IMPLEMENTING AN ANTIBIOTIC STEWARDSHIP PROGRAM TO DECREASE ANTIBIOTIC OVERUSE IN A PRIMARY CARE CLINIC

A Doctor of Nursing Practice Project Report

by

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This Doctor of Nursing Practice Project Report meets the standards for scope and quality of Texas A&M University-Corpus Christi College of Nursing and Health Sciences and is hereby approved.

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August 2021

DEDICATION

It is my honor to dedicate this work to my loving mother and father who have sacrificed so much for me to be who I am today. This is also dedicated to my daughters, Aanya and Aanvi. I hope the sacrifices you have endured for me to pursue this dream will be repaid to you with many opportunities for joy and success in your future.

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Lastly, but not the least, I would like to thank my husband for all his support, help, and encouragement throughout this journey. Without his support and encouragement this achievement would not have been possible. Together with me, you have earned this degree by staying right beside me!

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ABSTRACT

Background: Antibiotic overuse is one of the largest threats to global health. Nearly 50% of antibiotics prescribed in outpatient settings are unnecessary. The overuse of antibiotics is associated with antibiotic resistance, unnecessary adverse drug effects, and increased healthcare costs. **Purpose**: This quality improvement (QI) project aimed to increase patients' knowledge and improve their attitude toward appropriate antibiotic use in acute respiratory tract infections (ARTIs) and decrease antibiotic over-prescription by providers through the implementation of an antibiotic stewardship program in a North Texas primary care clinic. **Methods**: This is a before-and-after design QI project that implemented Centers for Disease Control and Prevention's (CDC) antibiotic stewardship educational intervention. A convenience sample (N=20) was recruited from all interested English-speaking patients who were 18 years or above. Patients' knowledge and attitude towards antibiotic use was assessed before and after an educational intervention. The second part of the project entailed provider education using a training activity from Stanford University (N=2). Pre- and post-training retrospective chart review was done to determine changes in antibiotic prescription rate. **Results**: There was a significant increase in patients' knowledge and their attitude towards appropriate antibiotic use in ARTIs ($p < .001$) after the educational intervention. Secondly, there was a 15% reduction in antibiotic prescription rate in 2021 compared to the same months in 2020. **Conclusion:** Provider and patient educational interventions are effective strategies in promoting antibiotic stewardship in outpatient settings and improving inappropriate antibiotic use in ARTIs. Further research is needed to explore innovative educational strategies incorporating inexpensive technology.

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Implementing an Antibiotic Stewardship Program to Decrease Antibiotic Overuse in a Primary Care Clinic

INTRODUCTION

Nearly 50% of antibiotics prescribed in outpatient settings are unnecessary (Centers for Disease Control and Prevention [CDC], 2019). Antimicrobial resistance among common bacterial pathogens has reached alarming levels in many countries and is now a global health crisis (World Health Organization [WHO], 2018). At least 2.8 million illnesses and more than 35,000 deaths in the United States (US) are caused by antibiotic-resistant bacteria (CDC, 2020). If this trend persists, it is estimated there will be 10 million antimicrobial resistance-related deaths worldwide by 2050 resulting in up to $100 trillion in health-related expenditures (CDC, 2019). Antibiotic overuse resulting in antibiotic-resistant infection is a real and growing threat to public health. The CDC recognized multidrug-resistant infections such as *Clostridium difficile* (*C. difficile*) and carbapenem-resistant Enterobacteriaceae (CRE) as urgent threats to the US healthcare system. It is estimated that *C. difficile* alone causes 2,500,000 infections, 14,000 deaths, and $1 billion in excess medical costs per year (Durkin et al., 2018). Significant regulatory measures to decrease antibiotic overuse or inappropriate use have been placed by CDC and Centers for Medicare and Medicaid Services (CMS) for inpatient antibiotic utilization; however, there are no such measures to regulate outpatient antibiotic utilization and ensure education of providers and patients (Durkin et al., 2018). Therefore, implementation of an antibiotic stewardship program in primary care clinics is vital to decrease antibiotic overuse in patients with symptoms of acute respiratory tract infections (ARTIs).

Background

Antibiotic stewardship refers to a set of coordinated strategies to improve the use of antimicrobial medications with the goal of enhancing patient health outcomes, reducing resistance to antibiotics, and decreasing unnecessary costs (The Society of Healthcare Epidemiology of America, 2019). Some of the actions for antibiotic stewardship include making accurate diagnoses, following antimicrobial use guidelines, regularly reviewing the need for therapy, delaying antibiotic prescription, and providing patient education on antibiotic use (CDC, 2020).

From 1982 to 2006, the percentage of antibiotics prescribed for upper respiratory infections increased from 43% to 71% (WHO, 2018). Treatment of viral respiratory tract conditions with antibiotics is particularly concerning. Worldwide, ARTIs are common reasons for seeking outpatient care in urgent care clinics, emergency departments, medical offices, or retail clinics (Palms et al., 2018). Among visits for inappropriate antibiotic prescriptions for ARTIs, the highest antibiotic prescription rate was observed in urgent care centers, followed by emergency departments, medical offices, and retail clinics i.e., 45.7%, 24.6%, 17%, and 14.4%, respectively (Palms et al, 2018).

The overuse of antibiotics is associated with antibiotic resistance, increased healthcare costs, and unnecessary adverse drug effects such as allergic reaction (rash, pruritus) and angioedema (severe swelling beneath the skin). Antibiotic resistance leads to longer hospital stays, higher medical costs, and increased mortality (CDC, 2019; File et al., 2014). The Joint Commission estimated that in the US, annually, one billion dollars is spent on unnecessary antibiotics for ARTIs (Joint Commission, 2016). Antibiotics are the most common cause of adverse drug events (ADE) and account for seven of the top ten drugs leading to emergency

room visits (CDC, 2019). It is important to protect the efficacy of existing antibiotics, so they remain effective therapies in treating infections in the coming years (Cope, 2018). Developing a new antibiotic is not the solution to the increasing problem of antibiotic resistance. It requires a great deal of time, effort, cost, and scientific research to develop new drugs. Therefore, antibiotic stewardship is an essential step to combat this growing global concern of antibiotic resistance (CDC, 2020).

Review of Literature

Antibiotic overuse for the treatment of ARTIs is very common even though the majority of ARTIs are caused by viruses (CDC, 2020). A qualitative study by Tillekeratne et al. (2017) found that primary care providers' (PCPs) perceived patient demand as the main reason antibiotics are prescribed for ARTIs. This finding suggests over-prescription may be a direct result of patients' lack of knowledge about the appropriate use of antibiotics. A survey *(n* = 113*)* done by Broniatowski et al. (2014) revealed that most patients are not aware of the difference between viral and bacterial infections. Another qualitative study done by Yates et al. (2018) found the primary barriers to reducing inappropriate antibiotic prescribing included patient education and expectations, system-level factors, and time constraints. These researchers suggested patient education on the appropriate use of antibiotics was needed, as many providers experience a high demand for an antibiotic prescription from their patients.

Many providers are familiar with antibiotic prescribing guidelines but fail to implement them into practice (Radecky, 2014). They report prescribing antibiotics for ARTIs to satisfy patients and keep them in the practice or shorten the duration of the visit. Some providers report prescribing antibiotics because they want to avoid being perceived as doing nothing or because they lack the energy to resist the demand (Radecky, 2014; Shaw Teng Pan et al., 2016). A survey

done by Davis et al. (2017) explored patients' awareness and perceptions of the appropriate use of antibiotics. The study (n = 119) showed that 53% of patients incorrectly believed antibiotics work well for treating viral infections. The patients reported experiencing confusion about which illnesses may be treated by antibiotics and reported unclear communication from providers about the appropriate use of antibiotics. PCPs' lack of knowledge and lack of comfort with effective strategies for reducing antibiotic prescribing is a major challenge in health care today and a focus of this quality improvement (QI) project. The above studies support the need to improve patient and provider knowledge on antibiotic stewardship.

Studies have shown that outpatient antibiotic stewardship measures that focus on patient and provider educational interventions are effective strategies in decreasing antibiotic overuse in ARTIs. A quasi-experimental pretest-posttest study ($n = 207$) by Chiswell et al. (2019) showed that antibiotic prescription for ARTIs decreased significantly from 56.3% (pre-intervention group) to 28.8% (post-intervention group) (p <.01), after implementation of a combined patient and provider educational intervention program. A non-randomized controlled intervention trial (n = 192) by Milani et al. (2019) revealed provider and patient education and provider feedback led to inappropriate antibiotic prescription reduction from 51.9% to 31% (p < .001). A cluster randomized controlled trial (n = 1009) in primary care by Dekker (2018), which used online training for general practitioners (GPs) and an information booklet for patients, demonstrated 21% antibiotic prescription in the intervention group compared to 33% in the usual care group, post intervention. A descriptive survey (n = 145), which used an animation series featuring different animals and key messages on ARTIs, reported 63% of patients responded by not asking GPs for an antibiotic next time they had an ARTI compared to 75% in the pre-intervention group (p < .001; Lecky et al., 2017).

