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Implementing the CDCs Core Elements of Outpatient Antibiotic Stewardship Program into the Urgent Care

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Implementing the CDC's Core Elements of Outpatient Antibiotic Stewardship into the Urgent Care: A Quality Improvement Project

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Abstract

Purpose: The inappropriate use of antibiotics has led to the development of antimicrobial resistance which is a severe threat to the public and an increasing global problem. The Centers for Disease Control and Prevention (CDC) estimates at least two million illnesses and 23,000 deaths are caused by antibiotic-resistant bacteria in the United States (CDC, 2014). The purpose of this quality improvement (QI) project was to evaluate the effectiveness of an antibiotic stewardship program (ASP) on urgent care providers' prescribing on viral respiratory tract infections (RTIs) including the common cold, pharyngitis, and bronchitis.

Methods: This QI project implemented the CDCs Core Elements of Outpatient Antibiotic Stewardship Program (CEOASP) into an urgent care setting to determine the impact it had on inappropriate antibiotic prescribing for viral RTIs. The process will included displaying commitment letters and antibiotic stewardship (ABS) educational posters in each exam room, presented education on ABS, pathophysiology, diagnosis and treatment guidelines on viral RTIs, as well as education on patient communication techniques used with patients. Retrospective electronic medical record review was conducted from 600 randomly selected patients who presented for treatment of RTIs during the evaluation period. The statistical analysis used was Exact McNemar test.

Results: A total of 600 charts, 300 preintervention, and 300 postintervention were evaluated in this study. The overall rate of inappropriate antibiotic prescribing decreased from 21.7% ($n = 65$) to 8.7% ($n = 26$), which is a 60% decrease in inappropriate antibiotic prescribing which results in a $p < .001$%.

Implications for Practice: Implementing the Core Elements of Outpatient ASP is needed to promote ABS and the judicious use of antibiotics in the treatment of RTIs.in the outpatient setting.

Keywords: antibiotics, antibiotic stewardship, pharyngitis, upper respiratory tract infection, bronchitis, outpatient treatment, antibiotic resistance

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Implementing the CDC's Core Elements of Outpatient Antibiotic Stewardship Program into the Urgent Care: A Quality Improvement Project

Introduction

The discovery of antibiotics, specifically penicillin, in the 1940's by Alexander Fleming, was the beginning of a new era in medical care (Center for Disease Control and Prevention [CDC}, 2015b). Infections which were once untreatable were being cured; patients who had once died from infectious diseases were being saved. Unfortunately, with the discovery of each new antibiotic, new drug-resistant bacteria started to appear. Penicillin-resistant staphylococcus was discovered in the early 1940's; tetracycline was found in 1950, resistant bacteria were found in 1959; erythromycin was found in 1953, resistant bacteria in 1969 (CDC, 2015b).

The beginning of these drug-resistant bacteria can be accredited to the evolution of microbes and to the inappropriate use of antibiotics to treat non-bacterial infections (Agency for Healthcare Research and Quality, 2014 [AHRQ]; CDC, 2013a). Antibiotic resistance is a global healthcare crisis, reducing the efficacy of antibiotics for the treatment of infection, increasing patient mortality and increasing healthcare costs (CDC, 2013a). To preserve the effectiveness of the antibiotics that are available and to decrease antibiotic resistance, efforts to promote antibiotic stewardship within the healthcare arena are an utmost urgency (CDC, 2013a).

Background

What is Antibiotic Stewardship

The World Health Organization (WHO) describes antibiotic stewardship as "the cost-effective use of antimicrobials which maximizes clinical therapeutic effect while minimizing both drug-related toxicity and the development of antimicrobial resistance" (World Health Organization, 2001). The CDC describes antibiotic stewardship as "the effort to measure and improve how antibiotics are prescribed by clinicians and used by patients" (CDC, 2016). Improving antibiotic prescribing involves implementing effective strategies to modify prescribing practices to align them with evidence-based recommendations for diagnosis and management of disease (CDC, 2016). In the past, antibiotic stewardship programs have focused on the acute care and nursing home setting, which have shown to be natural targets due to the high antibiotic utilization, close contact with other patients and the over-use of broad-spectrum antibiotic in these environments. However, the majority of antibiotics are prescribed in the outpatient setting with 60% being prescribed for RTIs, and over 30% of these antibiotics prescribed are not needed (Pew Charitable Trusts, 2016 pg 8). The liberal use of antimicrobial agents in the treatment of outpatients has led to unanticipated adverse drug events, emergency room visits, the emergence of resistant pathogens increased cost, and most importantly, increased mortality (Pew Charitable Trusts, 2016, p. 8).

To increase awareness of antibiotic stewardship (ABS), the Center for Disease Control and Prevention (CDC) instituted frameworks to address the overuse of antibiotics in acute care and nursing home settings, The Core Elements of Hospital Antibiotic Stewardship Program (CDC, 2014) and The Core Elements of Nursing Home Antibiotic Stewardship Program (CDC, 2015a), in 2014 and 2015 respectively. In 2016, the CDC introduced the Core Elements of Outpatient Stewardship Program (CEOASP) (CDC, 2016) to increase awareness of the importance of ABS within the primary care, emergency department, urgent care and convenient care/express clinics settings. (Appendix A)

The Significance of Antibiotic Stewardship

According to the CDC in 2015, in Missouri, 918-1016 outpatient antibiotic prescriptions were written per 1000 persons (CDC, 2015c). That is nearly one antibiotic prescription per resident of Missouri. The level of problem severity at a regional level can be determined by analyzing the reported incidence of drug-resistant organisms in an area. According to the Center for Disease Dynamics, Economics & Policy, in the West North Central area of the U.S, which includes Missouri and Kansas, there is a 34% resistance of macrolides to *Streptococcus pneumoniae* and 43% rate of resistance of fluoroquinolones and oxacillin to *Staphylococcus aureus*. (Center for Disease Dynamics, Economics & Policy, 2017).

