical appointment and following recommended treatment options. Role function is how the patient understands an individual should interact with the provider. This would include advocating for treatments from provider and being honest about symptoms and history.

Interdependence is the dependent relationship between the provider and patient. The patient expects to be taken seriously and feel valued and respected from the provider.

The action of the patient is motivated by the coping processes. These are innate or acquired motivators for behavior based on prior knowledge, experiences, or observations (Alligood & Marriner-Tomey, 2010). The process of changing this action is the concept of adaption. Adaption is how the patient responds to stimuli based on the four adaptive modes to create coping processes. For this project, the provider will provide patient education that fulfills the four modes of adaptation to hopefully alter the coping processes for the verbalized or perceived behavior of requesting an antibiotic. However, if the action does not meet all modes to properly alter coping processes, then the patient's behavior will be to imply or state the need for an antibiotic (see Appendix C for Theory Diagram).

Methods

IRB Approval, Site Approval, Ethical Issues, Funding

University of Missouri-Kansas City Institutional Review Board (UMKC IRB) reviewed the study as a quality improvement initiative (see Appendix D). With this project, the student investigator did not have direct interaction with the patients. The investigator received a self-report from the provider about their perception of patients which contained no personal health information about patients. Approval for the project at the site was through the nurse practitioners, physicians, and primary care clinic management (see Appendix E for Timeline Flow Graphic and Appendix F for Site Approval).

There were several ethical considerations that the student investigator addressed in this doctoral project. First was the privacy of the patient. Since providers self-reported on perception of patients, it was important to educate the providers to not include patient information on either

the pre or post education surveys in order to protect the privacy and confidentiality of the patient. Also during the provider education, the providers were informed to order antibiotics if necessary for the patient. The goal of this project was to decrease the patient perceived desire for antibiotics, not to withhold antibiotics for patients who have bacterial infections. The student investigator had no known research conflicts to this project.

This project had modest monetary demands (see Appendix G for itemized cost table). The total out of pocket costs for this quality improvement initiative was $203.00 with an additional $1,000 for project dissemination. For funding this project, several options existed. First, part of the funding was provided by the project site primary care clinic. The clinic agreed to provide one hour of nurse practitioner time for education and provide the location of the project and education. Also, UMKC provided a statistician for this project which covered part of the costs as well. The CDC also provided 500 pre-printed brochures at no cost, a value of $143.00. The other costs of the project were the nurse practitioner gift card incentive of $50 and breakfast for an educational presentation which was $50; these costs were funded by the UMKC Graduate Women's Council Graduate Assistance Fund.

Setting and Participants

This project was conducted at a primary care clinic in the Midwest. The clinic is private, and the practice had four physicians and three nurse practitioners on staff. The nurse practitioners were the only providers participating in this project. The facility served a rural community with patients from seven surrounding counties in Missouri. Each nurse practitioner saw approximately twelve to twenty-five patients per day depending on the day of the week and daily patient appointment fluctuation.

Inclusion criteria for the sample of providers consisted of the three nurse practitioner providers at the project clinic site. Physician providers were excluded in this initial quality improvement project. For the intervention, all adult patients presenting with acute upper respiratory complaints such as cough, sore throat, nasal congestion, sinus pressure, and ear pressure should have received the antibiotic educational brochure. Patients who did not receive the antibiotic education were those patients presenting with conditions outside of the upper respiratory system such as acute otitis media, otitis externa, and pneumonia. The providers completed a survey on antibiotic prescribing for all patient encounters prior to the patient education program who qualified for the education program and all encounters after the education program on patients who received the education.

Evidence Based Practice Intervention

The project occurred at one primary care clinic starting in fall 2016. Recruitment focused on the three nurse practitioners in the clinic (see Appendix H for recruitment materials). Providers were approached independently by the student investigator over a two week span. The student investigator explained that she was conducting a Doctor of Nursing Practice project that investigates influences on antibiotic prescribing behaviors. The providers were informed that the self-report data was used to determine the perception of the providers of antibiotic prescribing before and after patient education on antibiotics. The providers were informed that they were also to receive a $50 Visa gift card if they participated in the project until completion.

Project implementation began by collecting pre-intervention data. Providers completed a survey after interacting with a patient who would have met the criteria to receive education but no education was provided other than usual provider care in the pre-intervention period. The survey was based on the research by Dosh et al. (2000) and collected the patient's chief

complaint, if the provider perceived that the patient wanted an antibiotic, if antibiotics were prescribed, the final patient diagnosis, and secondary factors affecting antibiotic prescriptions (see Appendix I for provider survey). The pre data was collected for a period of four weeks with a goal of at least 100 patient encounters among the three nurse practitioners.

The week after the pre data collection concluded, week 5 of the project, the providers attended a provider education session to explain the next steps of the process and provide education on the CDC's *Get Smart: Know When Antibiotics Work* patient education brochure (see Appendix J for provider education; Appendix K for CDC patient educational brochure). The presentation was created by the student investigator by combining the CDC's Get Smart campaign tools to minimize bias. The CDC brochures were then placed in each patient exam room, readily accessible by the providers, and the providers were also given extra brochures in case more were needed. The nurse practitioners were encouraged to utilize the patient education materials with patients that have viral upper respiratory conditions. The providers were given three weeks to integrate the brochures into their daily practice before post-intervention data collection began.

After the educational program and integration period, the providers repeated the survey process with their patients while implementing the educational intervention for another four week period with a goal of at least 100 patient encounters. The survey was identical to the pre survey to allow for direct comparison. After this time, the providers were informed that the project period had ended; however, providers were left with additional educational brochures and encouragement to continue the education.

After the data collection period, the project concluded with analyzing and presenting the data over the next several weeks. The aggregate data will be presented to the providers at the site

and the project proposal was disseminated at a regional conference. The total project, from inception to completion, occurred over a one year period (see Appendix L for Intervention Flow Diagram) while the involvement of the providers was about three months.

Change Process, Evidence Based Practice Model

This project utilized two change theories. The first theory applied to the providers and was the Implementation Intention theory. This theory states that 20-30% of behavior is motivated by action planning (Eccles et al., 2007). This theory has been utilized to substantiate upper respiratory infection prescribing behaviors (Eccles et al., 2007). With this change theory, the student investigator addressed the when, where, and how factors to implement the use of the CDC's *Get Smart: Know When Antibiotics Work* patient education materials with the providers. For the patient education conducted by the provider, the project utilized the fuzzy-trace theory which focused on the verbatim and gist motivators behind expectations and actions. This theory was recently utilized by Broniatowski et al. (2015) to better understand the motivating factors behind patient's expectation for an antibiotic prescription for an upper respiratory infection. The verbatim knowledge is actual percentages and risks associated with particular actions and the gist is a broad generalization about potential harms and motivators. Research shows that patients generally use the gist factors to guide behaviors (Broniatowski et al., 2015). The CDC patient education materials provide a broad overview of when antibiotics work which provided patients with gist knowledge.

For the evidenced based practice model, this project used the model of evidence based practice change. With this framework one is to flow systematically from initial assessment for project need to reinforcement and sustainability of the project (Rosswurm & Larrabee, 1999, p.318-321).

Study Design and Validity

This project used a quasi-experimental design. The pre-survey was the provider self-report of patient encounters not involving the patient education; the post-survey was the provider self-report of patient encounters involving the education. This quasi-experimental project employed the same providers prior to and after the intervention although the patient encounters were different between the pre education period and post education period.

The internal validity represents the quality of the gathered data. Quasi-experimental projects do hold a concern for internal validity due to lack of a randomized control group; however, the patient diversity at the project site is fairly homogenous so this caused minimal impact. The use of a standard tool with similar education promoted internal validity. The survey contained mostly multiple choice options with only write in answers for chief complaint and final diagnosis. This improved validity because an investigator did not need to interpret the data other than categorizing chief complaint and diagnosis. The strength of the internal validity could have been threatened by the accuracy of completion of the surveys by the nurse practitioners. If the nurse practitioners failed to complete the survey for the actual encounter, the data will have weaknesses in internal validity. The data was analyzed for each individual nurse practitioner and as a practitioner group. The individual practitioner data did reveal that nurse practitioners interpret their patient's desires differently. However, an inter-rater reliability testing was not appropriate for this study because the nurse practitioners may infer the actions or demands of their patients differently.

This project is generalizable to a predominantly Caucasian, rural community. Some general concepts of this project may still apply to other settings such as an urban communities.

More projects of this nature would need to be performed in a more diverse venue to ensure that the improvement intervention results are similar in other settings and populations.

Outcomes to be Measured and Measurement Instruments

The primary outcome measured was the clinician's belief that the patient expects an antibiotic. A secondary outcome measured was the antibiotic prescription rate. The measurement instrument that was used is an abbreviated form of the tool used by Dosh et al. (2000). In this study, the providers completed a survey that included patient presenting condition, provider assessment, comorbidities, plan for treatment with diagnosis, provider interpretation of patient expectations, and any additional factors that influenced the treatment plan (Dosh et al., 2000, p. 409). For simplicity and ease of use, the questionnaire that was used did not include a history of lung disease and physical findings. These two criteria were not part of the primary or secondary outcomes measures for this project. The validity and reliability of this tool has not been published. The tool was printed on paper in a table format to allow multiple patients to be documented on a single sheet. The provider was asked to complete the survey on each patient who reports upper respiratory symptoms in their chief complaint. The instrument measured the primary outcome of a clinician belief that a patient expects an antibiotic and if antibiotics were prescribed (see Appendix I for provider survey). Dr. John Hickner, co-author of the Dosh et al. (2000) study, was contacted and permission was granted to use an abridged version of the tool (see Appendix M for permission for tool). The student investigator estimated that this tool took the nurse practitioners a maximum of five minutes each day.

Quality of Data

The data was analyzed using a 95% Confidence Interval (CI). The goal for this study was to have at least 100 patient encounters documented in the questionnaires in both the pre-

intervention and post-intervention phases. There were a total of 306 patient encounters but due to missing data, only 295 could be used for analysis, 146 in pre-data and 149 in post-data. The goal was a power of at least .8 regarding the sample size, and the actual power was determined to be 1.000. The pre-intervention surveys served as the baseline control data for this project.

