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Using Leaflets to Reduce Inappropriate Antibiotics for Upper Respiratory Infections

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Problem

Antibiotics are inappropriately prescribed for upper respiratory infections (URIs) throughout the United States, leading to complications like antibiotic-resistant pathogens, increased morbidity and mortality, adverse drug events, and increased healthcare costs (Lee et al., 2017; Meeker et al., 2016). Upper respiratory infections are one of the most common conditions that primary care providers see in their practice (Meeker et al., 2016). Current evidence does not support the use of antibiotics for URIs because most infections are caused by viruses, are self-limiting, and rarely lead to serious complications (Lee et al., 2017). As a result of overprescribing antibiotics, pathogens are becoming increasingly resistant to existing antibiotics, which leads to increased morbidity and mortality worldwide (Gonzales et al., 2013). According to the Centers for Disease Control and Prevention (CDC), each year in the United States over two million people become infected with antibiotic-resistant pathogens and as a result at least 23,000 people die (CDC, 2013). The use of antibiotics can have undesired consequences from side effects, adverse reactions, and complications. Antibiotics can cause side effects like nausea, diarrhea, rash, itching, photosensitivity, and abdominal discomfort. Moreover, antibiotics can lead to serious complications like acute kidney injury, hepatitis, anaphylaxis and secondary infections like *Clostridium difficile* diarrhea (CDC, 2013). The health care costs of antibiotics to treat URIs are significant in the United States. Meeker et al. (2014) explains that in the United States alone, 41.2 million prescriptions for antibiotics aimed at treating URIs are prescribed annually. This results in a cost of $1.1 billion dollars (Meeker et al., 2014). According to the CDC (2013), one in five emergency department visits are a direct result of an adverse drug event from prescribed antibiotics. In children antibiotics are the most common cause of emergency department visits resulting from adverse drug effects (CDC, 2013). Unnecessary use of antibiotics increases the healthcare cost from the initial purchase of the antibiotic, but also the emergency department visit associated with possible side effects (CDC, 2013).

There is a psychological and sociocultural variable that influences the use of antibiotics in treatment of URIs, and that is the desire to receive antibiotics by patients (Coxeter, Mar, & Hoffmann, 2017). According to Coxeter, Mar, and Hoffmann (2017), many patients overestimate the benefits and underestimate the harms of using antibiotics. This thought process by the public leads to increased demand and desire for antibiotics, regardless of whether or not they are indicated. Furthermore, patients often have inadequate knowledge and misconceptions about antibiotic use for URIs (Coxeter, Mar, & Hoffmann, 2017). For example, most patients believe that antibiotics are beneficial in treating common respiratory infections, including the ability to cure viral infections, and shorten the duration of URIs (Yu et al., 2014). Patients' misconception about antibiotics are a strong factor in the overuse of antibiotics, because when they visit their primary care provider they expect to receive antibiotics regardless of whether or not they are indicated (Gonzales et al., 2013; O'Sullivan, Harvey, Glasziou, & McCullough, 2016).

Primary interventions to reduce inappropriate use of antibiotics to treat URIs include yearly influenza vaccinations, pneumococcal vaccinations, proper hand hygiene, avoidance of people who are ill and overcrowded places, and furthermore engaging in healthy activities such as getting adequate sleep, smoking cessation, eating a healthy diet and exercising regularly (Wedro, 2018).

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Secondary interventions include the use of point-of-care diagnostic tests like C-reactive protein testing, rapid strep testing, and rapid influenza testing to determine the cause of illness, and better determine what antibiotics, if any, are indicated (Tonkin-Crine et al., 2017). Other secondary interventions are aimed at relieving associated symptoms (e.g., fever, cough, muscle pains, malaise). These interventions include analgesics, antihistamine/decongestant combinations, dextromethorphan, intranasal ipratropium bromide, saline nasal lavage, expectorants, zinc sulfate lozenges, and herbal products (Sexton, McClain, Hirsch, Aronson, & Melin, 2018). Tertiary interventions would be to avoid the use of antibiotics altogether, as this may lead to unforeseen complications in both the patient and general population (Sexton et al., 2018). For example, antibiotics can cause adverse effects (e.g., anaphylaxis, kidney damage, *C. difficile* infection) to the patient, but they can also lead to increases in antibiotic-resistant organisms that can affect populations at a larger scale (Gonzales et al., 2013; CDC, 2013).