ABS is an increasingly vital strategy to contain rising rates of antibiotic resistance, adverse drug events and health care costs (CDC, 2016). It is also a primary strategy for preservation of the effectiveness of currently available antibiotics in a time of limited antibiotic development. In the U.S., an estimated 2 million people per year develop infections resistant to antibiotics designed to treat those infections (CDC, 2016).

Purpose of the Project

The aim of this evidence-based QI project: was to implement the Core Elements of Outpatient ABS into the Urgent Care (UC), improve Advanced Practice Registered Nurse (APRN) knowledge of antibiotic stewardship and provide evidence-based education, and guidelines for the treatment of viral respiratory tract infections (RTI), including the common cold, pharyngitis and bronchitis without the use of antibiotics in patients presenting for treatment to the UC

PICOT

In a group of 20 APRNs providing care in six urban UCs, does providing education on ABS, pathophysiology, evaluation, and treatment of viral RTIs, and patient communication tactics as part of implementing the CDC’s CEOABS program aid in reducing the number of inappropriate antibiotic prescriptions to treat RTIs in adults age 18-65, by ten percent compared to the current practice of having no program, within three months of starting the program?

Review of Literature

Literature Review Process

The data search was conducted to review current English literature and guidelines dated 2000-2017. Key search terms include antibiotics, antibiotic stewardship, antibiotic or antimicrobial resistance, provider knowledge/perception, treatment guidelines, upper respiratory tract infections, pharyngitis, bronchitis, inappropriate antibiotic use, outpatient setting, urgent care, emergency room, nurse practitioners and evidence-based practice. Relevant studies and guidelines were identified by searching Cochrane Database of Systematic Reviews, Cumulative Index to Nursing and Allied Health Literature (CINAHL), National Guideline Clearinghouse, Ovid Medline, and PubMed databases for the English language. Additional studies were obtained by reviewing research that was cited by the studies appearing in the preliminary search. Criteria included human subjects ages 18-65, all healthcare providers, and both qualitative and quantitative studies. The search included both research conducted in and outside of the United States (US).

Analysis of Literature

The literature review produced over 155 articles published from 2000 to 2017. A manual search of the cited references of the articles was also conducted with an additional 20 articles. The student investigator excluded studies that were not consistent with the study question about RTI, excluding patients less than 18 years of age, over the age of 65, patients with a history of chronic obstructive pulmonary disease (COPD) or chronic sinusitis, studies involving immunocompromised patients with RTI, or studies related to inpatient antibiotic prescribing. With this inclusion and exclusion criteria, 13 studies were included in this synthesis of evidence: five clinical guideline reviews; three systematic reviews, two randomized trials, two nonrandomized trials, seven observational studies and nine interview/survey study.

Evidence by Sub-Topics

Evidence-Based Guidelines

Evidence-based guidelines focus on treatment of RTIs among adults (Harris, Hicks, & Qaseem, 2016) which include the common cold, pharyngitis, and bronchitis. These guidelines aid providers in managing RTIs by describing signs and symptoms inherent to these illnesses and helps the provider to initiate a list of differential diagnosis to rule out other causes of symptoms. The guidelines not only help reduce the use of inappropriate prescribing but also aid in encouraging first-line treatment for infections when appropriate, for the proper length of time. Symptomatic treatment for the illness is commonly included and can help the prescriber promote alternative therapies to alleviate symptoms.

Several disease-specific guidelines report that RTIs such as the common cold and pharyngitis are self-limiting viral conditions that can last 5-14 days, are manageable with supportive care, including analgesics, intranasal corticosteroids, over the counter cold medications and saline nasal irrigation (Aring et al., 2016). The Infectious Disease Society of America (IDSA), 2018, states that the only type of pharyngitis that needs treatment with antibiotics is Group A Streptococcal Pharyngitis (GAS), with diagnosis confirmed with rapid antigen detection test (RADT) or GAS throat culture (Infectious Disease Society of American, 2012). The guidelines go on to say that patient who presents with a cough, rhinorrhea, hoarseness and a sore throat, suggest a viral etiology, so RADT is not recommended (Shulman et al., 2012). Despite these facts, inappropriate antibiotic prescribing continues to occur for these illnesses.

A clinical guideline written by File (2017) states that acute bronchitis is a common, self-limited condition presenting with or without sputum production, lasting five days to three weeks. Symptoms are the result of inflammation of the bronchial airway, and most cases are viral with no antibiotic treatment needed (File, 2017). There are different guidelines for patients presenting with a history of chronic obstructive pulmonary disease

(COPD), so these treatment recommendations would not apply. This guideline goes on to report that "antibiotics are greatly overused for this condition [bronchitis] and that reducing antibiotic use for acute bronchitis is a national and international healthcare priority" (File, 2017).

Interventions used to improve antibiotic stewardship

A systematic review was performed by Drekonja et al. 2015) evaluating outpatient antibiotic stewardship programs and of the 50 studies found, 29 (58%) were related to RTIs. The study interventions included provider/patient education, individual provider feedback on prescribing practices, antimicrobial guidelines, delayed prescribing practices, communication skills training, restrictive prescribing (specifically fluoroquinolones), computerized clinical feedback support in the electronic health record, and financial incentives related to improved prescribing (Drekonja et al., 2015). The findings of this study showed medium strength evidence that ABS programs that incorporated communication skills and laboratory testing, were associated with a decrease in antibiotic use, but low to medium strength evidence that other stewardship interventions were associated with decreased prescribing (Drekonja et al., 2015).