The results of this project were compared to the data reported in the similar studies. Dosh et al. (2000) was the closest study to this project. The researchers in this study found that a clinician believed that a patient expected an antibiotic 62% of the time and prescribed antibiotics to these patients 79% of the time (Dosh et al., 2000, p. 411). Patients that the clinicians did not believe expected an antibiotic received an antibiotic prescription 45% of the time (Dosh et al., 2000, p. 411). Similarly, another study showed that providers believed that their patients expected an antibiotic 48% of the time and an antibiotic was prescribed to these patients 67% of the time (Cockburn & Pit, 1997). Yet, a study by Britten and Ukoumunne (1997) showed that providers perceived that patients wanted an antibiotic 56% of the time and of these an antibiotic was given 89% of the time.

Analysis Plan

For this project, the student investigator used chi square to analyze the provider perceived patient expectation of an antibiotic both prior to and after the education. Also, chi square was used to compare if a clinician believes that a patient expects an antibiotic and if an antibiotic was prescribed (see Appendix N for Logic Model synopsis of proposed project; see Appendix O for data collection template).

Results

Setting & Participants

The Project was completed at a at a rural primary care clinic in Missouri. The project was conducted in the fall and winter of 2016. It included recruitment, pre-data collection, implementation, and post-data collection. The clinic has four physicians and three nurse practitioners; however, only the three nurse practitioners were included in the study. However, one nurse practitioner did not complete the post data collection period. The two nurse practitioners that completed the study both are female, have Master's degrees in Nursing, have graduated within the past five years, and have primarily worked at the same clinic since graduation. Neither nurse practitioner are involved in professional organizations.

Intervention Course

The project took place from spring of 2016 through winter of 2016. The project had several phases. First, the Project was approved through management and the physicians at the clinic on June 20th, 2016. From there, the project was fine-tuned and discussed with clinical preceptor through September of 2016. Recruitment of the nurse practitioners to be involved in the study started on September 19th, 2016 and ended on September 26th, 2016. All three nurse practitioners at the clinic agreed to be part of the project. Pre-implementation data collection began on October 10th, 2016 and concluded on November 4th, 2016. The student investigator checked in with each nurse practitioner one to two times per week to ensure any questions or concerns were answered. Project education of the educational brochure was held on November 8th, 2016 at lunchtime with all three nurse practitioners in attendance. Immediately after the educational in-service, the patient brochures were placed in all ten of the patient exam rooms for use. Three weeks were given to allow the providers to become accustomed to the brochure and to allow for the Thanksgiving holiday. Post data collection began on November 28th, 2016 and concluded on December 23rd, 2016. The student investigator again met briefly with each nurse

practitioner one to two times per week to ensure proper data collection. Data collection books were received from two nurse practitioners on December 28th, 2016. The post-intervention data could not be retrieved from the third provider.

Outcome Data

This study measured several variables. First, the provider's perception if a patient desired an antibiotic did not have a statistical difference from the pre-implementation to post implementation. Overall, the provider perceived that a patient desired an antibiotic 36.7% of the time prior to intervention and 51.22% after the intervention (see Table 1). The rate of reported antibiotic prescriptions for viral diagnoses also did not have a statistical difference between pre and post intervention. Providers reported a 44.14% and 42.28% prescription rate for viral/non-bacterial diagnoses, respectively (see Table 2).

When analyzing if provider perception of patient's desire for antibiotic impacted prescribing rates for pre and post intervention, there was not a statistical change. However, when analyzing all data without regard to intervention, if a patient desired an antibiotic and if they were prescribed an antibiotic, there was a statistically significant result with a p value of 0.005 (see Table 3). Indicating that if a provider perceived that a patient with a viral diagnosis expected an antibiotic, they were more likely to receive one. Data indicated that antibiotic prescribing rates are higher on Friday than any other day of the week during pre-intervention (see Table 4) as the literature suggests (Broniatowski et al., 2015; Dosh et al., 2000). Data did not show a significant difference in provider perception of patient expectation for an antibiotic prescription by day of the week (see Table 5). Individual provider perception of patient's desire for an antibiotic or individual prescribing rates also did not show a statistically significant result for this project; however, one provider dramatically changed the patient perception of antibiotic

expectation (see Table 6 and 7). This showed a statistically significant result; however, it was not in accordance with the proposed project. A consideration for this result is that the provider may have altered their perception of patient expectation to be more comparable with the published literature.

Additionally, the individual provider diagnosis rates of bacterial or viral illnesses did show a statistically significant result between pre and post intervention (see Table 8). Sinus pain, cough/chest congestion, and sore throat were the top three chief complaints that providers perceived a patient desire for an antibiotic at 51.72%, 46.48%, and 45.65% respectively (see Table 9). Similarly, the top chief complaints that providers reported that they prescribed an antibiotic were sinus pain/head congestion, cough/chest congestion, and sore throat, respectively (see Table 10). The top three reasons that providers reported prescribing an antibiotic for a viral diagnosis were patient not improving, patient getting worse, and patient sick too long (see Table 11).

Discussion

Successes

This project contained a few successes. First, the two nurse practitioners who completed the study were very dedicated to improving antibiotic prescribing behaviors. They were unaware of the local rate of antibiotic prescriptions and the local effects of antibiotic resistance bacteria. Both providers mentioned that the data presented during the educational in-service was impactful. Also, the brochure was handed out to many patients to educate them on the proper indications for an antibiotic. Last, the study had a large sample size to allow for statistical analysis.

Study Strength

The study had several strengths. First, the clinic was well organized and the entire staff knew about the project. This allowed front desk staff, nursing, and providers to be cognizant of antibiotic prescribing. Additionally, the setting was controlled with the same population use for pre and post intervention data. The population was primarily existing patients with acute complaints, and the providers already had a report and sense of trust with the patients. The brochures were readily accessible in each patient exam room which aided in the ease of use for the providers. The culture of the clinic is one that desires to adapt to new evidence and implement in patient care. The entire staff was positive about the project and pleased to be involved. The leadership of the office asked about the project on several occasions to ensure no other resources were needed. Last, the project had a large sample size. Overall, the project was easily implemented at the clinic site.

Results Compared to Evidence in Literature

This project found that providers perceived that patients with viral diagnoses expected an antibiotic 44.6% of the time. Of these patients, 53.40% received an antibiotic prescription. In the encounters that the provider did not perceive a desire for an antibiotic prescription, 35.16% received a prescription. This result was statistically significant, indicating when a provider perceives that a patient desired an antibiotic prescription, the patient is more likely to receive one. The results found in this project were consistent with other published literature showing that if the provider perceived that the patient desired an antibiotic, then they were more likely to receive one (Britten & Ukoumunne, 1997; Cockburn & Pit, 1997; Dosh et al., 2000). The published studies varied on the provider perception of patient expectation from 48% to 62%, this project 44.6%, and patients whom providers thought expected an antibiotic received a prescription 67% to 89% of the time, this project 53.40%, (Britten & Ukoumunne, 1997;

Cockburn & Pit, 1997; Dosh et al., 2000). This study did have lower provider perception and antibiotic prescribing rate for those that the provider perception was high, but the trend of the values are similar to the published studies.

Limitations

Internal Validity Effects

Reflecting on the project brings attention to several concepts that could impact internal validity.

Use of educational brochure. Though educated to use the educational brochure for every patient that was diagnosed with a viral illness, the providers commonly only gave the brochures to patients who were resistant to the supportive care treatment plan. If the patient continued to want an antibiotic after viral illness was diagnosed, the provider would give them the educational brochure. While this is an appropriate use for the brochure, it did not meet the intended process for this project. The data collection tool did not collect data on which patients were given the brochure and which were not.

Incomplete and excluded data. There were 306 total patient encounters collected within this project, of which 231 were viral diagnosis. Of these, 13 samples could only be partly analyzed because the nurse practitioner did not complete the survey in the entirety for data collection. Also, since one nurse practitioner did not complete the post data collection, the 18 pre-data collection encounters that were collected by this provider could only be used in part of the analysis. Though this number is small compared to the overall patient encounters, it may have had an impact on outcomes.

Variable patient diagnosis. As reported in other studies, occasionally providers alter the diagnosis of the patient to meet clinical guidelines for an antibiotic prescription (Broniatowski et

al., 2015; Macfarlane et al., 1997). An example would be diagnosing a patient with acute bacterial sinusitis instead of common cold to justify the antibiotic prescription. It is unknown if this occurred within this study, but the data shows that 24 cases (16.44%) of bacterial infections necessitating an antibiotic were diagnosed during pre-data collection and 27 cases (17.88%) were diagnosed during post data collection.

Patient interpretation of symptoms. One concept that emerged during the analysis was that patients generally have an idea of their illness state. Other studies that have been performed show a correlation with provider perception of an antibiotic prescription and antibiotic prescription rates. However, this investigator did not find in the published studies the simple concept that patients know when they are very ill and this could be the times that they appear to the provider as desiring an antibiotic prescription. This could be an underlying factor explaining why patients that expect an antibiotic receive an antibiotic. This is shown by 90% of patients diagnosed with a bacterial illness in this study were perceived by the provider that they expected an antibiotic.

External Validity Effects

This project was completed in a primarily rural community. As Morgan and Hart (2009) stated in their study, rural populations typically wait longer to seek medical care. This could represent a higher percentage of patients necessitating an antibiotic when they are seen. This could be due to increased incidence of bacterial infections because of increased illness duration. Also, one provider did not complete the post-implementation data collection and had to be excluded from this project. Limiting to two providers from three decreases the strength of generalizability of this project to other nurse practitioners and providers. The nurse practitioners who completed the project are both recent graduates from nurse practitioner programs. Both

participants mentioned that their degree programs specifically taught antibiotic resistance and scrutiny of antibiotic prescribing. This previous education may have impacted their perception of the patient's desire for an antibiotic prescription and prescribing rates. Additionally, these providers may have lower antibiotic prescribing rates than other providers researched in other studies because of their recent background. Comparative studies did not mention the prior education on antibiotic prescribing that the providers may have received. Thus, it is unknown if this comparison is valid.

Sustainability of Effects and Plans to Maintain Effects

In order to sustain the project, several actions must occur. First, a determination of how to order or print the Center for Disease Control's patient education brochure would need to be decided. Once this decision is made, then the clinic must identify how to fund the minimal cost of the brochures. A designated person at the clinic must also be determined who can order or print the brochures and ensure that they are stocked in each exam room. Last, there must be ongoing provider education about the educational brochures and some standardized education for new providers regarding the patient education brochure.