Problem Description in the Setting

This QI project was conducted in a primary care clinic located in North Texas. This clinic provided healthcare services to medically underserved residents who were living at or below 200% of the federal poverty line. Many of these adults had lower health literacy levels and were often unable to understand basic health information needed to make appropriate health decisions. In this clinic, prior to the QI project, there were no measures in place to prevent antibiotic overuse or over prescription. The clinic staff perceived that some patients came to the clinic for quick problem resolution and wanted antibiotics regardless of the nature of their illness. They felt the desire for antibiotics by patients was likely due to misconceptions about viral illness and its treatment. These misconceptions were likely compounded by clinicians' limited willingness to educate these patients on appropriate antibiotic use during office visits due to time constraints and other clinical demands.

An organizational assessment of providers' antibiotic prescribing practice was conducted. A retrospective chart review, including all adult patients with any diagnosis of ARTIs (common cold, pharyngitis, laryngitis, upper respiratory infection, sinusitis, bronchitis) seen from January to March 2020, was conducted to assess baseline antibiotic prescription rate. The organizational assessment data determined gaps in practice in this medically underserved setting. Among 222 charts reviewed, 18 had a diagnosis of ARTIs and 9 were prescribed antibiotics. Thus, the three months average antibiotic prescription rate was 50%. Therefore, a patient and provider-focused educational intervention was determined to be the best intervention to decrease antibiotic prescription in this clinic.

Project Purpose and Aims

The purpose of this QI project was to increase adult patients' knowledge and improve their attitude toward appropriate antibiotic use in ARTIs and to decrease antibiotic over-prescription by providers through the implementation of an antibiotic stewardship program in a North Texas primary care clinic. The clinical question guiding this QI project was: Does implementation of an antibiotic stewardship program in a North Texas primary care clinic increase patients' knowledge of appropriate antibiotic use, improve their attitude towards antibiotic use, and decrease over-prescription of antibiotics by providers, following a three-month intervention?

The specific aims for the project were:

Aim #1: To increase patients' knowledge of appropriate antibiotic use in ARTIs after an educational intervention. Patients' knowledge was measured using a modified version of the Knowledge, Attitude, and Practice (KAP) survey (Panagakou et al., 2011). The modified version of the survey was referred to as the KA survey. Questions 1-6 of the KA survey were used to measure knowledge. Possible scores ranged from 6 (*all incorrect*) to 18 (*all correct*). The goal was for patients to significantly improve their score and/or to achieve a mean survey score of at least 14, post-intervention, indicating 75% of questions were answered to indicate a good understanding of appropriate antibiotic prescribing and use.

Aim #2: To improve patients' attitudes toward appropriate antibiotic use in ARTIs after an educational intervention. Patients' attitude toward antibiotic use was measured using questions 7-12 of the KA survey. Possible scores ranged from 6 (*all incorrect*) to 18 (*all correct*). The goal was for patients to significantly improve their score and/or to achieve a mean

score of at least 14, post-intervention, indicating 75% of questions were answered to indicate a positive attitude toward appropriate antibiotic prescribing and use.

Aim #3: To improve provider antibiotic prescribing practices for ARTIs in the primary care clinic after an educational intervention for providers. The specific goal was to decrease antibiotic prescription rates for ARTIs by at least 20% in three months, when compared to the 50% prescription rate found during the retrospective chart review from 2020. Because CDC (2020) estimated that 30-50% of antibiotic prescriptions in the U.S. are unnecessary, and the White House National Action Plan for Combating Antibiotic-Resistant Bacteria (White House, 2015) sought to reduce overall national antibiotic use by 50% by the year 2020, a 20% reduction was thought to be reasonable for this clinic over a three-month period.

This project aligned with DNP Essential I, *Scientific Underpinning of Practice* and DNP Essential VII, *Clinical Prevention and Population Health for Improving the Nation's Health* (American Association of Colleges of Nursing, 2006). DNP Essential I focused on using nursing science-based concepts to assess and improve health care delivery. In this project, I used evidence-based interventions to decrease antibiotic prescription in patients with ARTIs. DNP Essential VII focused on the analysis of epidemiological data in the development, implementation, and evaluation of clinical prevention and population health programs. This project applied research evidence that showed that patient and provider focused educational interventions improved antibiotic use in ARTIs. The project outcome demonstrated decreased antibiotic overuse after the intervention. This project also aligned with the NONPF competency: *Scientific Foundation* and *Quality* (The National Organization of Nurse Practitioner Faculties, 2014). This project planned to apply evidence to improve the quality of current practice and it incorporated research findings to enhance practice methods and patient outcomes.

Guiding Frameworks

This project used the Plan-Do-Study-Act (PDSA) QI model developed by W. Shewhart in the 1920s. It is a commonly used in the QI process in health care settings (Nelson et al., 2007). PDSA is a cyclical model, just as a circle; it has no end. The PDSA model allows the project to be tested on a small scale and allows for ongoing changes to be made. It is a four-step model. "Plan" means recognizing an opportunity and planning a change. "Do" refers to testing the change. The "Study" refers to reviewing the test and analyzing the results, and "Act" means taking actions based on what was learned (American Medical Association, 2016). The PDSA cycle should be repeated for continuous improvement of the project (see Figure 1, the Flow Diagram Describing the PDSA Cycle).

This project was also guided by Havelock's Change Theory which was formulated by Ronald G. Havelock (Havelock, 1973). Havelock's Change Theory has been formulated to expand on Lewin's Change Model to manage change through planning and monitoring. It accounts for the fluid, rather than linear nature of affecting change in a relational environment such as outpatient or inpatient facilities. Havelock's theory consists of six steps: (1) Building a relationship; (2) Diagnosing a problem; (3) Acquiring resources for change; (4) Selecting a pathway for the solution; (5) Establishing and accepting change; and (6) Maintaining and separation. A trusting relationship was built with the clinic administrator and staff before implementing the project. To help diagnose the problem, an organizational assessment was done in the primary care clinic to determine if over-prescription of antibiotics was a problem. A literature review was done to determine best practices for the project implementation and reliable and valid measurement tools. The final aspects of the theory will be discussed later in the paper (see Figure 2, the Flow Diagram Describing the Havelock's Change Theory).

METHODS

Ethical Considerations

This project was reviewed by the Texas A&M University-Corpus Christi Research Compliance Office and received a determination of "Not Human Subjects Research" and permission to proceed as a quality improvement project (see Appendix A). Personal Health Information (PHI) was collected for project purposes only and all data was deidentified. The data was stored in a password protected computer to which only the Project Director (PD) had access. A letter of support was provided by the Executive Director of the clinic agreeing to fully support the project (see Appendix B).

Project Design

This QI project used a before and after design to apply CDC's antibiotic stewardship educational intervention to improve patients' knowledge and attitude regarding antibiotic use and decrease inappropriate antibiotic prescribing practices by providers for adults with ARTIs in a North Texas primary care clinic. The clinic's leadership team expressed concern regarding a lack of measures to guide providers and educate patients on the need for antibiotics in ARTI diagnoses to prevent antibiotic overuse. Given that many patients attending the clinic had lower health literacy levels and little time was currently available to educate them, it was decided an evidence-based educational intervention, measuring improvements before and after the intervention, was needed to approach the problem of antibiotic over-prescription in the clinic.

Various potential barriers that could have affected the success of this quality improvement project were identified, including time delays, slowing clinic workflow, lack of participation from patients and providers due to time constraints, and low clinic census due to fear of coronavirus disease 2019 (COVID-19). These factors were mitigated by ensuring patient

educational intervention time was only 5-10 mins, using an abbreviated survey, recruiting only on days with lighter schedules, and carrying out the intervention with patients after the office visit or when most feasible, based on clinic workflow. Provider participation was encouraged by using shorter training sessions awarding continuing education units (CEUs).

Intervention

This project used CDC's *Be Antibiotic Aware* toolkit (CDC, 2021) to increase patients' knowledge of antibiotics and improve their attitude towards antibiotic use in ARTIs. The toolkit consists of resources to help healthcare providers educate patients and families about antibiotic use and risks of potential side effects (CDC, 2021). The second part of the project entailed provider education using a training activity *To Prescribe or Not to Prescribe? Antibiotics and Outpatient Infections* from Stanford University (Stanford Medicine, 2016). This training provided a practical approach to the management of common outpatient infections.