Two studies evaluated whether educational sessions would reduce the rate of inappropriate antibiotic prescribing. Weddle, Goldman & Myers, (2016) looked at 26 out of 40 Advance Practice Registered Nurses (APRNs) to see if educational sessions about ABS would decrease the rate of inappropriate prescribing. The results showed that the rate of prescribing before the intervention was ten percent and after the intervention, it dropped to eight percent (Weddle et al., 2016). This article noted that even with this improvement, more interventions are needed to continue to reduce the rate of inappropriate prescribing (Weddle et al., 2016). A study performed by Lior et al. (2012) in Spain, did a before-after audit based study with two groups having two different interventions; one with education on RTI guidelines, educational brochures for patients, workshops for point of care testing (POC) including RADT and C-reactive protein (CRP) rapid test while the other group had everything except the RADT and CRP testing. The result showed a more significant decrease in inappropriate antibiotics in the group with the educational material.

Barriers to clinical guideline adherence

Despite evidence to support avoiding antibiotics for viral infections and evidence showing they are an ineffective treatment, they are still being prescribed. A study was conducted to identify and understand providers perceptions about prescribing antibiotics for acute bronchitis, and the barriers that were encountered with antibiotic guideline adherence. (Dempsey, Businger, Whaley, Gagne, & Linde, 2014). All 13 physicians interviewed agreed that antibiotics are not indicated for the treatment of acute bronchitis and that antibiotics are overprescribed (Dempsey et al., 2014). The themes to barriers encountered that came out of this study included a perceived patient demand for antibiotics, lack of accountability for prescribing, diagnostic uncertainty, dissatisfaction of the provider at not meeting patient expectations, and time and money (Dempsey et al., 2014). Some of the providers in the study felt it was easier and less time consuming to prescribe an antibiotic for bronchitis versus having to explain to the patient why they do not need it, allowing them to see more patients and to be more financially productive (Dempsey, 2014).

A cohort study using retrospective chart reviews from 2005-2014, studied whether patients presenting with viral RTIs were at higher risk of developing a bacterial infection with the implementation of a policy to reduce antibiotic prescribing for RTIs. During this time frame, antibiotic prescribing decreased from 53.9% to 50.5% in men and 54.5% to 51.5% in women (Gulliford et al.,2016). With these changes came a decrease in the rates of meningitis (5.3%), mastoiditis (4.6%), and peritonsillar abscess (1.0%). New cases of pneumonia increased by 0.4% during this timeframe (Gulliford et al., 2016). These results should help alleviate any thoughts providers have about inappropriate antibiotic use when they prescribe out of fear of worsening conditions.

Evidence Supporting Outpatient Stewardship

A study reported by Jenkins et al., 2013, randomized eight primary care clinics into two groups, one who implemented clinical pathways and initiated the use of patient educational material upon discharge, for common non- pneumonia RTIs, and the second, control group with no intervention. The results indicated a statistically significant decrease in prescribing of antibiotics in the interventions group from 42.7% to 37.9% ($p < .001$). In the control group, the overall change in antibiotic prescriptions for acute respiratory infections was not statistically significant 39.8% vs. 38.7% ($p = 0.25$) which indicates the interventions had an impact on prescribing practices of the providers.

Other articles reviewed

A phone triage intervention completed by Ewen et al., 2015, looked to determine the extent and characteristics of telephone-based antibiotic prescribing in two different primary practice environments, teaching and nonteaching (Ewen et al. 2015). They looked at 11,610 patients cared for by 19 practices, both teaching and nonteaching, and evaluated them both in office and telephone encounters to see if there was a difference in clinical decision making to prescribe antibiotics for RTIs and urinary tract infections. If an antibiotic was prescribed from a telephone encounter, a chart audit was done to determine the appropriateness of the prescription. The results included 63,418 total antibiotic prescriptions and initially the telephone group accounting for only 7,876 (12.4%) of the prescriptions. This rate steadily increased from 2.2 to 4.2 prescriptions per 100 patient years during the study period (Ewen et al., 2015). Both telephone and office-based prescribing were shown to be higher in the visits associated with non-teaching centers (Ewen et al., 2015). This study indicates that one should consider the type of environment, teaching vs. non-teaching, when studying the rate of inappropriate antibiotic prescribing (Ewen et al., 2015).

The Hart Research Associates did a national survey in November 2012 about Americans' knowledge and attitudes towards antibiotic resistance. It involved a telephone survey of 1,004 adults. The results show that 87% of Americans know that antibiotics are used to treat bacterial infections like strep throat and some sinus infection, but 1 in 3 believe that antibiotics are effective for viral infections. Of those surveyed, 39% believe that if they take an antibiotic when not needed it will not affect others in the community and 78% acknowledge it is a problem (Hart Research Associates, 2012). This shows that more education is needed to make Americans aware of the risk of inappropriate antibiotic use and antimicrobial resistance.

Gaps in Literature

Although there are guidelines to aid in diagnosis and treatment of common infections, there continues to be diagnostic uncertainty among some providers. "Providers are often influenced by psychosocial factors which drive prescribing decisions, including concerns for both patient satisfaction with a clinical visit and potential negative consequences because of missed diagnoses" (Demirjian et al., 2015). Their concern about losing dissatisfied patients to other providers who might be more likely to prescribe antibiotics is also a concern. "Patients who are aware of the potential risks for antibiotic overuse might still express a preference for antibiotic treatment because of perceived benefits. Antibiotic stewardship interventions and educational efforts aimed at addressing both diagnostic uncertainty and patient expectations would be important to investigate" (Demirjian et al., 2015).