Efforts to Minimize the Study Limitations

To minimize study limitations this investigator attempted to have a diverse nurse practitioner participation. This investigator also tried to answer questions and encourage study participation with the nurse practitioners one to twice per week. Last, this investigator encouraged brochure use with all patients with viral illness by discussing this with the providers and having brochures easily available. However, despite these efforts, this investigator believes that the project limitations had a dramatic effect on the study outcomes.

Interpretation

Expected & Actual Outcomes

The student investigator theorized that the Center for Disease Control's patient education brochure *Get Smart Know When Antibiotics Work* would decrease the provider's perception of a patient desire for an antibiotic prescription. However, the data collected did not show a statistical difference in pre and post implementation perception for viral diagnosis. Rates of antibiotic prescribing for viral diagnosis did decrease from 44.14% to 42.28% but did not show a statistically significant result either. Impacting the results of the project, the providers did not give a patient education brochure to ever patient encounter and primarily used them as teaching tools when a patient refuted the idea of not having an antibiotic for their viral illness. This method of use did not meet the main objective of the study. If the brochure was used with every patient encounter, the results may have been different.

Intervention Effectiveness

The intervention was ineffective at reducing provider perceived patient expectation for an antibiotic prescription. This may be due to the inconsistent use of the patient educational brochure. However, providers stated that the brochure helped when trying to explain supportive care measures to patients that appeared disgruntled about not receiving an antibiotic prescription. Providers also stated that they found the educational intervention very helpful and insightful. One provider stated, "I did not know that *C. diff* was that prevalent in my community."

Intervention Revision

This project had a few areas that could be improved if the project were to be implemented again. First, the investigator would reinforce to use the educational brochure with every viral patient encounter. This would hopefully increase compliance with the project goal. Alternatively, once the student investigator is practicing as a nurse practitioner, the study could be conducted

with the patients at the student's future practice site. Though this may create a problem with internal validity because the perception in post implementation data could be biased because the goal of the project is known.

Additionally, the educational intervention for the providers would be limited to just the information about the educational brochure. The educational intervention during this project also included a small amount of information about local prescription rates, patient expectation for antibiotics, and complications of over prescribing antibiotics. This information may have altered the provider's data collection practices.

Last, reinforcement of the importance of completing the project would be done. One provider stated that they were interested in completing the project and did pre-data collection but failed to complete the post-data collection. This caused the project to be limited to two providers which limited generalizability. Increasing the number of providers would increase the strength of the study. Also, adding physicians and physician assists to the project would allow for more data analysis and comparison between professions.

Expected and Actual Impact to Health Systems, Costs, and Policy

The expected and actual impact to healthcare systems, costs, and policy were congruent. The effect to the healthcare system was as expected. When the brochure was used, providers stated that it took less than 30 seconds to review the brochure which did not greatly impact visit time. The providers stated that use of the brochure was not an inconvenience. The project costs were exactly as expected (See Appendix G). There were no unexpected costs. The facility does not have a policy about antibiotic prescribing and does not plan to create one. However, the providers involved in this study unanimously stated that the goal is to prescribe only the antibiotic necessary to treat illnesses.

Conclusion

Practical Usefulness of Intervention and Dissemination

The overall usefulness of this project was to reduce the providers' perceived patient expectation for antibiotics. Most research reviewed for this project studied the change in prescription rates based on an intervention but did not study the change in perceived patient expectations (Ackerman, Gonzales, Stahl, & Metlay, 2013; Angoulvant et al., 2013; Anthierens et al., 2014; Cals, Schot, de Jong, Dinant, & Hopstaken, 2010; Edwards et al., 2003; Harris, 2013; Huttner et al., 2010; Lopez-Vazquez et al., 2012; Metlay et al., 2007; Moore et al., 2009). Additionally, some studies reviewed the alteration in patient expectations as a secondary outcome, but not the main objective for the study (McCullough et al., 2016). Patient expectations are a driving force behind non-guideline supported antibiotic prescriptions; therefore, the alteration in patient expectations as perceived by providers was analyzed by this project although no statistically significant change was found.

The student investigator presented the project proposal of this project at the Advanced Practice Nurse of the Ozarks annual conference in November of 2016. The project proposal was well received and provided many nurse practitioners with ideas of how to implement this project in their practice setting. The results of this project were presented to the University of Missouri-Kansas City School of Nursing and Health Studies Doctor of Nursing Practice class and placed in the UMKC repository. The project poster is also to be shared with the project's primary care clinic. This will hopefully encourage the site to continue this intervention or apply it to other practice venues.

Further Study

By educating patients on the appropriateness of antibiotics, then their expectation for antibiotic prescriptions may decrease, ultimately decreasing pressure placed on the provider for a prescription (Bont et al., 2015; Little P et al., 2005; MacFarlane et al., 2002; Metlay et al., 2007). This may decrease the antibiotic prescription rates. This project should be completed again with the consistent reinforcement of utilizing the educational brochures in all patient encounters. Another arm of this project could be established in the future to further analyze this correlation by involving other medical disciplines in addition to nurse practitioners. Also, the outcome of patients that presented with upper respiratory complaints were not routinely reported in many reviewed studies that reported decreased antibiotic prescription rates (Drekonja et al., 2015). This project could be modified to focus on the short and long term outcomes of patients who received an educational brochure in order to promote quality of care.

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Table 1

Perceived Patient Expectation

Intervention		Pre-Intervention	Post-Intervention	*p*	***
Provider Perceived Patient Expectation for an Antibiotic (*n* , %)	Yes	40 (36.7%)	63 (51.2%)		
	No	69 (63.3%)	60 (48.8%)		
Total		109	123	.026	

***Percentages significantly different, chi^2 $p<0.005$

Table 2

Antibiotic Prescribed

Intervention		Pre-Intervention	Post-Intervention	*p*	***
Antibiotic prescribed for viral diagnosis (*n* , %)	Yes	49 (44.1%)	52 (42.3%)		
	No	62 (55.9%)	71 (57.7%)		
Total		111	123	.773	

***Percentages significantly different, chi^2 $p<0.005$

Table 3

Perceived Patient Expectation vs. Antibiotic Prescribed for Viral Diagnosis

		Perceived Patient Expectation			
		Yes	No	*p*	***
Antibiotic prescribed for viral diagnosis (*n* , %)	Yes	55 (53.40%)	45 (35.16%)		
	No	48 (46.60%)	83 (64.84%)		
Total		103 (44.6%)	128 (55.4%)	.005	***

***Percentages significantly different, chi^2 $p<0.005$

Table 4

Antibiotic Prescribed

Day of the Week			Pre-Intervention		Post-Intervention		*p*	***
Monday	Antibiotic Prescribed	Yes	8	40.0%	11	44.0%		
		No	12	60.0%	14	56.0%		
	Total		20		25		0.787	
Tuesday	Antibiotic Prescribed	Yes	12	38.7%	15	50.0%		
		No	19	61.3%	15	50.0%		
	Total		31		30		0.375	
Wednesday	Antibiotic Prescribed	Yes	11	45.8%	15	41.7%		
		No	13	54.2%	21	58.3%		
	Total		24		36		0.750	
Thursday	Antibiotic Prescribed	Yes	6	42.9%	3	30.0%		
		No	8	57.1%	7	70.0%		
	Total		14		10		0.521	
Friday	Antibiotic Prescribed	Yes	12	54.5%	8	36.4%		
		No	10	45.5%	14	63.6%		
	Total		22		22		0.226	
Total			111		123		0.773	

***Percentages significantly different, chi^2 $p<0.005$

Table 5

Perceived Patient Expectation

Day of the Week			Pre-Intervention		Post-Intervention		*p*	***
Monday	Perceived Patient Expectation	Yes	7	36.8%	11	44.0%		
		No	12	63.2%	14	56.0%		
	Total		19		25		0.128	
Tuesday	Perceived Patient Expectation	Yes	11	35.5%	15	50.0%		
		No	20	64.5%	15	50.0%		
	Total		31		30		0.252	
Wednesday	Perceived Patient Expectation	Yes	9	37.5%	15	41.7%		
		No	15	62.5%	21	58.3%		
	Total		24		36		0.747	
Thursday	Perceived Patient Expectation	Yes	5	38.5%	3	30.0%		
		No	8	61.5%	7	70.0%		
	Total		14		10		0.002	
Friday	Perceived Patient Expectation	Yes	8	36.4%	8	36.4%		
		No	14	63.6%	14	63.6%		
	Total		22		22		1.000	
Total			111		123		0.026	

***Percentages significantly different, chi^2 $p<0.005$

Table 6

Provider-specific Perceived Patient Expectation

Provider			Pre-Intervention		Post-Intervention		*p*	***
Provider 1	Perceived Patient Expectation	Yes	20	35.7%	25	31.6%		
		No	36	64.3%	54	68.4%		
	Total		56		79		0.621	
Provider 2	Perceived Patient Expectation	Yes	20	37.7%	38	86.4%		
		No	33	62.3%	6	13.6%		
	Total		53		44		0.000	***
Total			109		123		0.026	

***Percentages significantly different, chi^2 $p<0.005$

Table 7

Provider-specific Antibiotic Prescribing

Provider			Pre-Intervention		Post-Intervention		*p*	***
Provider 1	Antibiotic Prescribed	Yes	23	41.1%	31	31.6%		
		No	33	58.9%	48	68.4%		
	Total		56		79		0.831	
Provider 2	Antibiotic Prescribed	Yes	26	47.3%	21	86.4%		
		No	29	52.7%	23	13.6%		
	Total		55		44		0.964	
Total			111		123		0.773	

***Percentages significantly different, chi^2 $p<0.005$

Table 8

Provider Specific Viral vs. Bacterial Diagnosis

Day of the Week			Pre-Intervention		Post-Intervention		*p*	***
Provider 1	Viral vs Bacterial	Viral/Non-Bacterial	56	83.58%	80	80.00%		
		Bacterial	11	16.42%	20	20.00%		
	Total		67		100		0..560	
Provider 2	Viral vs Bacterial	Viral/Non-Bacterial	54	88.52%	44	86.27%		
		Bacterial	7	11.48%	7	13.73%		
	Total		61		51		0.720	
Provider 3	Viral vs Bacterial	Viral/Non-Bacterial	12	66.67%				
		Bacterial	6	33.33%				
	Total		18					
Total			146		151		0.742	