I introduced the project to the primary care clinic's medical director, providers, nurse manager, office manager, and clinical staff during a weekly clinic meeting prior to implementing the project. After the meeting, I displayed the CDC's posters *Viruses or Bacteria, What's Got You Sick?* and *Do You Need Antibiotics?* (CDC, 2020) in the patient exam rooms. The posters remained in place throughout the project implementation phase. I requested the clinic providers complete Stanford University's online training activity on management of common outpatient infections: *To Prescribe or Not to Prescribe? Antibiotics and Outpatient Infections* (Stanford Medicine, 2016). The providers completed the training during down time in the clinic or at their convenience. They accessed it through CDC's website. The training was 1.75 hours long and consisted of the following sections:

1. Define the scope and implications of antibiotic misuse in an outpatient setting.

2. Recognize when antimicrobials are indicated in common outpatient infections.
3. Select the most appropriate antimicrobial choice and duration of therapy for common outpatient bacterial infections; and
4. Employ effective communication strategies when discussing antibiotic decisions with patients.

I recruited patients for the project based on the inclusion criteria described earlier. I asked each patient to complete a brief KA Survey. The survey took approximately five minutes to complete. After the survey, I implemented the educational part of the intervention in the patient exam room or waiting room. The first part of the education was watching a 3:47-minute-long video, *Snort, Sniffle, Sneeze: No Antibiotics Please!* Next, the I used the brochure *Antibiotics Aren't Always the Answer* and *Viruses or Bacterial What's Got You Sick?* to further review and reinforce the appropriate use of antibiotics. The educational part of the intervention took approximately seven minutes. After answering patients' questions, I asked them to complete the post-intervention KA survey.

Data Collection

A convenience sample was recruited from all interested patients attending the clinic during the three-month data collection period of the project and meeting inclusion criteria. Participants were included if they were: (1) adults18 years or above (2) English speaking and (3) were interested in participating in the project. Originally, the inclusion criteria included a diagnosis of ARTIs, however, due to the COVID-19 restrictions, this criterion was removed to allow more patients to participate.

Throughout the three-month project, at the beginning of the visit, I asked the patients meeting criteria to complete the pre-intervention KA survey. The survey consisted of

demographic information (age, gender, race, and education), knowledge on antibiotic use, and attitude towards antibiotic use in ARTIs. After the educational intervention as described above, the participants filled out the post-intervention KA survey.

At one month, two months and three months post-intervention, I reviewed charts of all patients meeting criteria to assess the antibiotic prescription rate for ARTIs. A retrospective chart review from the same time frame the year before was done to obtain a baseline prescription rate. Please refer to the Project Timeline (Appendix D) for a visual diagram of the estimated time it took to conduct this project from the organizational assessments to dissemination of results.

Measurement Tools

The KAP survey (Panagakou et al., 2011) was modified and adapted to assess patients' knowledge and attitude regarding antibiotic use in ARTIs. Permission from the author was received to use and modify the survey for this QI project (See Appendix C). In the Panagakou et al. (2011) study, Greek researchers sampled 5264 participants from all geographical areas of Greece through a school-based stratified geographical clustering sample and found the original KAP survey had a marginally acceptable internal reliability (Cronbach's alpha = 0.68). The modified KA survey had two sections. The first section consisted of six questions which assessed patients' knowledge of antibiotic use and the second section had six questions which assessed patients' attitude towards antibiotic use. The three-point Likert scale was used for scoring. The participants chose either agree, uncertain, or disagree. Each question was assigned a value of three-points if correctly answered, two if uncertain, and one if incorrect. Thus, the score for the knowledge section ranged from 6 (*all incorrect*) to 18 (*all correct*). Similarly, the score for the attitude section ranged from 6 (*all incorrect*) to 18 (*all correct*). The knowledge portion of the survey consisted of questions such as: "Antibiotics should be given to all patients who develop a

fever" and "Antibiotics do not have any side effects"; the attitude portion consisted of questions such as: "Do you believe that antibiotics are used too much and unnecessarily?" "Or would you reuse any leftover antibiotics whenever you present with similar symptoms of a URTI (i.e., Sore throat, flu, cold)?" To determine the antibiotic prescription rate of providers in this clinic for adults with symptoms of ARTIs, I conducted a retrospective chart review using the Athenahealth electronic health record (EHR). It is a CMS and Office of the National Coordinator for Health Information Technology (ONC) certified EHR.

Data Analysis

The data analysis was conducted using SPSS version 27. The demographic data of the participants, age, gender, ethnicity, and education level was analyzed using descriptive statistics. Histograms were used to test for normality. To determine if Specific Aims #1 and #2 were met, post intervention mean knowledge and mean attitude survey scores were calculated to determine if the goal mean score of 14 was met post intervention. In addition, a paired t test was used to compare mean scores pre and post intervention to determine if a significant difference was achieved. Mean scores and t- test results were displayed in a data table and change in mean knowledge and attitude was displayed using a bar chart. To determine if Specific Aim #3 was met, frequencies were used to analyze the antibiotic prescription rate for the previous year and compared it to one month, two months, and three months post-intervention rates using a run chart to see changes over time.

RESULTS

While implementing the educational portion of the project to patients, I found that when the clinic was busy, it was difficult to complete the education and both surveys at one time, therefore some patients stayed after the visit to finish the final survey and were offered a $5 gift

card for the extra time taken. There were 22 patients enrolled in the project; however, two patients were unable to complete all parts of the intervention due to time constraints. Due to the COVID-19 pandemic, patient office visits were decreased, and fewer patients were willing to take part in the project as it involved spending time with a different person other than the provider and they feared COVID-19 exposure.

I introduced the project to the available providers during pre-clinic meetings. In addition to two part-time providers, the project site was run by a few volunteer providers. During clinic down time, I discussed the purpose and aim of the project with the providers individually and requested them to complete the online training activity. There were five providers enrolled in the project but only two providers completed the training. This lack of participation was likely mainly due to the non-profit nature of the clinic and the majority of the providers were part-time volunteers. I was unable to contact all the volunteer providers or follow up with the recruited providers in a timely manner.

At one month, two months and three months post-intervention (January to March 2021), I reviewed the charts of all the patients meeting criteria to assess the antibiotic prescription rate for ARTIs. I also conducted a retrospective chart review from January to March 2020 to obtain a baseline prescription rate for comparison purposes.

The mean age of the patient participants ($N = 20$) was 50.2 years ($SD = 12.17$) among which 70% were female and 30% were male. The majority were Caucasian (60%) and had some high school education (55%). See Table 2, The Demographics Table.

Aim #1: There was a significant increase in patients' knowledge of appropriate antibiotic use in ARTIs after the educational intervention ($M = 16.10$, $SD = 1.02$) when compared to pre-

intervention (*M* = 12.30, *SD*=2.00*; t*(19) = -9.79, *p* < .001, *d* = 2.19). See Table 3 and Figure 3, Pre- and Post- Intervention Knowledge and Attitude Scores Comparison.

Aim#2: After the educational intervention there was a significant improvement in patients' attitude toward appropriate antibiotic use in ARTIs. The mean pre-intervention attitude score was 13.90 (*SD*= 1.45) and mean post intervention attitude score was 16.75 (*SD* = .79)*; t*(19) = -10.39, *p* < .001, *d* = 2.32. See Table 3 and Figure 3, Pre- and Post- Intervention Knowledge and Attitude Scores Comparisons.

Aim#3: There was a gradual but definite improvement in the antibiotic prescription rate by providers after the educational intervention. The retrospective chart review from January to March 2020 showed an antibiotic prescription rate of 50% (total charts reviewed = 222, patients with ARTI diagnosis = 18 and patients prescribed antibiotics = 9). The chart review from January to March 2021 revealed an overall antibiotic prescription rate of 34.78% (total charts reviewed = 309, patients with ARTI diagnosis = 23 and patients prescribed antibiotics = 8). Thus, there was a 15% improvement or decrease in antibiotic prescription rate in 2021 compared to the same months in 2020 (See Figures 4 &5, ARTIs Diagnosis and Antibiotic Prescription in 2020 and 2021 and Figure 6, Run Chart Comparing Antibiotic Prescription Rate in 2020 and 2021).

DISCUSSION

Provider and patient education interventions were effective strategies in promoting antibiotic stewardship in a primary care setting and improving inappropriate antibiotic use in ARTIs. In terms of clinical outcomes, the patient-focused educational intervention significantly increased patients' knowledge and improved their attitude towards appropriate antibiotic use in

ARTIs. The provider educational training focusing on the CDC's treatment guidelines also resulted in a decreased antibiotic prescription rate in ARTIs.