Literature Review

The theoretical framework that clinicians can apply to reduce inappropriate antibiotic prescriptions for URIs is that of Kurt Lewin's change model theory. The change model theory is made up of three-stages called the unfreezing stage, change stage, and refreezing stage (Shirey, 2013). The unfreezing stage can be applied to primary care providers and patients as the stage where they are preparing to let go of a previously accepted idea or expectation (i.e., using antibiotics for the treatment of URIs). This stage is necessary in order to challenge the beliefs, attitudes, expectations and behaviors that are seen with the use of antibiotics for URIs (Manchester et al., 2014). The change stage is where the actual transition of practice takes place (i.e., information about antibiotics and URIs is given to the patient). This transition is supported by evidence-based research, knowledge, behaviors and attitudes aimed at following the new processes (Wojciechowski, Murphy, Pearsall, & French, 2016). The last stage, refreezing, is where the new process (i.e., antibiotics will *not* be used to treat URIs) becomes the new practice, and efforts are made to keep the new behavior from regressing to what it used to be. This will require thorough patient education to address cultural and personal beliefs; and also changes in policies, practices and habits of providers caring for those patients (Manchester et al., 2014; Shirey, 2013).

Lewin's change model theory also has three factors that affect the direction in which change will occur: driving forces, restraining forces, and equilibrium (Wojciechowski et al., 2016). Driving forces are positive forces that push in the direction that will cause change to happen (Manchester et al., 2014). An example of a driving force would be the information leaflet given to patients who are presenting with symptoms of URIs. The information leaflet would act as a force pushing in the direction of the desired change (i.e., reduction in the use of antibiotics). Restraining forces on the other hand, are forces that push in the direction against driving forces in order to keep change from taking place and maintain the status quo, or equilibrium (Wojciechowski et al., 2016; Manchester et al., 2014). An example of this would be the misconceptions that patients have about the use of antibiotics in treatment of URIs. It is their misconception that prevents change from taking place. Equilibrium occurs when the driving forces push against the restraining forces, and as a result, no change occurs (Wojciechowski et al., 2016).

As mentioned before, the unnecessary use of antibiotics to treat upper respiratory infections leads to consequences like increased drug-resistance, increased health care costs, and increased incidences of adverse effects (O'Sullivan, Harvey, Glasziou, & McCullough, 2016; Lee et al., 2017). Uncomplicated URIs result in 25 million visits to primary care providers across the United States each year (Zoorob, Sidani, Fremont, &Kihlberg, 2013). In a large outpatient study of more than 52,000 cases of URIs, it was found that over 65% ofpatients received antibiotics, and although indicated in some cases, antibiotics are still vastly overused(Zoorob et al., 2013). One reason antibiotics are overprescribed is because patients desire, and in some cases, expect to receive antibiotics from their providers, regardless of whether or not they are indicated (Gonzales et al., 2013; O'Sullivan et al., 2016).

An evidence-based review of numerous research studies aimed at reducing antibiotic prescriptions for upper respiratory infections was conducted using PubMed, Google Scholar, and various online resources (e.g., CDC, UpToDate). From these resources, five studies were found to show that printed information given to patients presenting with upper respiratory infections would result in reduced prescription rates for antibiotics (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew, Taaffe, Darker, O'Shea, & Clarke,2013; Meeker et al., 2014). The use of printed information would come in various forms, including leaflets, brochures, pamphlets, and a poster-size education/commitment letter (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al.,2013; Meeker et al., 2014).