***Percentages significantly different, chi^2 $p<0.005$

Table 9

Antibiotic Prescribing based on Chief Complaint

		Antibiotic Prescribed			
		Yes		No	
Chief Complaint	Sore throat	13	28.26%	33	71.74%
	Ear Pain/Hearing loss	1	11.11%	8	88.89%
	Chest Congestion/Cough	62	43.66%	80	56.34%
	Sinus Pain/Head Congestion	24	77.42%	7	22.58%
	Eye Pain/Pressure	1	33.33%	2	66.67%
	Watery Eyes	0	0.00%	1	100.00%
	Fever	0	0.00%	2	100.00%
Total		101	43.16%	133	56.84%

Table 10

Perceived Patient Expectation based on Chief Complaint

		Antibiotic Prescribed			
		Yes		No	
Chief Complaint	Sore throat	21	45.65%	25	54.35%
	Ear Pain/Hearing loss	1	11.11%	8	88.89%
	Chest Congestion/Cough	66	46.48%	76	53.52%
	Sinus Pain/Head Congestion	15	51.72%	14	48.28%
	Eye Pain/Pressure	0	0.00%	3	100.00%
	Watery Eyes	0	0.00%	1	100.00%
	Fever	0	0.00%	2	100.00%
Total		103	44.40%	129	55.60%

Table 11

Reported Reasons for Giving Antibiotic for Viral Diagnosis

	n	Percent
Patient Expected an Antibiotic	10	4.10%
Patient Requested an Antibiotic	2	0.80%
Patient Leaving Town	3	1.20%
Patient Not Improving	65	26.90%
Patient Getting Worse	64	26.40%
Patient Sick Too Long	45	18.60%
Patient Has Chronic Lung Disease	9	3.70%
Patient Has Comorbidity	7	2.90%
Patient is Extremely Ill	1	0.40%

Appendix A

Definition of Terms

Adult: A patient greater than 18 years of age.

Acute Upper Respiratory Symptoms: cough, sore throat, nasal congestion, sinus pressure, and ear pressure.

Patient Expectations for an Antibiotic: the verbalized or provider perceived desire for an antibiotic prescription to treat the patient's current acute health condition.

Provider: a licensed physician, nurse practitioner, or physician's assistant.

Usual Care: baseline provider information and instructions given to patients about acute upper respiratory illnesses prior to intervention.

Appendix B

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Guidelines							
Rosenfeld, R. M., (2015). Clinical Practice Guideline (Update) Adult Sinusitis. *Otolaryngology -- Head and Neck Surgery*	Guideline on sinusitis	Systematic Review of Literature; Guideline LOE 1					
Fashner, J. (2012). Treatment of the common cold in children and adults. *American Family Physician*	Guideline for Common Cold	Systematic Review of Literature; Guideline LOE 1					
Shulman, S. T.(2012). Clinical Practice Guideline for the Diagnosis and Management of Group A Streptococcal Pharyngitis: 2012 Update *Clinical Infectious Diseases*	Guideline on Strep Throat	Systematic Review of Literature; Guideline LOE 1					
Albert, R. H. (2010). Diagnosis and treatment of acute bronchitis. *American Family Physician*	Guideline for bronchitis care	Systematic Review of Literature; Guideline LOE 1					

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Variance from Guidelines							
Lopez-Vazquez, P.(2012) Misprescription of antibiotics in primary care: a critical systematic review of its determinants. Journal of Evaluation in Clinical Practice	review researched reasons for misperscripion s of antibiotics	Systematic Review LOE 1; factors attitudes and knowledge related with the misprescription of antibiotics	46 papers reviewed. Excluded qualitative data.		Determining factors for antibiotic RX.	Fear and fulfilling patient's perceived expectation for antibiotics. Theme analysis	Not all studies used same variables.
Tonkin-Crine, S., (2011). Antibiotic prescribing for acute respiratory tract infections in primary care: a systematic review and meta-ethnography. *The Journal of Antimicrobial Chemotherapy*	to understand why interventions are affective for reducing inappropriate antibiotic RX	qualitative systemic review; LOE 5; motivating factors for successful interventions; prescribing decisions	12 qualitative research articles; primary general practitioners		identified themes	Identified themes that affect prescribing decisions; meta-ethnography	qualitative evidence that is subject to author interpretation
Undeland, D. K., (2010). Appropriately Prescribing Antibiotics for Patients With Pharyngitis: A Physician-Based Approach vs a Nurse-Only Triage and Treatment Algorithm. *Mayo Clinic Proceedings*	determine adherence to guideline with physicians vs. nurse triage	retrospective review. LOE 3; adherence to guidelines	4996 patients; 71.5% saw physician and 28.5 saw a nurse triage, La Crosse, WI health system		number of pharyngitis cases prescribed antibiotics without positive diagnostics	physicians adhered to guidelines 92% of time at first visit and 82% of time at second visit. Nurse triage adhered 99% of time.	limited to one health system

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Beckett, M. K. (2009). Outpatient Satisfaction: The Role of Nominal versus Perceived Communication. *Health Services Research*,	Compare patient satisfaction of communication with provider communication	Patient survey; coder analysis of encounter with inter-rater reliability. LOE 4; communication strategies	522 pediatric encounters age 6 months-10 years		Surveyed patients about satisfaction and if actions were observed compared with videotaped encounter ($p<.001$)	Satisfaction increased with key topics covered by provider. multivariate analysis adjusted for this hierarchical structure	Pediatrics visits only; based on parents perceptions of visit
Stearns, C. R., (2009). Antibiotic Prescriptions Are Associated with Increased Patient Satisfaction With Emergency Department Visits for Acute Respiratory Tract Infections. Academic Emergency Medicine	To determine if patient satisfaction is correlated with antibiotic prescriptions.	Secondary review of randomized trial. LOE 5. factors patient satisfaction	959 patients at 8 VA hospitals		Soci-odemographic characteristics and satisfaction 95% CI	Antibiotic RX improved patient satisfaction	Only included VA facilities.
Wigton, R. S.(2008). How Do Community Practitioners Decide Whether to Prescribe Antibiotics for Acute Respiratory Tract Infections? *Journal of General Internal Medicine*	Provider reasons to prescribe antibiotics	observational study; LOE 4; factors affecting prescribing behavior	100 community practitioners and 8 faculty members		Paper case vignette study	Increased antibiotic RX rates with longer duration of illness. Practitioners responses compared to guidelines	analysis on case studies not actual patients

First author, Year, Title, Journal	Purpose	Research Design[1], Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Ranji, S. R., (2008). Interventions to Reduce Unnecessary Antibiotic Prescribing: A Systematic Review and Quantitative Analysis. *Medical Care*	to assess QI measures to reduce antibiotic RX rates	systematic review with quantitative analysis; LOE 1; factors interventions and antibiotic prescription rates	43 studies with 55 trials		Absolute change in antibiotic RX rates; p-=0.096	overall 9.7% decrease in antibiotic RX rates	only 30 studies were about to be used in quantitative review; not all studies were upper respiratory infections
Altiner, A., (2007). Reducing antibiotic prescriptions for acute cough by motivating GPs to change their attitudes to communication and empowering patients: a cluster-randomized intervention study. *Journal of Antimicrobial Chemotherapy*	Reduce inappropriate antibiotic RX in primary care	Randomized intervention study; LOE 2; attitudes and communication for antibiotic prescriptions	86 general practitioners	peers visited practitioners to encourage antibiotic judiciousness	rate of antibiotic prescriptions	60% reduction in antibiotic RX rates. Generalized estimating equations (GEE) models	Very resource heavy study.
Gonzales, R. (2001). Excessive Antibiotic Use for Acute Respiratory Infections in the United States. *Clinical Infectious Diseases*	Impact of decision tool on antibiotic RX rates	Cluster Randomized Trial; LOE 2; antibiotic prescriptions	33 primary care practices from one health system. 11 practices in each group	printed and computer generated decision supports	number of visits that received antibiotic prescriptions (p=0.003)	implementation of either printed or computer support decreased antibiotic RX rates	providers may have shifted diagnosis codes for their prescriptions to seem more appropriate

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Dosh, S. A. (2000). Predictors of Antibiotic Prescribing for Nonspecific Upper Respiratory Infections, Acute Bronchitis and Acute Sinusitis. *Journal of Family Practice*	Determine factors for prescribing antibiotics for acute viral respiratory infections	Observational study without control. LOE 4. Variables of patient expectations and provider prescription indications	15 practices, 58 providers, and 928 patients. Providers selected 20 consecutive patients >4 yoa		surveyed patients and providers on patient symptoms, desire for an antibiotic (95% CI)	Patients >18yoa, sick >14 days and an urgent care visit got antibiotic RX with greater frequently. Patients also expected an antibiotic if they perceived that one had helped with a previous illness. SPSS 7.0 with regression models.	Limitations not discussed. No control. Does show a correlation between patient expectation of antibiotic and previous antibiotic RX
Mangione-Smith, R. (1999). The relationship between perceived parental expectations and paediatrician antimicrobial prescribing behaviour. *Pediatrics*	To analyze what parents expect from visit and if providers think the parent wants an antibiotic	questionnaire study. LOE 4; patient expectations, provider perceptions and patient satisfaction	306 pediatric visits in 2 private pediatric clinics		Pre and post survey of patients and providers	physicians were more likely to diagnose bacterial infections and antibiotics if they perceived the parent wanted an antibiotic	pediatric population; limited sample setting