Despite the challenges brought by the COVID-19 pandemic, our first goal for patients to achieve a mean knowledge survey score of at least 14 post intervention was exceeded as the mean score after patient education was 16.10. The goal to achieve a mean attitude survey score of at least 14 post intervention was also exceeded by a mean post-education patient attitude score of 16.75. These findings indicate that for this primary care clinic, patient-focused educational interventions such as video messages helped improve patients' knowledge and attitude toward antibiotic use in ARTIs and decreased antibiotic demands by patients who were being treated for ARTIs. This intervention also helped providers spend less time educating patients and increased their comfort level in discussing management of viral ARTIs with patients.

Our third goal was to decrease antibiotic prescription rates for patients with ARTIs by at least 20%. This goal was partially met as the antibiotic prescription rate decreased by15% by the end of the project period from 50% (or 1 out of every 2 patients) to 35% (1 out of every 3 patients), a clinically significant difference. The lower-than-expected improvement may have been due to restrictions placed by the COVID-19 pandemic. Fewer people were seeking healthcare for mild illnesses and there were fewer infections due to implementation of COVID-19 precaution measures such as social distancing and wearing face coverings (CDC, 2020). Only two providers completed the educational training because the clinic was a nonprofit and most of the providers in the clinic were part-time volunteers. Therefore, I could not follow-up with the providers on a regular basis and they might not have been able to invest the time to complete the educational training, due to other full-time employment demands. More provider participation may have helped further decrease the antibiotic prescription rate. These positive findings help the

clinic director support the need to develop a policy to recommend all new providers in the clinic, take Stanford University's online training. In addition, providers now have easy access to CDC's treatment guidelines on ARTI diagnoses and brochures/pamphlets available for patient education.

The results of this QI project were consistent with other similar studies. In this QI project patients' knowledge and attitude toward appropriate antibiotic use in ARTIs improved significantly after watching a 3:47 min long educational video from the CDC. Similarly, a randomized controlled trial (RCT) conducted by Goggin et al. (2020) to assess the impact of a 90-second animated video on parents' interest in receiving antibiotics for their child revealed that after watching the video, parents' average antibiotic interest rate significantly decreased by 10 points (*Pre-M* = 57, *post-M* = 47.5, $p < .001$). The sample in the Goggin et al. (2020) study were all parents of minor children, whereas the sample from this QI project were adult patients, who were not necessarily parents. Many of the adults in this QI project had lower health literacy levels and were often unable to understand basic health information needed to make appropriate health decisions. Studies have shown that addressing issues of health literacy may be helpful in removing barriers to care and promoting provider-patient partnership in care (Shaw et al., 2009). Therefore, through education, both studies support that increasing patient or parent knowledge regarding appropriate antibiotic use can result in decreasing their interest in receiving antibiotics.

A QI project conducted by Durante et al. (2017) in an outpatient setting to determine whether provider education would reduce antibiotic prescription revealed that incorporating provider educational interventions can improve antibiotic prescription in patients with upper respiratory infection (URI) symptoms. In the pre-intervention group, 85% received antibiotics for URI symptoms compared to 79% in the post-intervention group ($p = .514$). Although, this

finding was not statistically significant, there was a 6% reduction in antibiotic prescription rate which was clinically significant (Durante et al., 2017). A quasi-experimental pretest-posttest study (n = 207) by Chiswell et al. (2019) also showed that antibiotic prescriptions for ARTI diagnoses decreased significantly from 56.3% (pre-intervention group) to 28.8% (post-intervention group) ($p < .01$), following a combined patient and provider educational intervention program. Similarly, this QI project showed a 15% improvement on antibiotic prescription rate after implementing an educational intervention for patients and providers.

A systematic review of interventions to reduce childhood antibiotic prescription for URTIs conducted via an electronic literature search of publications between 1980 and December 2015 showed that educational interventions targeting clinicians and patients were more effective in reducing antibiotic prescribing for URIs than those of either group alone (Hu et al., 2016). The review found that a patient-clinician communication approach was the most effective intervention in reducing antibiotic prescription for URIs. Similarly in this QI project, the provider training from the Stanford University focused on employing effective communication strategies when discussing antibiotic decisions with patients. Providers need to balance patient expectations with best practice treatment. This means it is essential to use effective communication skills to explain the difference between viral and bacterial infections and the best course of treatment to feel better now and to feel better when future infections may strike.

Limitations

One of the major limitations in the project was the COVID-19 pandemic. Due to COVID-19 exposure concerns and clinic restrictions, overall clinic census was low, and very few patients presented with symptoms of ARTIs which led to a reduction in the sample size. In addition, just prior to the implementation of the project, the medical director of the clinic was changed and one

of the nursing staff transitioned to a provider role. The new medical director brought up a concern regarding how the project implementation might impact the clinic workflow. Due to this concern, we decided to enroll patients on the days when the clinic schedule was lighter or when patients were waiting for the provider or after the clinic visit was over. Also due to time concerns, we only enrolled English-speaking patients so that clinic providers were not slowed down by having to wait for an interpreter to ensure the patient understood the education provided. By doing so, the clinic workflow was not impacted during the project intervention.

Another limitation of the project was the limited number of provider enrolled in the training. This could have been due to the nonprofit nature of the clinic. The majority of the providers in the clinic were volunteer providers and some of them were conducting virtual visits from their home. As a new employee in the clinic, I was unable to contact all volunteer providers or follow up with the recruited providers in a timely manner due to changes in clinic administration.. Therefore, only two providers completed the provider training. Improved communication with volunteer providers could help recruit more providers to complete the training in the next PDSA cycle. After the pandemic subsides, more in-person visits by providers and an influx of patients with symptoms of ARTIs will increase the ability of the clinic to apply the educational initiative to a larger sample. Therefore, in next PDSA cycle, both the patient and provider sample size can be increased and patient provider education on antibiotic use in ARTIs can be continued to be standardized to improve more judicious antibiotic use in ARTIs.

Interpretation

This QI project was guided by the PDSA model. As discussed earlier, PDSA is a four-step cyclical model. Recognizing an opportunity and planning a change is the first step. Project implementation is the second step of the cycle. Analysis or evaluation is the third step, and

continuing interventions is the last step of the cycle. This QI project was also guided by the conceptual framework, Havelock's Change Theory. Building a relationship, diagnosis a problem, and acquiring resources for change are the first three steps. The fourth step, selecting a pathway for solution, guided this study in the implementation of patient and provider specific educational interventions. These interventions increased patients' knowledge on antibiotics, improved their attitude toward antibiotic use, and decreased antibiotic prescriptions in ARTIs. The fifth and six steps of the theory are establishing and accepting change, and maintenance and separation.

This project is the first PDSA cycle. In this cycle, we were able to achieve the first and second goal of the project by improving patients' knowledge and attitude toward antibiotic. There was also improvement in antibiotic prescription rate in ARTIs, but the goal was not met. Due to the unusual challenges placed by the pandemic, implementation of QI project focusing on patients with symptoms of ARTIs can produce results in the next PDSA cycle to come closer to proposed goals. The second PDSA cycle can focus on ensuring that educational videos are played both in English and Spanish languages, patient educational brochures and pamphlets are available in both the languages, and all provides complete the training.

Due to restrictions and risks associated with the COVID-19 pandemic, the antibiotic prescription rate may have been skewed because fewer patients with minor ARTIs and more patients with serious infections were presenting, increasing the need for antibiotics in patients' who were seen. Also, due to the similarities in symptoms between COVID and ARTIs, if a patient tested negative for COVID, providers may have been more inclined to order antibiotics as fewer other viruses were seen during this time. The antibiotic prescription rate for ARTIs was zero in February, most likely due to the clinic closure in the wake of a deadly freeze in Texas. In

addition, since most providers did not complete the education, there was a decreased likelihood they would change their prescribing practices.

The patient and provider education on antibiotic use in ARTIs should be standardized for the outcome of the project to be sustainable. The result of the project will be shared with the executive director and medical director focusing on the benefits of the project outcomes. The CDC's patient educational videos on antibiotic use will be played on the patient waiting room television. The CDC's brochures and pamphlets on antibiotics and ARTIs will be made available in the patient exam rooms and copies can be made whenever needed. For providers, a resource binder will be created based on the CDC's treatment guidelines. The clinic director will be recommended to ask new providers to complete the provider training from Stanford University. It is easily accessible and free of cost. The clinic's medical director will be urged to require a biannual antibiotic prescription rate audit with provider feedback to continue prevention and monitoring of inappropriate antibiotic use.