Dempsey et al., 2014 recommended that the focus on research methods to reduce inappropriate antibiotic prescribing should include having patient handouts and other educational material available to patients to help describe their illness and methods to alleviate symptoms. He recommends quality and feedback reports to inform each provider of their antibiotic prescribing rates and practices to compare to others in their practice. Clinical decisions support within the EHR that provides a means of reviewing best practice, having alternative prescription options and ready to print patient handouts for the patients is needed. Adding pre-visit triage by nursing staff to reduce unnecessary visits by delivering reassuring education about treating symptoms and when they should seek treatment could be utilized along with over the counter prescription pads which are pre-printed forms for the provider to use for non-antibiotic treatment (Dempsey et al., 2014) (Table 1)

Conceptual Model

The conceptual model utilized with this project was the Model for Improvement (Langley, Nolan & Nolan, 1994). This is a simple model to achieve changes that are an improvement (Langley, Nolan & Nolan, 1994). This model is intended to ensure that change is planned and tested, using an objective measure, to determine if a change has resulted.

The Model for Improvement has two components: first answering three fundamental questions about the process and then implementing a plan/do/study/act (PDSA) cycle to test a selected intervention. These three questions include: What are we trying to accomplish? How will we know that a change is an improvement? What change can we make that will result in improvement? (Institute of Healthcare Improvement [IHI], 2018). The first question in this process requires setting aims. The aim should be time-specific and measurable. A specific population of patients that will be affected should be defined (IHI, 2018). Many organizations align their Aims of Improvement with those outlined in the Institute of Medicines (IOM) report *Crossing the Quality Chasm: A New Health System for the 21st Century* which includes being safe, effective, patient-centered, timely, efficient and equitable (Institute of Medicine, 2001).

The second question sets measures what will be studied. Measures are critical in testing and implementing changes and are a key element to the Model for Improvement (IHI, 2018). It is these measures that will show if the interventions have led to change. Measures should be balanced between outcome measures: how the change impacts the patient's health and well-being; process measures: if efforts are on track to make the needed improvement; and balance measures: whether one change for improvement cause a problem for another part of the process (IHI, 2018).

Finally, it must be asked. “what change can we make that will result in improvement?” (IHI, 2018). “A change concept is a general notion or approach to change that has been found to be useful in developing specific ideas for changes that lead to improvement. Creatively combining these change concepts with knowledge about specific subjects can help generate ideas for tests of change" (IHI, 2018). Interventions that are most likely to result in change must be chosen carefully since not all change leads to an improvement (IHI, 2018) (Appendix B).

The second component of the Model for Improvement involves the Plan-Do-Study-Act Cycle (PDSA) which is a commonly used tool in QI processes. Now that a problem and required changes have been identified, measures have been used to determine if the change has led to improvement. The next step is to test the change in the work environment (IHI, 2018). According to the IHI, “the PDSA cycle is shorthand for testing a change — by planning it, trying it, observing the results, and acting on what is learned. This is the scientific method, used for action-oriented learning” (IHI, 2018). After going through several PDSA cycles, and the change has shown to be an improvement, it is time for implementation of the change on a larger scale, perhaps in primary care offices or other clinics in the system. (Appendix C)

Method

Approval Process

The QI project proposal was submitted to the student investigator's committee and the Institutional Review Board (IRB) of the University of Missouri St. Louis before starting IRB training was completed for research involving human subjects. Approval was obtained for this DNP project from the directors of the urgent cares where the intervention and research were conducted. There was no direct contact with patients and no identifying information from the charts reviewed or from the APRN staff involved with the intervention.

Funding and Ethical Issues

Funding for this QI project was not obtained, and there was minimal costs for the project which was financed by the student investigator (SI) (see Appendix D). The APRN providers were informed of the implementation of the CEOASP within the UC and was reiterated that no specific provider prescribing practices would be retrieved. Prescribing practices were evaluated as a group, not individually. Data were manually extracted from documentation from the patient visits via the SI but will not include personal identifiable patient information. Information was stored on an encrypted USB flash drive to limit breach of confidentiality.

Study Design

This QI project was a pre/post-intervention design. The project was initiated in January 2018 with an end date of May 2018. A pre-intervention, retrospective chart audit was done on charts from patients treated in April 2017 for RTIs by providers in the UC to determine the rate of antibiotic prescribing for RTIs. In January 2018, the intervention was initiated with ABS commitment letters and ABS posters from the CDC displayed in each exam room, to demonstrate a commitment to ABS (Appendix E). ABS education was started one to two times per month for three months via newsletters, which included pathophysiology, etiology, evaluation, diagnosis, and treatment of RTIs including the common cold, pharyngitis, and bronchitis (Appendix F). The education detailed a description of the problem, the significance of overuse of antibiotics, and it's effect on antimicrobial resistance. A description of the CDCs CEOASP and how it was implemented in the UC setting; a review of the updated clinical reommendations for RTIs (Appendix G), patient communication strategies (Fleming-Dutra, Mangione, & Hicks, 2016), introduction to patient educational handouts (Appendix H), and the goals of the study were provided (Appendix I).

A post-test chart audit was done on 50 charts from each UC (n = 300) in April 2018, to determine the effect the intervention had on prescribing practices of the APRNs in the UC. Group statistical data was provided to APRN providers upon completion. Ongoing educational material to maintain updates on ABS; and chart audits will be continued through the Healthcare Effectiveness Data and Information Set (HEDIS) measure program. HEDIS is a tool used by more than 90% of American health plans to measure performance on the important dimension of care and service (National Committee for Quality Assurance, n.d.)