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Public knowledge and Attitudes							
McCullough (2016), A Systematic Review of the public's knowledge and beliefs about antibiotic resistance, Journal of Antimicrobial Chemotherapy	SR of public knowledge of andbitiocs and risks	Quantitative and Qualitative Systematic Review; LOE 5. Variables of public knowledge of antibiotic resistance	54 studies were reviewed ith a total of 55225 participants. Random, Convenience, Purposive, or opportunistic. Studies were conducted in Europe, Asia, or North America.	Test understanding of public knowledge of antibiotics. No intervention	Surveys were the main data source (74%); reliability not reported	Public doesn't under sand antibiotic use and risks. thematic synthesis was done for qualitative studies;	Limited survey response rate; only 2 included studies purpose was to collect knowledge about antibiotic resistance,. meta-analysis was precluded by lack of study heterogeneity
Northey, A.(2015). Patients' antibiotic knowledge: a trial assessing the impact of verbal education. *International Journal of Pharmacy Practice*	Effect of pharmacist educating patients on antibiotics	RCT. LOE 2. variable- patient knowledge	34 patients; New South Wales, Australia	verbal education to patients with antibiotic RX	patient knowledge of antibiotics 1 month after education given	Increase in one month knowledge assessment of antibiotics with verbal education (P=0.008)	Patients already had antibiotic RX. Pharmacists provided education. Small sample size. Not US
Broniatowski, D. A (2015). Germs Are Germs, and Why Not Take a Risk? Patients' Expectations for Prescribing Antibiotics in an Inner-City Emergency Department. *Medical Decision Making*	Identify if patients understood difference in bacteria and virus; and that antibiotic have risks.	Descriptive study LOE 6. variables- patient knowledge	113 patients in urban ED. Paper survey		19 question survey with Likert scale and write in answers	Public did not understand bacterial/viral differences; thought antibiotic held no risk	From ED. Mostly African American

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Hart, A. M (2013). Acute Respiratory Infection-Related Patient Behaviors and Expectations in Wyoming. *The Journal for Nurse Practitioners*	How patients manage acute upper respiratory infections	Descriptive study LOE 6. variables- patient management and patient expectations	655 household survey in Wyoming.		53 questions survey administered by phone with a 5 point Likert scale for each question.	Patients want antibiotic prescriptions but also want to be heard and receive recommendations for supportive care.	Possibility of decreasing antibiotic RX rates with more thorough explanation but no supportive evidence
Price, E. L., (2011). A computerized education module improves patient knowledge and attitudes about appropriate antibiotic use for acute respiratory tract infections. *Patient Education and Counseling*	Effect of electronic education on patient understanding of antibiotics and desire	cross sectional study. LOE 6 variables- symptoms, knowledge, and desire	2027 adult. 8 ED's (4 VA) Kiosk available to all in English and Spanish	computerized education module	10 point visual analog scale. P=.001	Increase in knowledge and decrease in desire. Multivariable analysis	Unknown if knowledge correlated to decreased request for antibiotics; no control; unknown knowledge retention; not all patients were able to use technology; unsure if antibiotic was appropriate.
Larson, E. (2009). Knowledge and Misconceptions Regarding Upper Respiratory Infections and Influenza Among Urban Hispanic Households: Need for Targeted Messaging. *Journal of Immigrant and Minority Health*	To characterize knowledge and misconceptions regarding viral upper respiratory infections	Observational study. LOE 6. variables knowledge of URI and correlates of knowledge	453 Hispanic homes; Manhattan		Structured interview	Knowledge gap about antibiotics and viruses ; Cross-tabulations using the Chi-square statistic	Limited to one neighborhood. Only included household with a preschool aged child. Results dependent on participant response and only one person from household interviewed.

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Morgan, K.(2009). Families in rural settings: Values regarding acute respiratory infections. *Families, Systems, & Health*	Rural patient management and values about ARI	Observational study. LOE 6. variables values about ARI	42 participants; Wyoming		focus group interviews	tend to wait longer, have limited access to care; they value self-knowledge and consider the community as family	small sample size; qualitative study
McDonnell Norms Group. (2008). Antibiotic Overuse: The Influence of Social Norms. *Journal of the American College of Surgeons*	to uncover social norms with antibiotic use	Research Support, grey literature; LOE 7			Themed social norms	social norms exist within the patient and provider mindset	low LOE
Provider Knowledge and Attitudes							
McCullough, A. R.(2015). Not in my backyard: a systematic review of clinicians' knowledge and beliefs about antibiotic resistance. *Journal of Antimicrobial Chemotherapy*	Providers belief and knowledge on resistant bacteria	Systematic review of quantitative and qualitative studies; LOE 4; knowledge and attitudes about antibiotic resistance	57 included qualitative and quantitative		clinician beliefs; reliability reported in IQR	Clinicians believed that antibiotic resistance was a national and global problem but not necessarily a local one	not addressed

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Anthierens, S., (2014). Clinicians' Views and Experiences of Interventions to Enhance the Quality of Antibiotic Prescribing for Acute Respiratory Tract Infections. Journal of General Internal Medicine	Identify useful interventions to support provider prescribing	qualitative study; LOE 6; clinical training and knowledge	66 clinicians from another RCT; across 6 countries		Interview	4 themes identified; thematic and framework analysis	low LOE; only used clinicians from previous trial
Dempsey, P. P., (2014). Primary care clinicians' perceptions about antibiotic prescribing for acute bronchitis: a qualitative study. *BMC Family Practice*	Provider feelings about antibiotics	qualitative study; LOE 6; clinical training and knowledge	3 primary care clinicians in Boston, Massachusetts		semi structured interview	Antibiotics prescribed to satisfy patients; other provers were the reason for over prescription; thematic analysis	low LOE; clinicians used were academically affiliated; low sample size
Grossman, Z. (2012). Antibiotic prescribing for upper respiratory infections: European primary paediatricians' knowledge, attitudes and practice. *Acta Paediatrica*	Pediatrician view of antibiotic RX	descriptive study; LOE 6; knowledge, attitudes and practice of antibiotic prescribing	695 clinicians; primarily EAPRASnet members		Web-based survey with 5 point Likert scale	Thought no antibiotic RX was riskier than antibiotic RX; descriptive analysis only	LOE; bias of respondents

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Stivers, T.,(2003). Why do physicians think parents expect antibiotics? What parents report vs what physicians believe. J Fam Pract,	Effect of patient expectation and actions on provider prescribing	nested cross-sectional study with parallel measures; LOE 5; behaviors and provider precieved antibiotic expectation	Ten physicians in 2 private pediatric practices		previsit survey of parents, post visit survey of physicians. P<0.001	Certain communication behaviors increased physicians belief that parents wanted antibiotics; parents commonly just wanted reassurance. multivariate model	limited sample size
Interventions to Improve Antibiotic RX							
Meeker (2016). Effect of Behavioral Interventions on Inappropriate Antibiotic Prescribing Among Primary Care Practices A Randomized Clinical Trial. JAMA	Provider education and peer accountability on antibiotic RX	Cluster RCT. LOE 2. Variables of educational/peer intervention Dependent-prescription rates	248 PCP in Boston and Los Angeles. Recruited through email.	education to provider for patient education, how to justify prescriptions and peer accountability	antibiotic prescribing rate	All decreased RX rates. There were no statistically significant interactions (neither synergy nor interference) between interventions	Small sample. Low external validity. Variable coding habits. Analysis methods used.

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
McDonagh, M. (2016). *Improving Antibiotic Prescribing for Uncomplicated Acute Respiratory Tract Infections*. Rockville (MD): Agency for Healthcare Research and Quality (US)	To assess the comparative effectiveness of interventions for improving antibiotic use	systematic review; LOE 1; reducing resistance to antibiotics, improving appropriate prescribing , or decreasing overall prescribing of antibiotics	133 studies, including 88 randomized controlled trials	education, communication, clinical, system-level, and multifaceted interventions	prescription rates	best decrease in antibiotic RX rates: specific education interventions for patients/parents and clinicians, procalcitonin in adults, and electronic decision support; Clinical and methodological heterogeneity limited quantitative analysis	Not all studies used same variables.
Bont, E. G. P. M. (2015). Patient information leaflets to reduce antibiotic use and reconsultation rates in general practice: a systematic review. *BMJ Open*,	Effect of patient education handouts on antibiotic RX	systematic review; LOE 1; effect of information leaflets	8 studies; 3407 patients in general practice	informational leaflets	antibiotic use and reconsultation rates	informational leaflets decreased antibiotic RX rates and rates of reconsultation; meta-analysis of aggregated data	only 4 studies pertained to respiratory tract infections

First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Drekonja (2015). Antimicrobial Stewardship in Outpatient Settings: A Systematic Review. Infection Control & Hospital Epidemiology	Effect of anitbioc RX programs on RX rates, patient prognosis, and monetary obligations	Systematic Review LOE 1. Variables patient outcomes prescribing, costs and harms	50 studies (RCTs), (CRCTs), (CCTs), (CBAs), or (ITS).	provider/patient education; provider feedback; guidelines; delayed prescribing; communication training; prescription policies	rated strength of evidence based on AHRQ methods	All decreased RX rates. Changes in RX did not affect outcomes or cost. Qualitative analysis	qualitative analysis; not all URI studies;
Agnew, J. (2013). Delayed prescribing of antibiotics for respiratory tract infections: use of information leaflets. *Irish Medical Journal*	to effect of information leaflet on delayed antibiotic RX	Pragmatic, non-randomized, controlled trial, LOE 3; information leaflet and delayed antibiotic RX	115 patients;	informational leaflet & delayed prescription	Self-report of antibiotic fulfillment; p=0.0018	Patients with informational leaflet were less likely to fill antibiotic; analysis method not reported	analysis method not reported; limitations not discussed
Harris (2013). Initiatives to improve appropriate antibiotic prescribing in primary care. Journal of Antimicrobial Chemotherapy	to determine the effectiveness of a multifaceted approach to reduce inappropriate antibiotic prescriptions	Observational study. LOE 6. Provider knowledge, public knowledge, prescriptions rates	No reported sample size, but included providers and general public. In UK	Education to providers. Education to public and school aged children	measure prescription rates of cephalosporin and quinolones	Decrease in prescription rates. No analysis method	Poor study. Initiated great interventions but had no way to measure outcomes.