Conclusion

This project illustrated the impact of combined patient and provider-specific educational interventions in increasing patients' knowledge on antibiotics, improving their attitude towards antibiotic use, and decreasing antibiotic prescription rates for ARTIs. In the future, the patient and provider educational intervention on antibiotic use in ARTIs should be standardized to see the continuous improvement in antibiotic prescription rate. Providers should practice effective communication strategies when discussing antibiotic decisions with their patients. Providers need to be educated on current evidence-based guidelines to ensure the quality of healthcare and patient safety. Administrators should focus on implementing the quality improvement measures to track inappropriate antibiotics use in ARTIs and giving regular feedback to the providers.

There should be a collaboration with other healthcare professionals such as pharmacists to reinforce the educational needs of patients. This project's findings should also encourage clinicians to advocate for policies requiring outpatient care facilities to establish an antibiotic stewardship program.

This QI project can be duplicated in an urgent care setting where the majority of patients present with symptoms of ARTIs. Patients come to an urgent care clinic for quick problem resolution and may demand antibiotics regardless of their illnesses. The desire for antibiotics may be caused by a misconception about viral illness and treatment. These misconceptions can be compounded by clinicians' limited willingness to educate patients on appropriate antibiotic use during office visits due to time constraints and other demands. Educating patients on the indicated treatments for viral ARTIs and providers on the importance of educating patients can be a key measure in preventing antibiotic resistance.

Incorporating relatively inexpensive technology in patient education such as an interactive computerized education module or animation videos can be more effective in providing patient education while consuming less of the providers' time. More research is needed to identify the long-term effects of these programs. Computerized patient education using a touchscreen format could be helpful in educational strategies to accommodate people with language barriers and low literacy rates. Further research is needed to explore enhancement of patient education and quality of care through other computerized platforms such as tablets or mobile devices.

REFERENCES

American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice*. Washington, DC. https://www.aacnnursing.org/Portals/42/Publications/DNPEssentials.pdf

American Medical Association (2016). *Plan-Do-Study-Act (PDSA)*. https://edhub.ama-assn.org/steps-forward/module/2702507

Broniatowski, D. A., Klein, E. Y., & Reyna, V. K. (2014). Germs are germs, and why not take a risk? Patients' expectations for prescribing antibiotics in an inner-city emergency department. *Medical Decision Making, 35*(1), 60-67. doi: 10.1177/0272989X14553472.

Centers for Disease Control and Prevention (2019). *Adverse drug events from specific medicines*. https://www.cdc.gov/medicationsafety/ adverse-drug-events-specific-medicines.html

Centers for Disease Control and Prevention (2020). *Antibiotic/Antimicrobial resistance (AR/AMR)*. https://www.cdc.gov/drugresistance/index.html

Centers for Disease Control and Prevention (2021). *Be antibiotic aware partner toolkit*. https://www.cdc.gov/antibiotic-use /week/toolkit.html

Chiswell, E., Hampton, D., & Okoli, C.T.C. (2019). Effect of patient and provider education on antibiotic overuse for respiratory tract infections. *Journal of Healthcare Quality, 41*(3), e13-e20. doi: 10.1097/jhq.0000000000000144

Cope, A. L. (2018). Why are we still prescribing so many antibiotics? *Dental Health, 57* (4), 20-24.

Davis, M. E., Liu, T. L., Taylor, Y. J., Davidson, L., Schmid, M., Yates, T., Scotton, J., & Spencer, M. D. (2017). Exploring patient awareness and perceptions of the appropriate

use of antibiotics: A mixed-methods study. *Antibiotics (Basel, Switzerland)*, *6*(4), 23. https://doi.org/10.3390/antibiotics6040023

Dekker, A. R. J., Verheij, T.J.M., Broekhuizen, B.D.L., Butler, C.C., Cals, J.W.L., Francis, N.A., Little, O., Sanders, E. A.M., Yardley, L., Zuithoff, N.P.A., & Van der Velden, A.W (2018). Effectiveness of general practitioner online training and an information booklet for parents on antibiotic prescribing for children with respiratory tract infection in primary care: A cluster randomized controlled trial. *Journal of Antimicrobial Chemotherapy, 73*(5), 1416-1422. doi: 10.1093/jac/dkx542

Durante, J., McBride, J., Miklo, L., Killeen, M., & Creech, C. (2017). Implementation of an educational intervention to reduce inappropriate antibiotic use in upper respiratory infections. *Journal of Doctoral Nursing Practice, 10* (1), 45-49. doi: 10.1891/2380-9418.10.1.45

Durkin, M., Jafarzadeh, S.R., Hsueh, K., Sallah, Y.H., Munshi, K.D., Henderson, R.R., & Fraser, V.J. (2018). Outpatient antibiotic prescription trends in the United States: A national cohort study. *Infection Control & Hospital Epidemiology, 39*(5), 584-589.

Goggin, K., Hurley, E. A., Bradley-Ewing, A., Bickford, C., Lee, B. R., Pina, K., De Miranda, E. D., Mackenzie, A., Yu, D., Weltmer, K., Linnemayr, S., Butler, C. C., Miller, M., Newland, J. G., & Myers, A. L. (2020). Reductions in parent interest in receiving antibiotics following a 90-second video intervention in outpatient pediatric clinics. *The Journal of Pediatrics, 225,* 138–145.e1. https://doi.org/10.1016/j.jpeds.2020.06.027

Havelock R.G, (1982). *The change agent's guide to innovation in education*. Educational Technology Publications.

Hu, Y., Walley, J., Chou, R., Tucker, J. D., Harwell, J. I., Wu, X., Yin, J., Zou, G., & Wei, X. (2016). Interventions to reduce childhood antibiotic prescribing for upper respiratory infections: Systematic review and meta-analysis. *Journal of Epidemiology and Community Health*, *70*(12), 1162–1170. https://doi.org/10.1136/jech-2015-206543

Joint Commission. (2016). *Proceedings from the National summit on overuse*. http://www.jointcommission.org/overuse_summit/

Lecky, D. M., Dhilon, H., Verlander, N.Q., & MCNulty, C.A.M. (2017). Animations designed to raise patient awareness of prudent antibiotic use: Patient recall of key messages and their immediate effect on patient attitude. *BMC Research Notes, 10,* 1-6. doi: 10.1186/s13104-017-3048-0

Milani, R. V., Wilt, J.K., Entwisle, J., Hand, J., Cazabon, P., & Bohan, J. G. (2019). Reducing inappropriate outpatient antibiotic prescribing: Normative comparison using unblinded provider reports. *BMJ Open Quarterly, 8*(1). doi: 10.1136/bmjoq-2018-000351

Nelson, E.C., Batalden, P.B., & Godfrey, M.M. (2007). *Quality by design: A clinical microsystem approach*. Jossey-Bass

Palms, D.L., Hicks, L.A., Bartoces, M., Hersh, A.l., Zetts, R., Hyun, D. Y., & Fleming-Dutra, K.E. (2018). Comparison of antibiotic prescribing in retail clinics, urgent care centers, emergency departments, and traditional ambulatory care settings in the United States. *JAMA Internal Medicine, 78*(9), 1267-1269. doi:10.1001/jamainternmed.2018.1632

Panagakou, S. G., Spyridis, N., Papaevangelou, V., Theodoridou, K. M., Goutziana, G. P., Theodoridou, M. N., Syrogiannopoulos, G. A., & Hadjichristodoulou, C. S. (2011). Antibiotic use for upper respiratory tract infections in children: a cross-sectional survey

of knowledge, attitudes, and practices (KAP) of parents in Greece. *BMC Pediatrics, 11,* 60. https://doi.org/10.1186/1471-2431-11-60

Radecky, R. (2014). *Emergency physicians don't follow evidence when prescribing antibiotics, and that needs to change.* http://www.acepnow.com/article/ emergency-physicians-dont-follow-evidence-prescribing- dent-follow-evidence-prescribingantibiotics-needs-change/

Shaw, A., Ibrahim, S., Reid, F., Ussher, M., & Rowlands, G. (2009). Patients' perspectives of the doctor-patient relationship and information giving across a range of literacy levels. *Patient Education and Counseling*, *75*(1), 114–120. https://doi.org/10.1016/j.pec.2008.09.026

Shaw Teng Pan, D., Huixin Huang, J., Hui Min Lee, M., I-Cheng Chen, M., Ee Hui, G., Jiang, L., Wen Chen Chong, J., Sin Leo, Y., Hong Lee, T., Siong Wong, C., Weng Keong Loh, V., Zhongxian Poh, A., Yean Tham, T., Man Wong, Wei, & Fong Seng, L. (2016). Knowledge, attitudes, and practices towards antibiotic use in upper respiratory tract infections among patients seeking primary health care in Singapore. *BMC Family Practice,17,* 1-9. doi: 10.1186/s12875-016-0547-3

Standfort Medicine (2016). *To prescribe or not to prescribe? Antibiotics and outpatient infections*. https://stanford.cloud-cme.com/course/courseoverview?P=0&EID=20758

Tillekeratne, L.G., Bodinayake, C.K., Dabrera, T., Nagahawatte, A., Arachchi, W. K., Sooriyaarachchi, A., Stewart,k., Watt, M., Ostbye, T., & Woods, C.W. (2017). Antibiotics overuse for acute respiratory tract infections in Sri Lanka: A qualitative study of outpatients and their physicians. *BMC Family Practice, 18*(17). doi: 10.1186/s12875-017-0619-z

The National Organization of Nurse Practitioner Faculties (2014). *Nurse practitioner core competencies content*. https://cdn.ymaws.com/www.nonpf.org/resource/resmgr/competencies/20170516_NPCoreCompsContentF.pdf

The Society of Healthcare Epidemiology of America (2019). *Antimicrobial stewardship*. https://www.shea-online.org/index.php/practice-resources/priority-topics/antimicrobial-stewardship

White House (2015). *National action plan for combating antibiotic-resistant bacteria* https://www.cdc.gov/drugresistance/pdf/national_action_plan_for_combating_antibotic-resistant_bacteria.pdf.