Setting

This project included a convenience sample of 20 APRN urgent care providers, from a network of six Missouri hospital-owned urgent care centers. The centers are in different suburban regions across the large metropolitan area and serve children and adults of diverse racial and socioeconomic backgrounds. The UCs, staffed only by APRNs, are open 364 days per year and provide initial workman’s compensation evaluation, and services to those seeking treatment for less critical illnesses and injuries which require immediate care.

Sample

The random sample included 50 retrospective chart audits from each of the six UCs (n = 300) in adult patients, ages 18-65, presenting to the UC for treatment of RTIs, including the common cold, pharyngitis, and bronchitis in April 2017. The chart audit provided a baseline rate of antibiotic prescribing. The retrospective chart audits were done manually, performed by the SI, using the Data Collection Tool (see Table 3). The process for the chart audits included evaluating the history of present illness (HPI) for presenting symptoms, length of symptoms, review of any diagnostic testing done during the visit, and whether the patient received an antibiotic or not. The CDC Adult Treatment Recommendations were used as a reference to ABS prescribing practices. (Appendix G). For inclusion, exclusion criteria, see Appendix J and K.

Primary Outcome

The primary outcome of this project was to determine if the interventions used to implement the CEOASP into the UC, decreased the overall inappropriate prescribing practices by UC providers for RTIs by 10% after the three-month period of education.

Results

The number of APRNs staffing the UC was 20, one male and 19 females. Ages of the APRNs ranged between 30-60 and years of experience as an APRN ranged between < 1 to 9 years.

The summary of sample demographics from the study can be found in Table 2. Of the 600 charts audited, 384 (64%) were female, and 218 (36%) were male. The age of these patient's breakdown can be reviewed in Table 2.

The exact McNemar test was used to compare the pre-intervention prescribing rates to the post-intervention prescribing rates for RTIs with a p value of .05%. There was a statistically significant change in the rate of inappropriate antibiotic prescribing for all but one of the RTIs measured: common cold decreased from 9% (n = 7) preintervention to 4.2% (n = 3) postintervention ($p < .001$); pharyngitis decreased from 29.1% (n = 16) preintervention to 25% (n = 9) post-intervention, $p = .126$, but was not statistically significant; and bronchitis decreased from 55.7% (n = 34) preintervention to 10% (n = 6),

$p < .001$. The overall rate of inappropriate antibiotic prescribing for RTIs showed a statistically significant decrease from 21.7% to 8.7% with $p = <.001$. (see Table 3,4,5).

Significance of Findings

The findings of this QI project demonstrated that implementing the CEOASP into an UC setting can affect prescribing practices of the providers treating patients for RTIs. The development and utilization of an outpatient stewardship program will help promote judicious use of antibiotics for RTIs and other illnesses by healthcare providers not only in UC, but in express clinics, emergency rooms, and primary care offices.

Sustainability of this DNP project will require support from management and other administrators, showing their support of the initiative; implementing the program into new provider orientation, and adding it to the antibiotic treatment policies, treatment algorithms and guidelines for practice. HEDIS measures will be performed quarterly on all providers through chart audits. This will give individualized feedback of antibiotic prescribing to provide insight on their performance compared to local and national antibiotic prescribing rates. Ongoing education will be presented to providers monthly through newsletters which will include ABS practices beyond just RTI, including urinary tract infections and otitis media.

To disseminate this valuable information about ABS to other healthcare providers, the poster presentation was submitted for review to the Advanced Practice Nurses of the Ozarks conference committee, in hopes of being accepted for presentation for their annual conference in November 2018. The study and related presentation will be presented at the September 2018 TMF-QIN Office Hours Webinar to educate about the importance

Healthcare providers should adhere to appropriate antibiotic prescribing measures to help preserve antibiotic effectiveness, decrease antibiotic resistance and control healthcare costs. This step helps keep providers working towards the Triple Aim of Healthcare which includes improving patient quality and safety of care, improving the health of populations and reducing the cost of healthcare (IHI, 2018).

Conclusion

This evidence-based intervention had a positive impact on healthcare providers' knowledge regarding antibiotic resistance and use, which aided in decreasing antibiotic prescribing for patients who presented for treatment of RTIs in the UC. It introduced ABS to the APRNs in the UC and provided evidence of its effectiveness in improving quality of healthcare while preserving antibiotic effectiveness, decreasing antibiotic resistance and helping to reduce healthcare costs associated with the global public health threat of antibiotic resistance. Knowing that the area where the greatest number of inappropriate antibiotics are prescribed is the outpatient setting, it is essential to initiate an effective antibiotic stewardship program now.