This evidence-based review is aimed at evaluating the use of printed information for patients, and will address the following research question: Will providing information leaflets to adult patients with upper respiratory infections reduce the use of antibiotics?

Lee et al. (2017) designed a patient-targeted educational pamphlet on the causes of URIs and the role of antibiotics, with a goal of reducing antibiotic prescriptions. The educational pamphlet was based on information from the Health Promotion Board of Singapore, the CDC of the United States, and consultations from several primary care and infectious disease providers, and public health experts (Lee et al., 2017). Lee et al. (2017) used a randomized control trial in patients over 21 years in age, presenting with URI symptoms for seven days or less, who presented to the primary care clinics in Singapore (Lee et al., 2017). Out of 457 patients who participated in the study, Lee et al. (2017) found that the educational pamphlet significantly reduced antibiotic prescriptions for URIs in a small Indian ethnic subgroup. The rest of the participants had no significant decreases in prescription rates, but did increase the patients' understanding of URIs, why antibiotics are not necessary for URI, and side effects of antibiotics(Lee et al., 2017).

Wei et al. (2017) used a two-part intervention, pragmatic cluster-randomized trial aimed at reducing inappropriate antibiotic prescriptions for URIs in pediatric patients seeking care in primary care hospitals in China. The first intervention was aimed at educating and training providers on the guidelines of treating URIs, appropriate prescribing, and also monthly peer-review meetings (Wei et al., 2017). The second intervention was aimed at the parents of pediatric patients. Parents were given paper leaflets about antibiotics and URIs, and at the same time, there was an educational video playing on a loop in the waiting rooms of the primary care hospitals (Wei et al., 2017). Wei et al. (2017) saw a decrease in antibiotic prescription rates from 80% to 40% among participants in the intervention group. Wei et al. (2017) concluded that interventions aimed at both providers and patients were highly effective at reducing the prescribing rate of antibiotics for upper respiratory tract infections.

Gonzales et al. (2013) conducted a three-arm, cluster-randomized trial aimed at reducing antibiotics for acute bronchitis. The three-arms were divided into a control group (no education was provided), a printed interventions group in which educational brochures from the CDC were given to patients at triage and posters displaying the clinical algorithm for treatment of acute bronchitis were posted in every exam room (Gonzales et al., 2013). The computerized group used the electronic medical record to alert the nursing staff when a chief complaint of cough was entered, prompting the nurse to give an educational brochure from the CDC to the patient and also alert the provider, via the electronic medical record, to use a specific algorithm with specific documentation, relevant history, and physical exam elements (Gonzales et al., 2013). Gonzales et al. (2013) saw decreases in prescribed antibiotics in both the printed interventions group (80% down to 68.3%), and the computerized intervention group (74% down to 60.7%). Gonzales et al. (2013) conclude that educational brochures can help reduce antibiotic prescription rates for upper respiratory infections.

Agnew et al. (2013) used an intervention trial study design with 115 patients from the Dublin, Ireland area presenting to their primary care provider with complaints of acute respiratory tract infections. The purpose of the study was to determine if delayed prescriptions and an information leaflet on antibiotics would reduce the rate of antibiotic use (Agnew et al., 2013). The intervention group was given a delayed prescription for antibiotics and also an information leaflet. The information leaflet contained written details explaining the role of antibiotics in respiratory tract infections, indications for use, and potential side effects (Agnew et al., 2013). Agnew et al. (2013) called patients over the phone 10 to 14 days after their consultation, and as a result found that only 43% of the intervention group said they used the antibiotics they were given, concluded that the use of an additional information leaflet is highly effective at reducing the use of antibiotics for respiratory tract infections.