First author, Year, Title, Journal	Purpose	Research Design[1], Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Huang, Y. (2013). Association between point-of-care CRP testing and antibiotic prescribing in respiratory tract infections: a systematic review and meta-analysis of primary care studies. *British Journal of General Practice*	Effect of POC testing on antibiotic RX	systematic review; LOE 1; point of care testing	13 studies containing 10 005 patients	POC testing	current or delayed antibiotic RX and patient satisfaction; 95% CI	POC testing decreased antibiotic RX at time of visit; fixed-effects model	not enough data on if delayed antibiotic RX rates declined
Cals, J. W. L. (2010). Point-of-Care C-Reactive Protein Testing and Antibiotic Prescribing for Respiratory Tract Infections: A Randomized Controlled Trial. *Annals of Family Medicine*	Effect of CRP and antibiotic RX	RCT; LOE 2; CRP testing	258 patients by 32 physicians,	point of care testing of CRP	antibiotic RX at index visit; antibiotic RX 28 days after visit, satisfaction, and patient outcome; 95% CI	Reduced antibiotic RX at initial visit; patients more satisfied with CRP testing. $\chi 2$ or the Mann-Whitney (Wilcoxon) U	no non-biased limitations
Huttner, B. (2010). Characteristics and outcomes of public campaigns aimed at improving the use of antibiotics in outpatients in high-income countries. *The Lancet Infectious Diseases*,	Effect of national campaigns to reduce antibiotic RX rates	Systematic review LOE 1. Public health campaigns	National/regional programs in wealthy countries from 1990-2007	Public campaigns; simple internet to expensive mass-media campaigns.	antibiotic RX rates	CDC's Get Smart program is used in regional campaigns. Discusses perceived patient demand. Unable to report outcomes due to varied interventions	unable to accumulate results

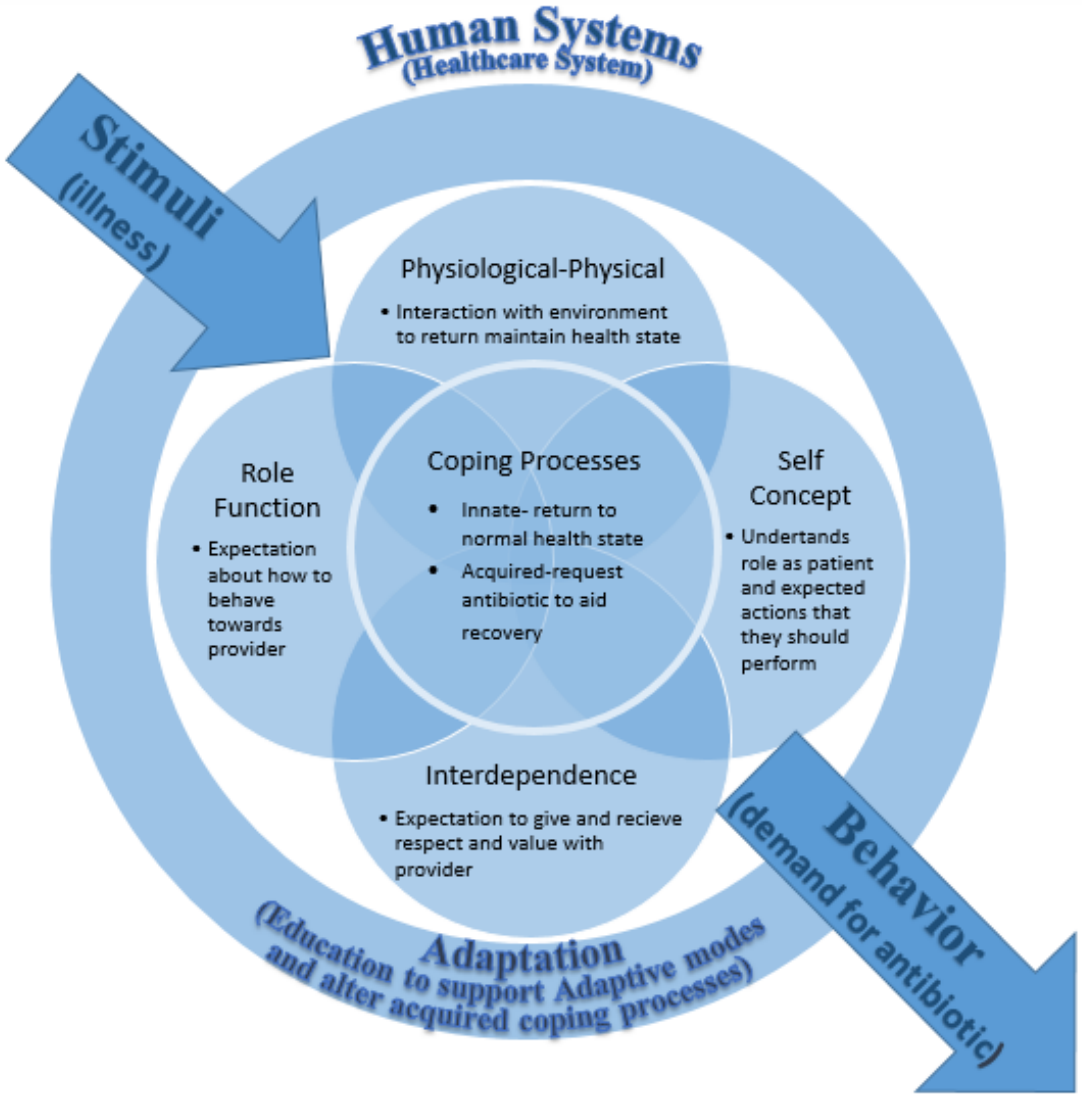
First author, Year, Title, Journal	Purpose	Research Design[1] , Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Schnellinger (2010) Animated Video vs Pamphlet: Comparing the Success of Educating Parents About Proper Antibiotic Use. Pediatrics	Improve parents knowledge about antibiotic resistance and test if a video or pamphlet led to longer retention of knowledge	RCT. LOE 2. Variables of pamphlet and video education tools and knowledge retention	246 completed study of the 331 approached. Pediatric ED; Minnesota	Parental education using pamphlet and video formats.	Pre intervention, post intervention and 4 week follow up knowledge survey. P<.05	Video education has the longest retention, but pamphlet and video education showed improved knowledge immediately after intervention. Friedman test, Kruskal-Wallis test, and the Mann-Whitney U test.	not proportional age group variations
Francis, N. A.(2009). Effect of using an interactive booklet about childhood respiratory tract infections in primary care consultations on reconsulting and antibiotic prescribing: a cluster randomised controlled trial. *BMJ: British Medical Journal*	Effect of handout on pediatric return to clinic rates	Pragmatic cluster randomized controlled trial with randomization; LOE 2; educational booklet	558 patients in 61 general practice cli9nics in Wales and England	educational booklet and physician communicati on strategies	Parent approval, antibiotic RX rates, and return rates; 95% CI	Antibiotics RX rates reduced at initial visit. Revisit rates stay the same.	clinicians in control group may have altered behavior

First author, Year, Title, Journal	Purpose	Research Design[1], Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
Metlay, J. P., (2007). Cluster-Randomized Trial to Improve Antibiotic Use for Adults With Acute Respiratory Infections Treated in Emergency Departments. *Annals of Emergency Medicine*	Effect of education on antibiotic RX	RCT; LOE 2; educational program	16 hospitals in 8 regions including one VA and one non-VA in each region	Computerized patient education, clinician training, and patient handouts	antibiotic RX rates, return visits and visit satisfaction, 95% CI	Decrease in 10% of overall antibiotic RX rates. Descriptive statistics and regression models	Used multiple arms of study, unsure of which had greatest effect.
Little P (2005). Information leaflet and antibiotic prescribing strategies for acute lower respiratory tract infection: A randomized controlled trial. *JAMA*	To estimate the effectiveness of 3 prescribing strategies and an information leaflet	Factorial randomized controlled trial; LOE 2; information leaflet, delayed antibiotics, duration and severity of illness	807 patient in primary care	with/without educations leaflet AND no antibiotics, antibiotics, or delayed antibiotics	antibiotic RX rates; reconsultation rates; symptom diary from patients; 95% CI	No significant change in duration and severity of illness within antibiotic groups. Antibiotic RX did reduce reconsultation rates.	only 10% of patients included symptom diary
Edwards, M. (2003). Patients' responses to delayed antibiotic prescription for acute upper respiratory tract infections. *The British Journal of General Practice*	Analyze reasons for filling delayed antibiotic RX	Postal questionnaire survey. LOE 4; antibiotic RX and motivating factors	374 patients; England	delayed antibiotic RX	questionnaire study;	patients are confident in filling delayed antibiotic RX due to presenting symptoms	different practices had different RX rates

First author, Year, Title, Journal	Purpose	Research Design[1], Evidence Level[2] & Variables	Sample & Sampling, Setting	Intervention	Measures & Reliability (if reported)	Results & Analysis Used	Limitations
MacFarlane, J. (2002). Reducing Antibiotic Use For Acute Bronchitis In Primary Care: Blinded, Randomised Controlled Trial Of Patient Information Leaflet. *BMJ: British Medical Journal*	Effect of written handout on antibiotic RX	Single blind randomized controlled trial; LOE 2; verbal and written education for patients	259 patients in three suburban general practices in Nottingham	verbal and written education	antibiotic RX in 2 weeks following visit; p=0.04	fewer patients with educational leaflet took antibiotics	patients who got the leaflet also got verbally assured
Macfarlane (1997) Influence of patients' expectations on antibiotic management of acute lower respiratory tract illness in general practice: questionnaire study. British Medical Journal	To analyze clients wviews and motivation for seeking care for antibiotic RX.	Nested, single blind, randomized controlled trial. LOE 2; patient belief; provider interpretation of patient desire	76 general practitioners and 1014 patients. Practitioners were obtained from Community respiratory Infection Interest Group.	None	Pre visit and post visit survey with patients. Post visit questionnaire with practitioners. Reconsultation of patients P<0.0001	Chi2 and students t test	Not discussed in article, but choice of practitioners used; patient opinions in over 200 surveys not returned. Not clear Lower respiratory tract definitions. Can be applicable to any primary care setting.

Appendix C

Theory to Application Diagram



Appendix D

UMKC
Office of Research Services

UMKC
5319 Rockhill Road
Kansas City Missouri
TEL: 816 235-5927
FAX: 816 235-5602

NOTICE OF NEW APPROVAL

Principal Investigator: Lyla Lindholm
UMKC Health Sciences Building
Kansas City, MO 64108

Protocol Number: 16-239
Protocol Title: Effect of Patient Antibiotic Education on Provider Perceived Patient Expectation for Antibiotics
Type of Review: M

Date of Approval: 08/30/2016
Date of Expiration: 12/31/2999

Dear Dr. Lindholm,

The above referenced study, and your participation as a principal investigator, was reviewed and approved by the UMKC IRB. You are granted permission to conduct your study as described in your application.