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Appendix A

Core Elements of Outpatient Antibiotic Stewardship Program

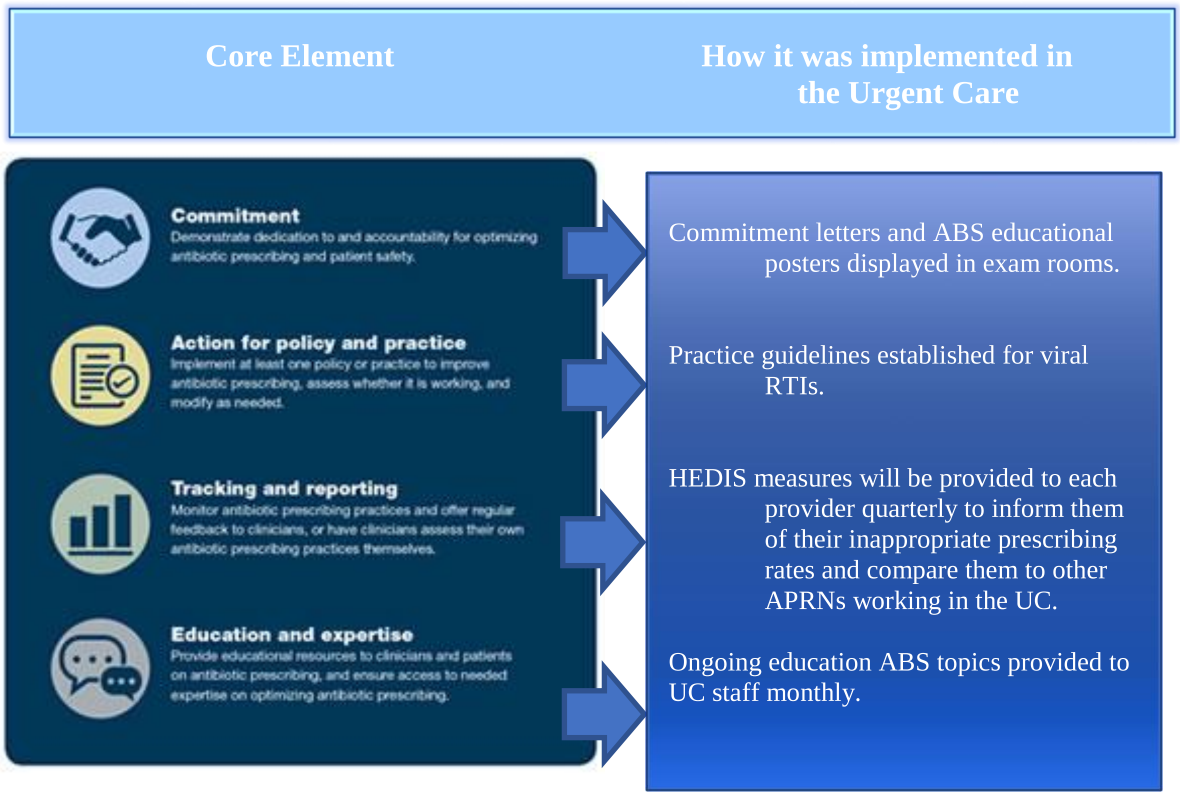

Figure A: Core elements of outpatient antibiotic stewardships program. Reprinted from Antibiotic prescribing and use in doctor offices by CDC, 2016. Retrieved from https://www.cdc.gov/antibiotic-use/community/improving-prescribing/core-elements/core-outpatient-stewardship.html

Appendix B

Model of Improvement

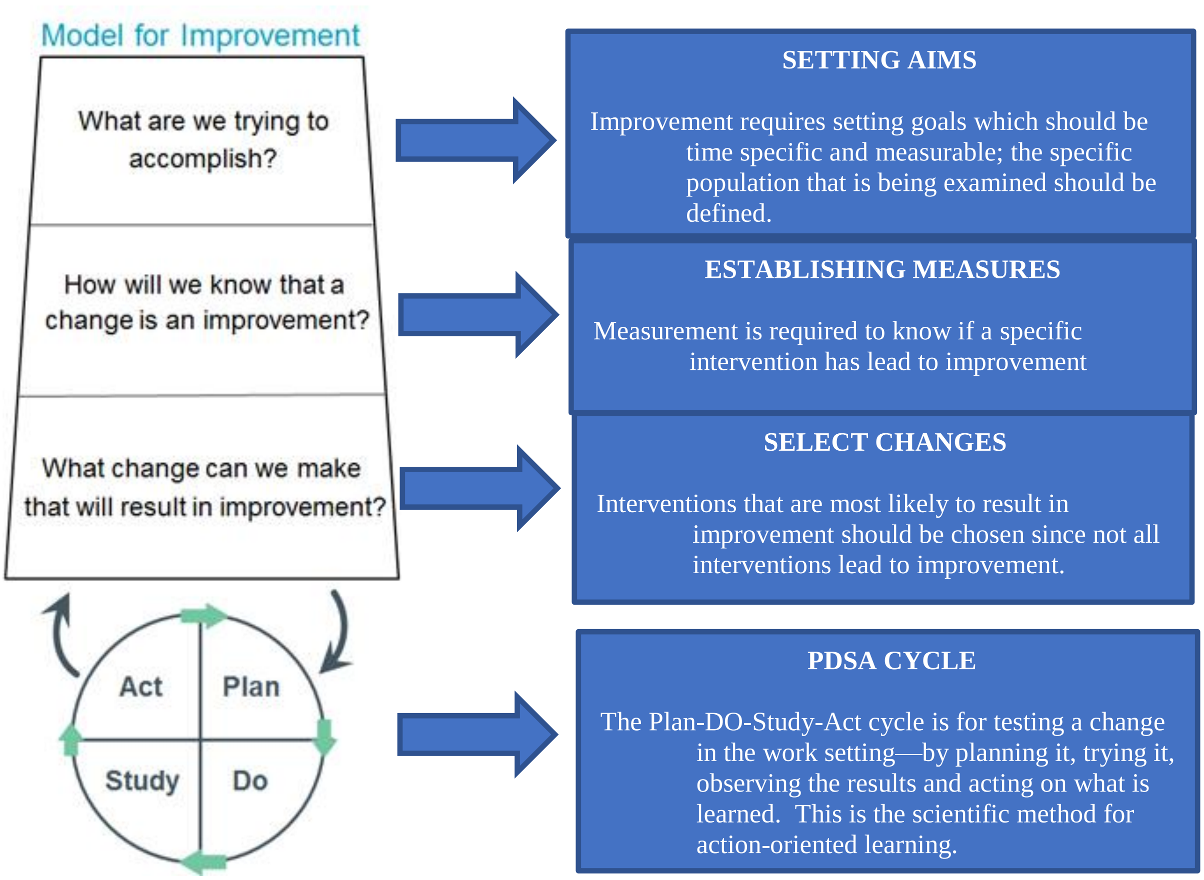

Figure B: Model for improvement. Reprinted from How to improve. Retrieved from http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementHowtoImprove.aspx. Consent obtained to reproduce material on March 17, 2017.