Meeker et al. (2014) conducted a randomized clinical trial with 954 adults presenting with acute respiratory infections in outpatient clinics located in Los Angeles, California. Participants were 18 years and older, diagnosed with a URI for which antibiotics might or might not have been appropriate. The intervention included the use of a poster-size (18 x 24 inch) commitment letter explaining why antibiotics were not appropriate in many cases; these would be posted in examination rooms (Meeker et al., 2014). The clinicians who were included in the intervention group would have their photograph and signature added to the commitment letter (Meeker et al., 2014).The rate of antibiotic prescriptions for the intervention group (n=449) decreased from 43.5% to 33.7%, and Meeker et al. (2014)

Concluded that there was a significant reduction in antibiotic prescriptions for URIs for patients treated by clinicians who signed and posted a commitment letter in their examination rooms. The commitment letter was written at an eighth-grade reading level in both English and Spanish, and included information about antibiotics, use of antibiotics, side effects of antibiotics, increased drug-resistance due to antibiotics, and how it is important to "only use an antibiotic when it is necessary to treat your illness" (Meeker et at., 2014, p. 427).

Discussion and Application

According to the CDC, initial treatment of upper respiratory infections consists of watchful waiting for patients who can easily follow up if their condition worsens (CDC.gov, 2017). Other interventions are aimed at symptomatic relief with the use of decongestants, antipyretics, non-steroidal anti-inflammatory drugs (NSAIDs), and cough suppressants (CDC.gov, 2017). The use of antibiotics as initial or secondary interventions is not recommended for uncomplicated upper respiratory infections (CDC.gov, 2017). According to the Infectious Disease Society of America (IDSA), the use of antibiotics is indicated when one or more of three criteria are met by the patient: (a) persistent symptoms lasting greater than 10 days; (b) onset of *severe* symptoms, or signs of high fever (≥39°C [102°F]) and purulent nasal discharge, or facial pain lasting for at least 3–4 consecutive days; or (c) onset of *worsening* symptoms like new onset of fever, headache, or increase in nasal discharge following a typical URI that lasted five to six days and was initially improving (Chow et al., 2012). Both the CDC and the IDSA advise against the use of antibiotics for uncomplicated URIs, furthermore, the evidence-based research of five studies support this recommendation and attempt to curve the inappropriate use of antibiotics for URIs using various printed mediums (CDC.gov, 2017; Chow et al., 2012; Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al., 2013; Meeker et al., 2014).

All five of the studies employed the use of printed information to educate patients about URIs, antibiotics, side effects of antibiotics, and the inappropriate use of antibiotics for treatment of URIs (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al.,2013; Meeker et al., 2014). Meeker et al. (2014) had one difference from all of the others in that the written information was posted in the exam room, and could not be taken home with the patient. All other of the studies provided patients with leaflets, brochures, or pamphlets that could be taken home (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al.,2013). Wei et al. (2017) also included an educational video playing on a loop in the waiting rooms, whereas none of the other studies included a video medium. Two studies, Wei et al. (2017) and Gonzales et al. (2013) also included education and training about antibiotics and URIs to participating clinicians. Three studies, Lee et al. (2017), Agnew et al. (2013) and Meeker et al. (2014), included only adults in their sample selection, Wei et al. (2017) only included children in their sample selection, and Gonzales et al. (2013) included a combination of adolescents (>13 years old) and adults in their sample selection. The overall conclusion of all five studies was that providing printed information to patients with URIs was effective at reducing the rate of inappropriate antibiotic prescriptions (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al.,2013; Meeker et al., 2014).

Providing education to patients about the use of antibiotics and URIs is the first stage of Lewin's change model theory, unfreezing (Manchester et al., 2014). This is supported by the idea that printed information given to patients will prepare them to let go their previously accepted ideas, or misconceptions, about using antibiotics to treat URIs (Manchester et al., 2014; Lee et al., 2017). The unfreezing stage is further embodied by the use of guidelines and data showing the consequences of current antibiotic use (e.g., increased drug-resistance, adverse effects, and costs) (Wojciechowski et al., 2016; O'Sullivan et al., 2016). The change stage is where the education, implementation and presenting of the idea that antibiotics should not be used to treat URIs takes place. This stage includes the use of evidence-based research to support the idea of not using antibiotics for treatment of URIs, all the while fostering the new process (Wojciechowski et al., 2016).