This approval includes the following documents:

The ability to conduct this study will expire on or before 12/31/2999 unless a request for continuing review is received and approved. If you intend to continue conduct of this study, it is your responsibility to provide a Continuing Review form prior to the expiration of approval.

This approval is issued under the University of Missouri - Kansas City's Federal Wide Assurance FWA00005427 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under the Board's Assurance, please do not hesitate to contact us.

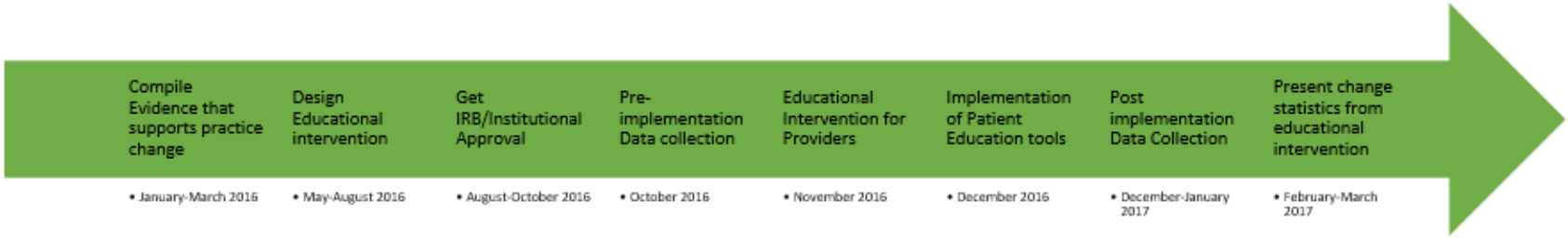
There are 5 stipulations of approval:
1) No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date. (PIs and sponsors are responsible for initiating Continuing Review proceedings).
2) All unanticipated or serious adverse events must be reported to the IRB.
3) All protocol modifications must be IRB approved prior to implementation unless they are intended to reduce risk. This includes any change of investigator.
4) All protocol deviations must be reported to the IRB.
5) All recruitment materials and methods must be approved by the IRB prior to being used.

Please contact the Research Compliance Office (email: umkcirb@umkc.edu; phone: (816)235-5927) if you have questions or require further information.

Thank you,

Appendix E

Timeline Flow Graphic



Appendix F

Approval from Clinic Site for project completion.

Appendix G

Antibiotic Patient Education Project Cost Table

Component	Financial Impact
Costs *($2,584.00)*	
Direct Costs	
Increased Nurse Practitioner work time: $44.55 per hour (median nurse practitioner hourly wage[1]) * {60 minutes education time + 100 minutes survey time (5minutes per day/5 days per week/4 weeks) * 3 Nurse Practitioners =	-$356.40
Nurse Practitioner Monetary Incentive for Participation $50 Visa gift card	-$150.00
Printed brochure cost: $28.60 per 100 brochures (CDC) * 5 (500 total brochures)=	-$143.00
Printed Survey Cost: 120 surveys *.025 (cost per black and white copy @best value copy)=	-$3.00
Statistician: 10 hours * $38.25[1] per hour=	-$382.00
Breakfast for Educational Offering Pastries, Fruit, and coffee for 10 people	-$50.00
Indirect Costs	
Building maintenance for educational offerings	-$500.00
Result dissemination at Advanced Practice Nurse of the Ozarks annual conference	-$1,000.00
In-kind Donations *($1,381.00)*	
Rural Practice Clinic:	
Nurse Practitioner paid time=	+$356.40
Building maintenance for educational offering	+ 500.00
University of Missouri Kansas City:	
Paid Statistician=	+$382.00
CDC:	
Patient Education Brochures=	+$143.00
Total	-$1,203.00

[1](Bureau of Labor Statistics, 2013)

[2](Bureau of Labor Statistics, 2012)

Appendix H

Recruitment Script

1. Introduction of Investigator or Research Assistant

Excuse me, (Nurse Practitioner at clinic site)

Do you have a minute? My name is Jennifer Williams.
I am a student investigator at University of Kansas City, and I am working on a doctorial Quality Improvement Project.

2. Immediate opportunity to opt-out

I'm here to follow up on the email I sent you previously and to see if you are interested in hearing more about my project. Is it OK for me to continue?

3. Make a BRIEF statement about why he/she was selected.

- I am approaching you to see if you would like to be included in the project. This project is not required for you job and will not be used for employment evaluation. I am asking all nurse practitioners at Rural Family Clinic to participate. The study is focused on patient expectations for antibiotic prescriptions during an acute visit for upper respiratory illnesses.

4. Ask if he/she is interested in hearing more details.

So, are you interested in hearing some details about the research study?

- If not interested, thank the individual for his/ her time.
- If interested, then move to the consent form.

Appendix I

Provider Survey

Provider: _____ **Date:** _____

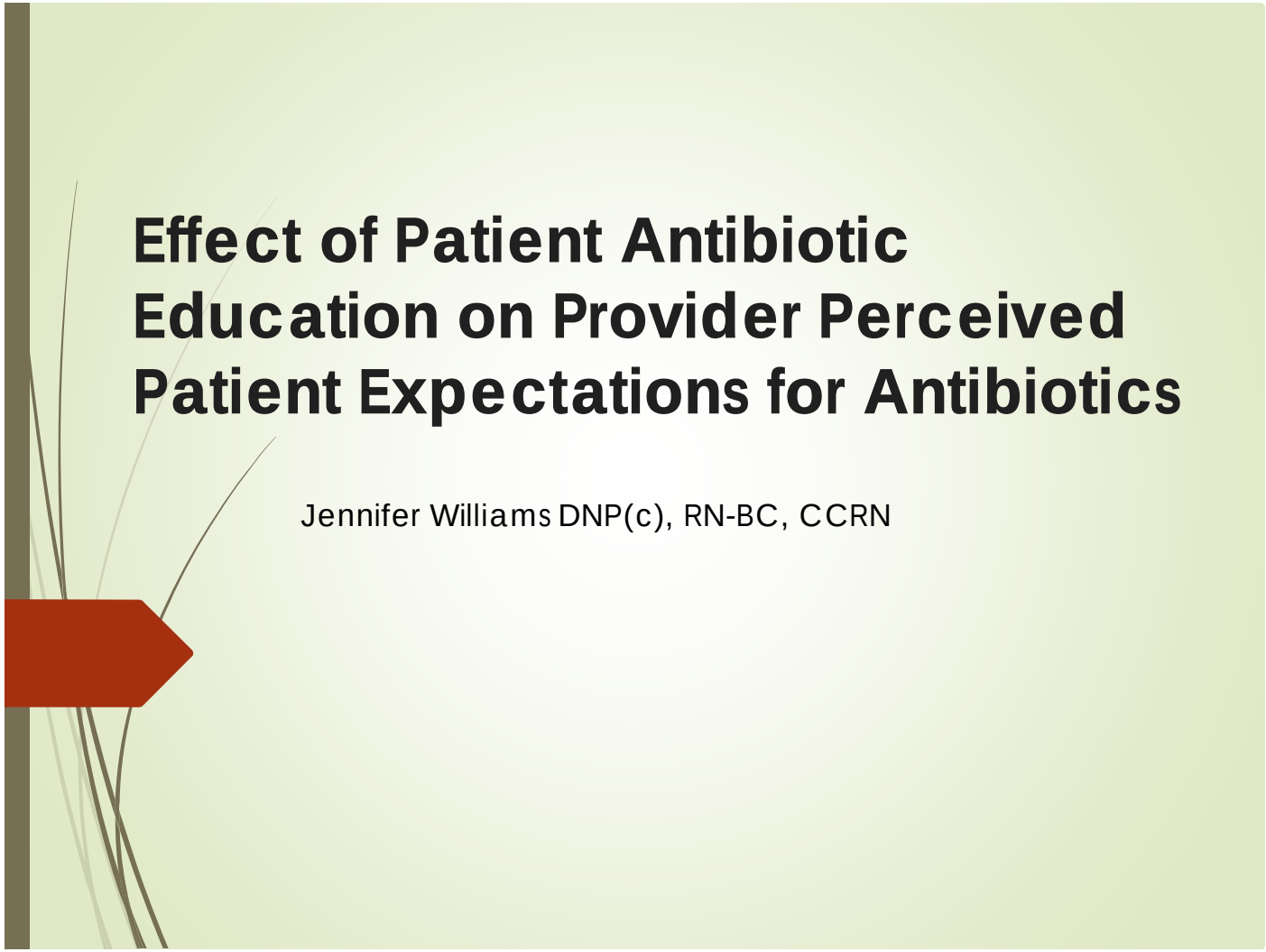
Patient Antibiotic Education Project Survey

Patient	Chief Complaint	Did the patient expect an antibiotic? *(Yes/No)*	Was an antibiotic prescribed? *(Yes/No)*	Acute Diagnosis *(ICD-10 Code or written diagnosis)*	Secondary Factors Affecting Antibiotic Prescription: *(Circle all that apply or None if No Antibiotic Rx Given)* 1- Patient expected an antibiotic 2- Patient requested an antibiotic 3- Patient leaving town 4- Patient not improving 5- Patient getting worse 6- Patient sick too long 7- Patient has chronic lung disease 8- Patient has comorbidity 9- Patient is extremely ill
1		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
2		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
3		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
4		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
5		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
6		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
7		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
8		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
9		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
10		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
11		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
12		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
13		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
14		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9
15		Yes / No	Yes / No		1, 2, 3, 4, 5, 6, 7, 8, 9

Tool Adapted from:
Dosh, S. A., Hickner, J. M., Mainous III, A. G., & Ebell, M. H. (2000). Predictors of Antibiotic Prescribing for Nonspecific Upper Respiratory Infections, Acute Bronchitis and Acute Sinusitis. *Journal of Family Practice*, *49*(5), 407–414.