World Health Organization (2018). *Antimicrobial resistance*. https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance

Yates, T. D., Davis, M. E., Taylor, Y. J., Davidson, L., Connor, C. D., Buehler, K., & Spencer, M. D. (2018). Not a magic pill: a qualitative exploration of provider perspectives on antibiotic prescribing in the outpatient setting. *BMC Family Practice, 19*(1), 96. https://doi.org/10.1186/s12875-018-0788-4

Table 1

Project Timeline

Task	Aug 2020	Sept. 2020	Oct. 2020	Nov. 2020	Dec. 2020	Jan. 2021	Feb. 2021	Mar. 2021	April 2021	May 2021
Organizational Assessment										
Selection of intervention										
Draft project Proposal										
Obtain Letter of Support										
Project Proposal Submission										
Proposal Approval										
TAMUCC IRB Approval										
Provider Training										
Data collection Pre-intervention KA survey Patient Education Post-intervention KA Survey										
Retrospective Chart Review										
Data Analysis										
Dissemination of Results										

Table 2

Patients' Demographic Characteristics

Characteristic	N (%) or Mean (*SD*)
Gender	
Male	6 (30%)
Female	14 (70%)
Age (years)	50.2 (*12.17*)
Race	
Caucasian	12 (60%)
African American	4 (20%)
Hispanic	4 (20%)
Education Level	
High School (Grade 9-12)	11 (55%)
Middle School (Grade 6-8)	7 (35%)
Primary School (KG-5)	1 (5%)
None	1(5%)

Table 3

Pre- and Post- Intervention Knowledge and Attitude Scores Comparisons (N=20)

Variables	Mean (*SD*)	*t* (df)	*p*-value	Cohen's *d*
Pre-Intervention Knowledge Score	12.30 (*2.00*)	-9.80 (19)	<.001	2.19
Post Intervention Knowledge Score	16.10 (*1.02*)			
Pre-Intervention Attitude Score	13.90 (*1.45*)	-10.40 (19)	<.001	2.32
Post-Intervention Attitude Score	16.75 (*.79*)			