Meeker et al. (2014) found that clinicians were more influenced by interpersonal factors (i.e., their photograph and signature added to a commitment letter about antibiotics) than they were by pay-for-performance incentives. Lewin's change stage would attribute this phenomenon to providers' engagement as stakeholders and role models with the new process (Meeker et al., 2014; Wojciechowski et al., 2016). The last stage of Lewin's change model theory, refreezing, is where the patients are encouraged and motivated by the resources they are given to accept the idea that antibiotics should not be used for treatment of URIs, with examples like the risks vs benefits of antibiotics, the self-limiting etiology of URIs, and the need to decrease antibiotic-resistance (Manchester et al., 2014; Wojciechowski et al., 2016).

Implications for practice are aimed at reducing antibiotic prescriptions for URIs. The use of printed information, like leaflets, are aimed at educating patients about the pathogenesis of URIs, lack of evidence showing that antibiotics are useful in treating URIs, side effects, complications, and cost of unnecessary utilization of antibiotics (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al., 2013; Meeker et al., 2014). Clinicians can use printed information (e.g., pamphlets, leaflets, brochures) to educate patients about antibiotics and URIs, which in turn will help reduce patient desire for antibiotics and decrease inappropriate use of antibiotics (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al.,2013; Meeker et al., 2014). Printed information in the form of leaflets has been found to be very useful in educating patients, especially for acute conditions where the patients are misinformed or lack knowledge (Sustersic, Gauchet, Foote, & Bosson, 2017). Sustersic et al. (2017) conducted a systemic review of 986 articles and found that printed information leaflets improved patients' knowledge, satisfaction, adherence to treatment for acute conditions, and also improved patients' behaviors for chronic diseases. Information leaflets are inexpensive and easily prepared interventions that can help reduce overall health care costs in the primary care setting (Sustersic et al., 2017). Clinicians can write, develop and implement information leaflets, in both English and Spanish, to help educate their patients, curve desires for antibiotics, and inappropriate antibiotic use (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al.,2013; Meeker et al., 2014).

The healthcare system in the United States can be described as a hybrid system of various payers, including private, business, and government, operating simultaneously and interactively (Department for Professional Employees [DPE], 2016). There are multiple levels that exist within the government-funded healthcare system, among them are local, state and federal. At the federal level, we have Medicare; at the state level, we have Medicaid (i.e., Medi-Cal in California). Within the United States healthcare system, there are various pay models. One example is the fee-for-service model which reimburses clinicians a set amount for each of the services they perform, regardless of patient health outcomes (HealthCare.gov, n.d.). Another model is the pay-for-performance model in which providers have financial incentives based on improving patient health outcomes (Bardach et al., 2013). A new model from the Centers for Medicare and Medicaid Services (CMS) is the capitated model, in which a provider, or group of providers, receive a monthly fixed amount of money to provide comprehensive care (i.e., outpatient, inpatient, preventative services, diagnostic and treatment services) to each patient assigned to them (CMS, 2017).

In capitated models there is a pool of money that is collected and held until the end of the year. If the overall healthcare costs of the patients are low, financial rewards are given to the providers, whereas if the overall healthcare costs are high, the financial rewards for providers are minimal (CMS, 2017). The use of capitated models can influence clinicians' decisions on care. On one hand, clinicians are asked to provide quality care, but on the other hand they are asked to manage that care while being cost-effective. This dilemma may cause clinicians to prescribe antibiotics when they are not indicated (i.e., for treatment of a URI) in order to keep their patient's health from getting worse, which could lead to a hospitalization. For example, if a patient with a URI was seen by a provider and was not prescribed antibiotics, there is a small possibility that they could develop pneumonia and require hospitalization (Gonzales et al., 2013). A clinician, incentivized by the capitated model, may be more inclined to prescribe antibiotics in order to prevent the expensive and costly hospitalization of a more serious infection. The capitated reimbursement environment may lead providers to err on the side of caution and prescribe unnecessary antibiotics for URIs. Since the implementation of the Affordable Care Act (ACA) in 2014, there has been an increasing trend in healthcare to deliver customer-centered care aimed at increasing patient satisfaction (Detsky & Shaul, 2013).