Appendix C

PDSA Cycle

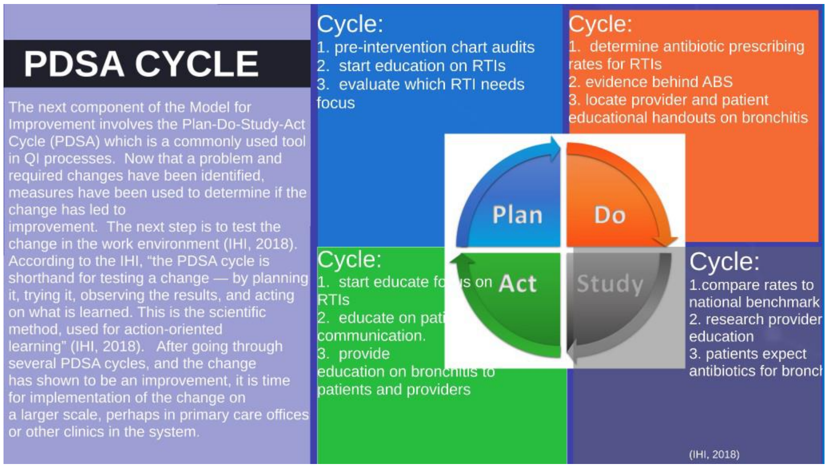

Figure C: PDSA cycle from Model of improvement. Retrieved from http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementHowtoImprove.aspx

Appendix D

Financial Breakdown

Cost Worksheet for DNP Project		
Direct Costs		
Print Posters	20 x $4.50 =	$90
Print and Laminate Commitment Letters	20 x $2.85 =	$57
Frames for Posters	20 x $3.50 =	$70
	Total	**$217**

Figure D: Breakdown of costs of project.

Appendix E

Site Posters

Figure E: Posters displayed in each urgent care exam room. Reprinted from Antibiotic prescribing and doctor's offices with permission. Retrieved from https://www.cdc.gov/antibiotic-use/community/materials-references/print-materials/hcp/index.html

Appendix F

Education Schedule Provided to APRNs

January 1, 2018	Introduction to ABS
January 15, 2018	Promoting ABS within the Urgent Care
February 1, 2018	Introduction to Core Elements
February 15, 2018	The Common Cold
March 1, 2018	Pharyngitis
March 15, 2018	Bronchitis
April 1, 2018	Patient Communication Techniques
April 15, 2018	Introduction to HEDIS Measures

Figure F: Schedule for education provided to APRNs during the intervention.

Appendix G

CDC Adult Treatment Recommendations

BE ANTIBIOTICS AWARE
SMART USE, BEST CARE

CDC Adult Treatment Guidelines

Condition	Epidemiology	Diagnosis	Management
Common Cold or nonspecific URI	• The common cold is the third most frequent diagnosis in office visits, and most adults experience two to four colds annually. • At least 200 viruses can cause the common cold.	• Prominent cold symptoms include fever, cough, rhinorrhea, nasal congestion, postnasal drip, sore throat, headache, and myalgias.	• Decongestants (pseudoephedrine and phenylephrine) combined with a first-generation antihistamine may provide short-term symptom relief of nasal symptoms and cough. • Non-steroidal anti-inflammatory drugs can be given to relieve symptoms. • Evidence is lacking to support antihistamines (as monotherapy), opioids, intranasal corticosteroids, and nasal saline irrigation as effective treatments for cold symptom relief.

Figure G: Adult treatment recommendations for URI, pharyngitis and bronchitis. Reprinted with permission from CDC's Adult treatment recommendations. Retrieved from http://www.cdc.gov/getsmart/community/for-hcp/outpatient-hcp/adult-treatment-rec.pdf

Appendix H

Patient Education Material

Figure H: Posters displayed in each urgent care exam room. Reprinted from Antibiotic prescribing and doctor's offices with permission. Retrieved from https://www.cdc.gov/antibiotic-use/community/materials-references/print-materials/hcp/index.html