SD = standard deviation

df = degrees of freedom

Figure 1

Flow Diagram Describing the Plan Do Study Act (PDSA) Cycle

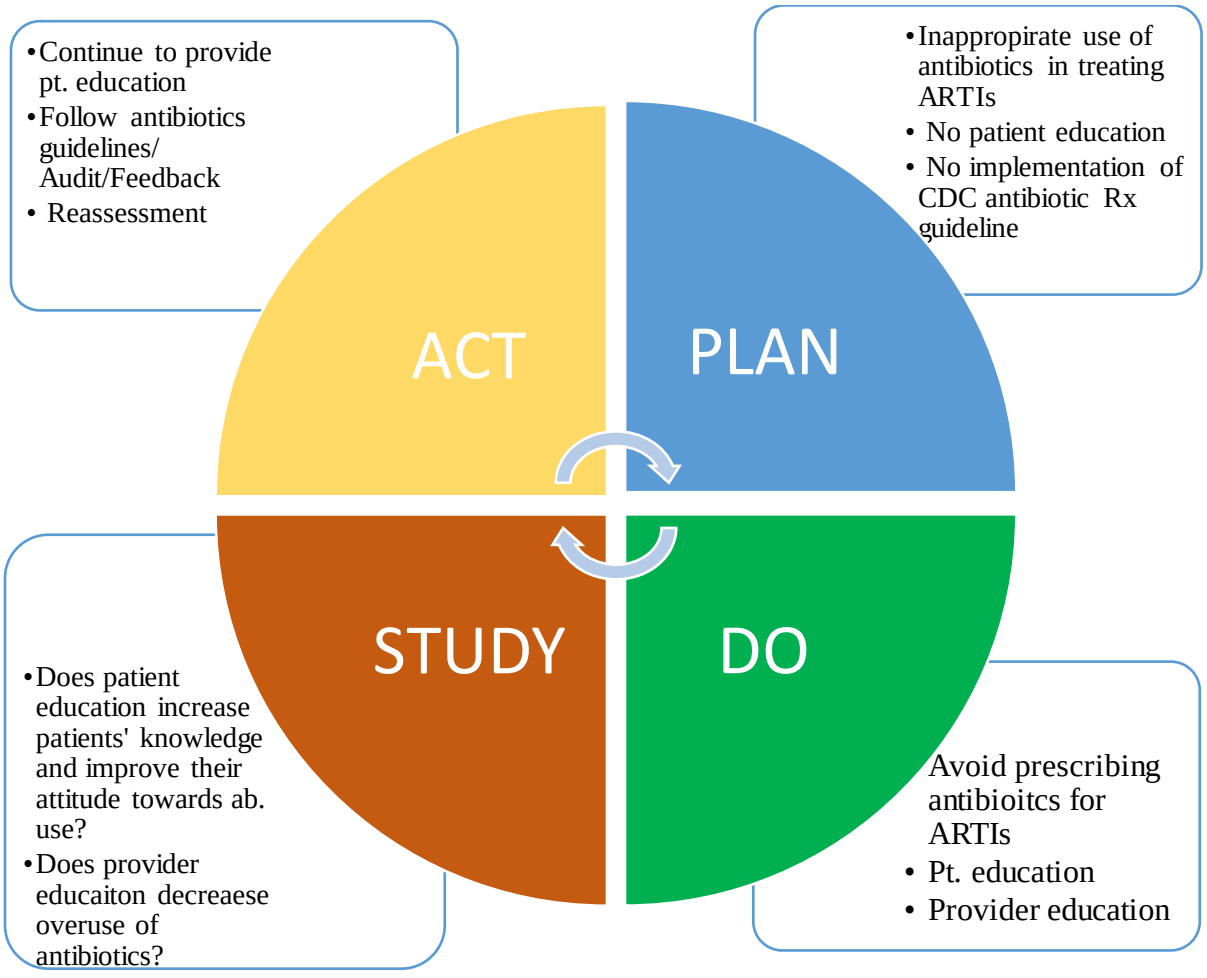


Figure 2

Flow Diagram Describing Havelock's Change Theory

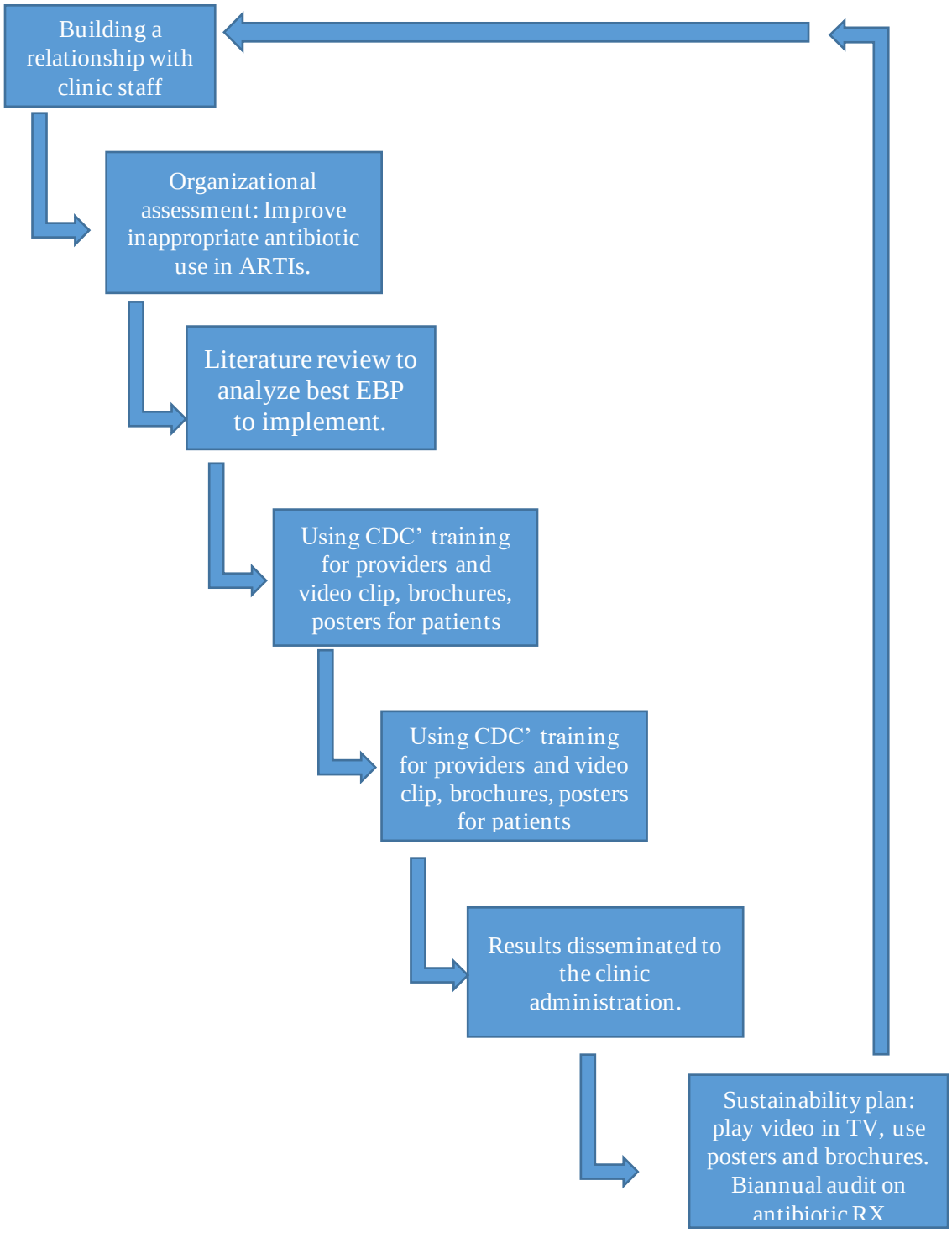


Figure 3

Pre and Post Intervention Patients' Mean Knowledge and Mean Attitude Scores

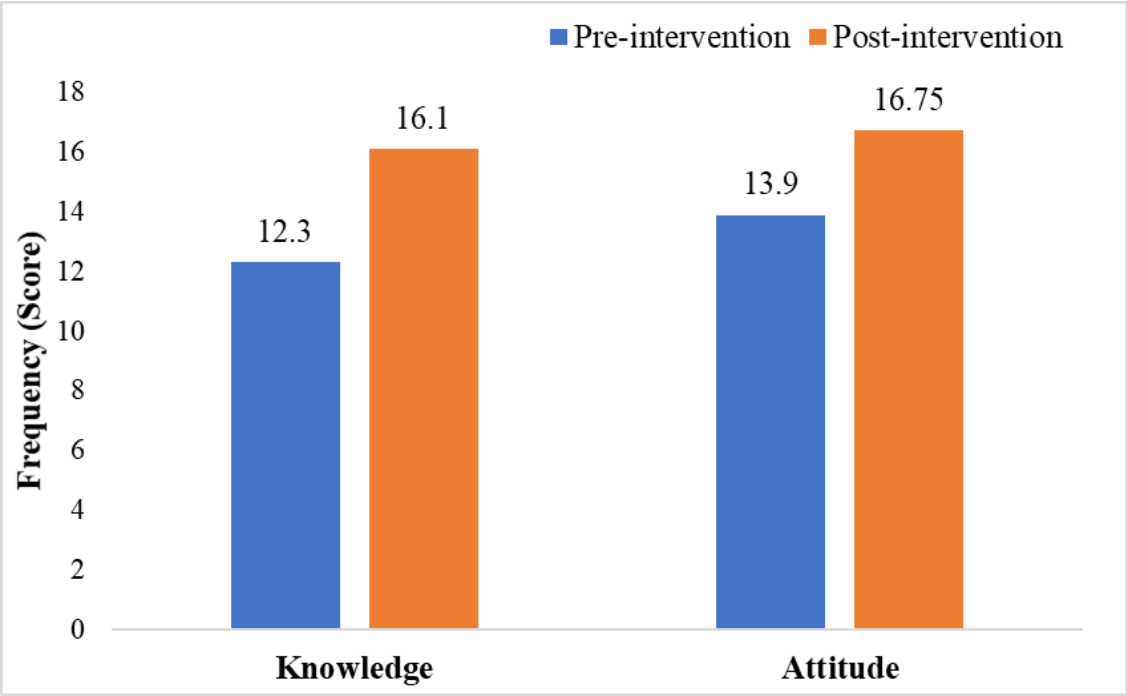


Figure 4

ARTIs Diagnosis and Antibiotic Prescription in 2020 and 2021

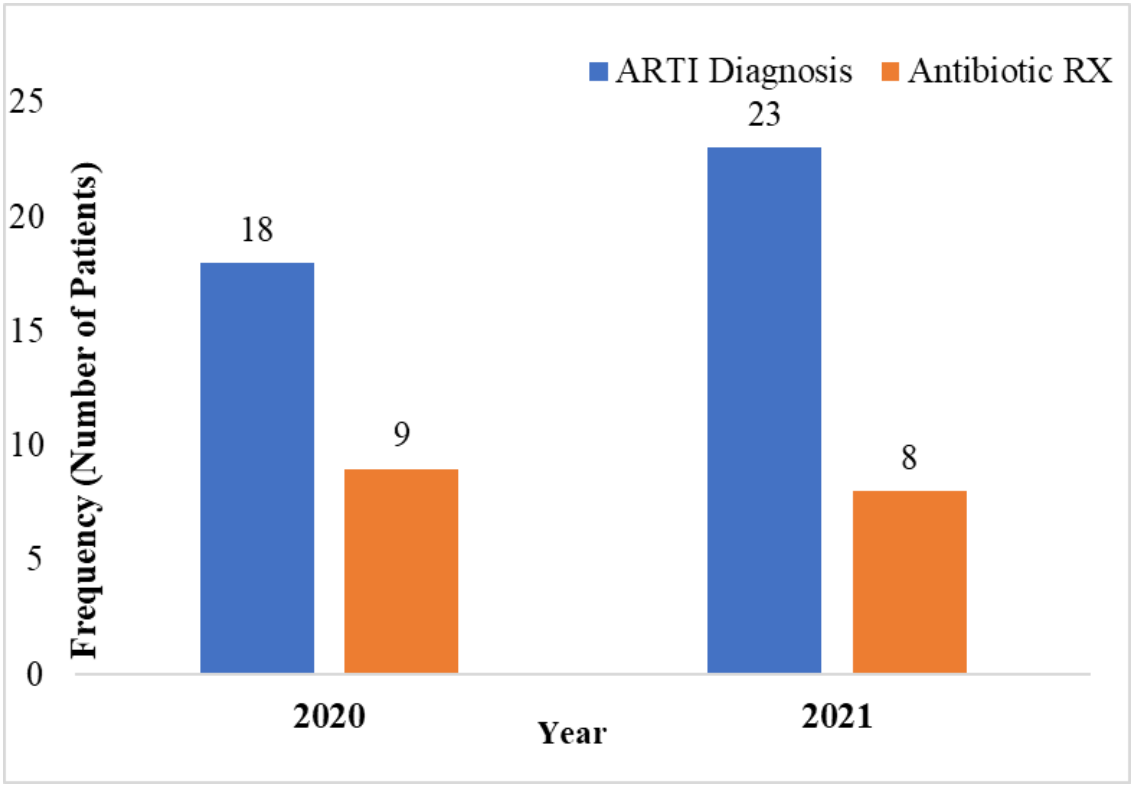


Figure 5

Antibiotic Prescription Rate in 2020 and 2021

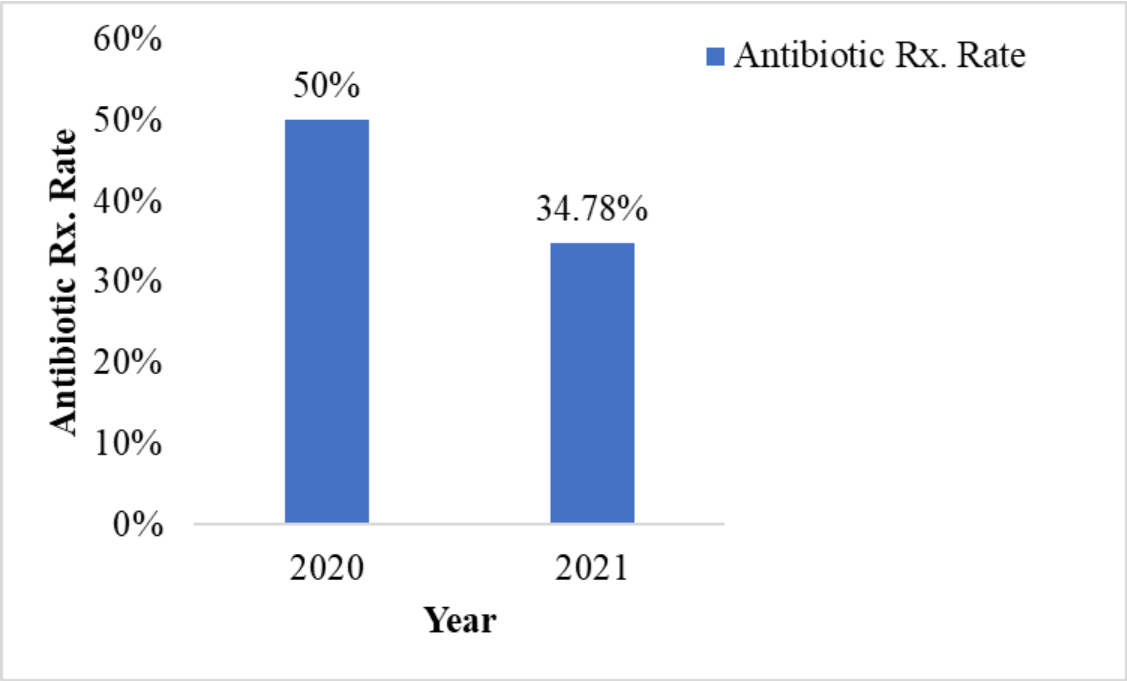
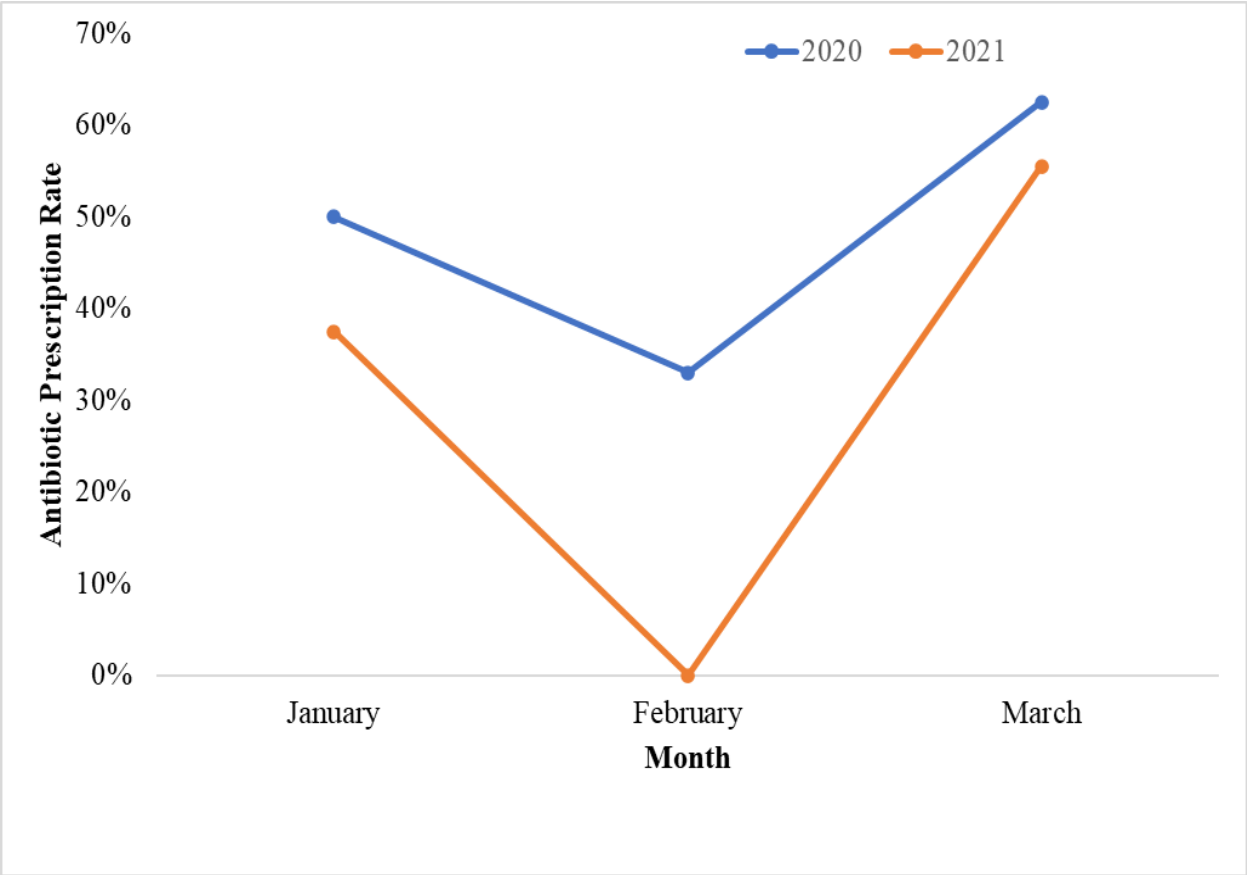


Figure 6

Run Chart Comparing Antibiotic Prescription Rate in 2020 and 2021



LIST OF APPENDICES

APPENDIX PAGE

APPENDIX A: Letter of Determination

Office of Research Compliance Letter of Determination

Dear Sara Baldwin,

Activities meeting the DHHS definition of research or the FDA definition of clinical investigation and involve human subjects are subject to IRB review and approval.

On 11-17-2020, the Office of Research Compliance reviewed the project below and determined that the proposed activity does not meet the DHHS definition of research involving human subjects under 45 CFR 46.102:

Type of Review:	Not Human Subjects Determination
IRB ID:	TAMU-CC-IRB-2020-11-12
Project Lead:	Sara Baldwin
Title:	Implementing an Antibiotic Stewardship Program to Improve Antibiotic Use in Adults in an Outpatient Clinic
Rationale:	

Therefore, this project does not require IRB review. You may proceed with this project.

Limits to this determination:

1. This determination applies only to the activities described in the documents reviewed. Any planned changes require submission to the IRB to ensure that the research continues to meet criteria for a non-human subject research determination.
2. This project may NOT be referenced as "IRB approved".

The following statement can be included in the manuscript: "This Project was reviewed and determined to not meet the criteria for human subjects research by the Texas A&M University-Corpus Christi Institutional Review Board."