Appendix J

Provider Education



(Double click to open presentation)

Appendix K

CDC Get Smart: Know When Antibiotics Work Brochure

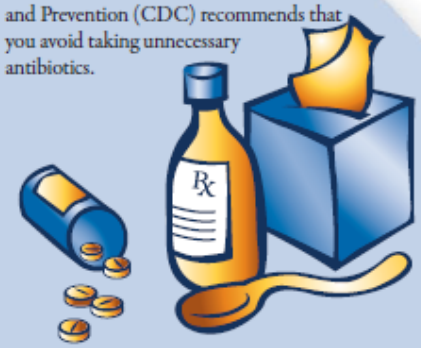
When you feel sick, you want to feel better fast. But antibiotics aren't the answer for every illness. This brochure can help you know when antibiotics work – and when they won't. For more information, talk to your healthcare provider or visit www.cdc.gov/getsmart.

The Risk: Bacteria Become Resistant

What's the harm in taking antibiotics anytime? Using antibiotics when they are not needed causes some bacteria to become resistant to the antibiotic.

These resistant bacteria are stronger and harder to kill. They can stay in your body and can cause severe illnesses that cannot be cured with antibiotics. A cure for resistant bacteria may require stronger treatment – and possibly a stay in the hospital.

To avoid the threat of antibiotic-resistant infections, the Centers for Disease Control and Prevention (CDC) recommends that you avoid taking unnecessary antibiotics.



Antibiotics Aren't Always the Answer

Most illnesses are caused by two kinds of germs: bacteria or viruses. Antibiotics can cure bacterial infections – not viral infections.

Bacteria cause strep throat, some pneumonia and sinus infections. *Antibiotics can work.*

Viruses cause the common cold, most coughs and the flu. *Antibiotics don't work.*

Using antibiotics for a virus:

- Will NOT cure the infection
- Will NOT help you feel better
- Will NOT keep others from catching your illness

Protect Yourself With the Best Care

You should not use antibiotics to treat the common cold or the flu.

If antibiotics are prescribed for you to treat a bacterial infection – such as strep throat – be sure to take all of the medicine. Only using part of the prescription means that only part of the infection has been treated. Not finishing the medicine can cause resistant bacteria to develop.

Talk to Your Healthcare Provider to Learn More

Commonly Asked Questions:

How Do I Know if I Have a Viral or Bacterial Infection?

Ask your healthcare provider and follow his or her advice on what to do about your illness.

Remember, colds are caused by viruses and should not be treated with antibiotics.

Won't an Antibiotic Help Me Feel Better Quicker so That I Can Get Back to Work When I Get a Cold or the Flu?

No, antibiotics do nothing to help a viral illness. They will not help you feel better sooner. Ask your healthcare provider what other treatments are available to treat your symptoms.

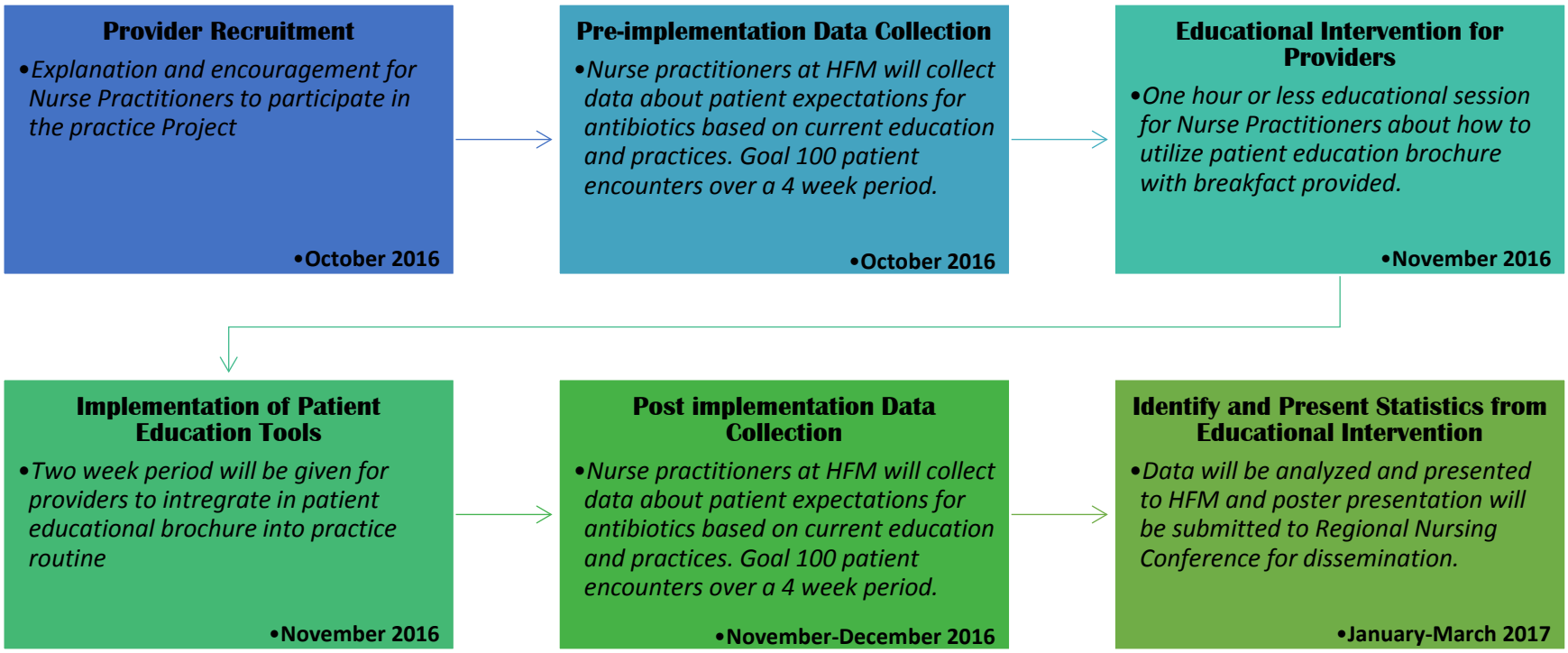
If Mucus from the Nose Changes from Clear to Yellow or Green — Does This Mean I Need an Antibiotic?

No. Yellow or green mucus does not mean that you have a bacterial infection. It is normal for mucus to get thick and change color during a viral cold.

(Center for Disease Control, 2015)

Appendix L

Intervention Flow Diagram



Appendix M

Personal Communication allowing use of standardized tool.

Appendix N

Rev. 7/09, 1/2015
http://www.uwex.edu/ces/lmcourse/interface/coop_M1_Overview.htm Logic-Model Worksheet content revisions by Lyla Lindholm for DNP Project. Not to be placed on web for public use. For UMKC DNP coursework only.

Logic Model for DNP Project

Student: Jennifer Williams

PICOTS: **In adult outpatients with upper respiratory symptoms, does receiving the Center for Disease Control's Get Smart: Know When Antibiotics Work patient education compared usual care or no antibiotic education decrease clinician's belief that the patient expects an antibiotic during an acute outpatient visit in the primary care setting?**

Inputs	**Intervention(s)** *Activities*	**Outputs** *Participation*	**Outcomes -- Impact** *Short*	*Medium*	*Long*
Evidence, sub-topics Guidelines for Upper Respiratory Infections Reasons for Variance from Guidelines Public Knowledge of Antibiotic Use and Antimicrobial Resistance Provider Knowledge and Attitudes about Antibiotic Prescribing Interventions to Improve Antibiotic Stewardship **Major Facilitators or Contributors** -Nurse practitioners at clinical site desire more resources for proper antibiotic prescribing **Major Barriers or Challenges** **-**time to utilize resources in clinical practice -availability of resources -approval by HFM management	**EBP intervention which is supported by the evidence in the Input column** Utilization of CDC Get Smart: Know When Antibiotics Work patient education materials for patients presenting with viral upper respiratory infections **Major steps of the intervention** 1. Assess the Need for Change in Practice 2. Locate the Best Evidence 3. Critically Analyze the Evidence 4. Design Practice Change 5. Implement and Evaluate Change in Practice 6. Integrate and Maintain Change in Practice	**The participants (subjects)** Nurse Practitioners at HFM **Site** Rural Family Medicine Clinic **Time Frame** January 2016- March 2017 **Consent Needed or other** Rural Family Medicine Clinic UMKC IRB **Person(s) collecting data** Jennifer Williams Clinic Nurse Practitioners **Others directly involved** Dr. Renee Endicott-Academic Adviser Clinical Preceptor	**(Completed as student)** **Outcome(s) to be measured with valid & reliable tool(s)** **-**Clinician belief that patient desires an antibiotic for acute illness **Statistical analysis to be used** Chi Squared	**(after student DNP)** **Outcomes to be measured** Antibiotic Prescription rates Nurse Practitioners will continue to utilize brochures to educate patients about appropriateness of antibiotic	**(after student DNP)** **Outcomes that are potentials** Physicians will begin to utilize patient education materials Antibiotic resistant strains of bacteria will decrease in the local community

Appendix O

Data Collection Template

Pre/Post Intervention	Provider	Date	Chief Complaint	Did the patient expect an antibiotic? *(Yes/No)*	Was an antibiotic prescribed? *(Yes/No)*	Acute Diagnosis *(ICD-10 Code or written diagnosis)*	Secondary factors affecting antibiotic prescription: 1- Patient expected an antibiotic 2- Patient requested an antibiotic 3- Patient leaving town 4- Patient not improving 5- Patient getting worse 6- Patient sick too long 7- Patient has chronic lung disease 8- Patient has comorbidity 9- Patient is extremely ill

Appendix O

UMKC School of Nursing and Health Studies

July 26, 2016

Members of UMKC Institutional Review Board
University of Missouri-Kansas City
Kansas City, MO 64108

UMKC IRB,

This letter serves to provide documentation regarding Jennifer William's Doctor of Nursing Practice (DNP) Project proposal. Ms. Williams obtained approval for her project proposal, Effect of Patient Antibiotic Education on Provider Perceived Patient Expectation for Antibiotics, from the School of Nursing DNP faculty committee on July 26, 2016.

If I can provide any further information, please feel free to contact me.

Sincerely,

Susan J. Kimble

Susan J. Kimble, DNP, RN, ANP-BC, FAANP
Clinical Associate Professor
DNP Programs Director
UMKC School of Nursing and Health Studies
816-235-5962
kimbles@umkc.edu