The ACA includes a provision that will redistribute up to 1% of Medicare reimbursements from the hospitals with the lowest patient satisfaction scores to hospitals with the highest patient satisfaction scores (Detsky & Shaul, 2013).This environment of patient satisfaction and customer-centered care, has led providers to chase financial incentives derived from institutional pressures, reimbursement schemes, discretionary care (i.e., medical interventions that have no proven benefit), and the desire to avoid bad ratings from customers (Detsky & Shaul, 2013).

Clinicians will find themselves in a conflicting healthcare environment, where on one hand they are asked to improve patient satisfaction, but on the other hand they must deliver quality care. This dilemma further aggravates the issue of prescribing antibiotics for URIs when patient satisfaction is such a strong variable. If a patient is not given a prescription to treat their upper respiratory infection, they may be more inclined to give the provider a low satisfaction score. Conversely, providers may be more willing to give their patients a prescription of antibiotics for URIs if there is an opportunity to receive a higher satisfaction score, as this may lead to more financial compensation.

The use of printed information has shown promising results at both educating patients and reducing prescriptions for inappropriate antibiotics for URIs (Lee et al., 2017; Wei et al., 2017; Gonzales et al., 2013; Agnew et al.,2013; Meeker et al., 2014). There are many variables that need to be addressed in regards to this issue. Among them are patients, providers, institutions, policies, and payers. The need for further research aimed at multiple parties (i.e., patients, providers, and organizations) would be beneficial to address the issue from different angles. Also, the use of information leaflets may be considered archaic when compared to the present day smart phones and digital applications. The use of smart phones, digital applications, emails, and text messages to deliver the same information found on leaflets may be beneficial to a younger and more technologically savvy population, furthermore suggesting the need for additional studies to verify the efficacy of these digital interventions.

Intervention Recommended for Clinicians

Clinicians can use printed information leaflets to educate patients on URIs, antibiotics, indications for antibiotics, and complications that can arise from antibiotics. The information leaflets for this intervention would be written at an eight-grade reading level, and would contain information from various resources aimed at providing guidelines for clinicians (e.g., CDC, National Institutes of Health, and IDSA). The information leaflet would be written in both English and Spanish, as this will help capture a larger population of patients. The leaflet would have detailed information about the causes of URIs, disease progress, and symptomatic management. It would also have descriptions of how antibiotics function, their side effects, possible complications that may arise, and how they are not indicated for URIs because they are often times caused by viruses. All of this information will be written in a way that patients can easily read, understand and discuss with their providers. Clinicians will be asked to help clarify any misconceptions, explain the information, and answer any questions patients may have about the information found on the leaflet. The leaflet can be given to patients at various points of contact throughout their visit in the primary care setting. The triage staff can provide the leaflet if the patient presents with a chief complaint of cough or cold-like symptoms. The leaflets can also be placed in easily accessible areas of the waiting room and examination rooms, to encourage patients to take one freely. Lastly, the clinician can also hand a leaflet to the patient and discuss its content throughout the consultation.

The strengths of the information leaflets would have to be that it is easy to read and understand, precise and straight to the point, and readily available to anyone. Another benefit is the low-cost of printing copies, and the unnecessary purchase of new equipment (e.g., computers, tablets, smart phone applications). Some of the weaknesses found in leaflets are that in a digital age, paper mediums are often overlooked. They are also discarded after being read and are seldom kept for reference. Also, patients who are illiterate would not be able to read and comprehend the information provided in the leaflet. Lastly, the discussion and explanation of the leaflet between the provider and the patient is paramount to the efficacy and outcome it aims to achieve. Clinicians can use the leaflet to educate and curve patients' desires for antibiotics, which in turn will help reduce inappropriate antibiotics for upper respiratory infections.

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