Please do not hesitate to contact the Office of Research Compliance with any questions.

Respectfully,

Germaine Hughes-Waters

APPENDIX B: Letter of Support

10/26/2020

Dr. Sara Baldwin
Associate Dean for Academic Programs
College of Nursing and Health Sciences
Texas A&M University – Corpus Christi
6300 Ocean Drive
Corpus Christi, TX 78412
Sara.baldwin@tamucc.edu

Dear Dr. Baldwin,

The purpose of this letter is to provide Sabita Sigdel, a Doctor of Nursing Practice student at Texas A&M University College of Nursing and Health Sciences, support in conducting a quality improvement project at [redacted] TX. The project, implementing an antibiotic stewardship program to improve antibiotic use in adults, entails implementing antibiotic stewardship education to patients and providers to improve inappropriate antibiotic use.

The purpose of this project is to determine if implementation of an antibiotic stewardship program can increase patient's knowledge and attitude towards antibiotic use and decrease overuse and over prescription of antibiotics. [redacted] was selected for this project because [redacted] mission is to provide healthcare services to [redacted]. Sabita Sigdel will be working at this institution and has an interest in improving care at this facility.

I, [redacted] Clinic, do hereby fully support Sabita Sigdel in the conduct of this quality improvement project, implementing an antibiotic stewardship program to improve antibiotic use in adults at [redacted]

I also approve Sabita Sigdel to access protected health information (PHI) for purposes of conducting this quality improvement project. She has signed a HIPAA release form.

Sincerely,

[redacted]

_____

[redacted], Executive Director

APPENDIX C: Permission from Author to use the Instrument.

Dear Sabita Sigdel

on behalf of Dr. Hadjichristodoulou, you can use the questionnaire as seen in "Development and assessment of a questionnaire for a descriptive cross - sectional study concerning parents' knowledge, attitudes and practises in antibiotic use in Greece"

please inform us of your future findings

best of luck with your PhD

Sincerely

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