Appendix I

Intervention Flow Diagram/Timeline

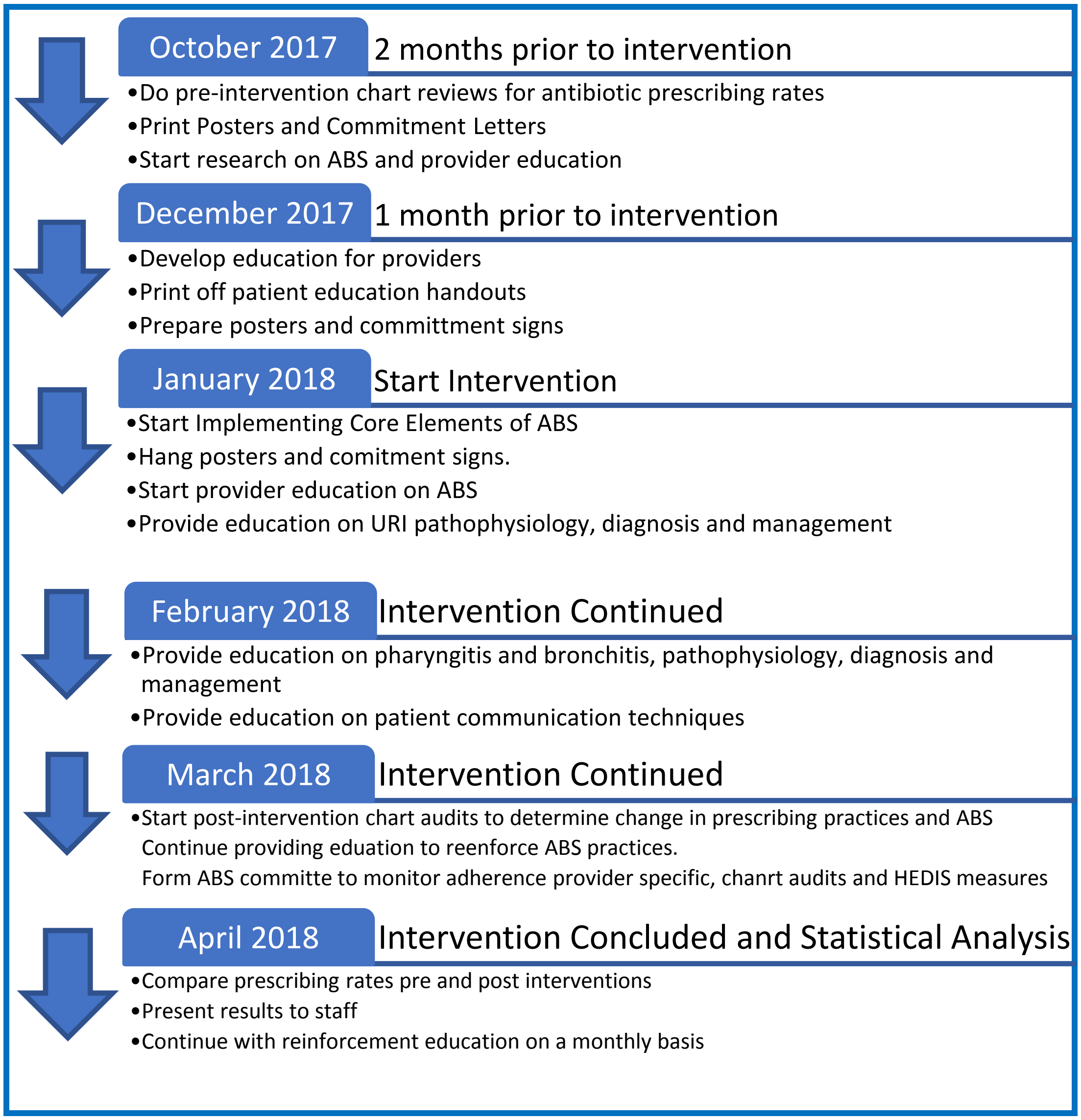

Figure I: Timeline for project.

Table 1

Data Collection Tool

Location	Sex	Age	S&S	Length	Testing	Result	Diagnosis	Treatment	Appropriate

Table 1: Tool used to collect data during chart audits.

Appendix J

Inclusion Criteria

Adult patients ages 18-65 presenting for treatment of RTI including a runny nose, nasal congestion, sinus pressure, sore throat, or a cough	RTI symptoms included: • a runny nose • nasal congestion/drainage • sinus pressure • a sore throat • a cough • chest congestion

Figure J: Specific diagnosis codes were not utilized during this project; presenting symptoms, length of symptoms, testing and treatment were the focus.

Appendix K

Exclusion Criteria

Patients < 18 and > 65 years of age	Patients with chronic obstructive pulmonary disease (COPD)
Patients who had been on antibiotics for Sinusitis, pharyngitis or bronchitis within the past six weeks	Patient with asthma
Patients with chronic sinus conditions	Patients with positive rapid antigen testing for strep pharyngitis
Patients with past sinus surgery	Patients with positive testing for influenza
Patients with multiple diagnoses at one visit, (i.e., Otitis media, and common cold)	Patients with an immunocompromising condition like cancer, HIV, AIDS, on immunotherapy, etc.

Figure K: Specific diagnosis codes were not utilized during this project; presenting symptoms, length of symptoms, testing and treatment were the focus.

Table 2

Demographics of Study

Sex

		equency	ercent	lid Percent	ulative Percent
lid	nale	384	64.0	64.0	64.0
	ale	216	36.0	36.0	100.0
	otal	600	100.0	100.0	

Table 2A: Breakdown of gender.

Age

		equency	ercent	lid Percent	ulative Percent
lid	8	15	2.5	2.5	2.5
	9	26	4.3	4.3	6.8
	0	11	1.8	1.8	8.7
	1	19	3.2	3.2	11.8
	2	11	1.8	1.8	13.7
	3	9	1.5	1.5	15.2
	4	10	1.7	1.7	16.8

5	9	1.5	1.5	18.3
6	15	2.5	2.5	20.8
7	19	3.2	3.2	24.0
8	16	2.7	2.7	26.7
9	21	3.5	3.5	30.2
0	10	1.7	1.7	31.8
1	12	2.0	2.0	33.8
2	15	2.5	2.5	36.3
3	19	3.2	3.2	39.5
4	11	1.8	1.8	41.3
5	19	3.2	3.2	44.5
6	15	2.5	2.5	47.0
7	20	3.3	3.3	50.3
8	15	2.5	2.5	52.8
9	13	2.2	2.2	55.0
0	15	2.5	2.5	57.5
1	16	2.7	2.7	60.2
2	8	1.3	1.3	61.5
3	12	2.0	2.0	63.5
4	10	1.7	1.7	65.2
5	11	1.8	1.8	67.0
6	8	1.3	1.3	68.3
7	5	.8	.8	69.2
8	9	1.5	1.5	70.7
9	10	1.7	1.7	72.3
0	11	1.8	1.8	74.2
1	17	2.8	2.8	77.0
2	9	1.5	1.5	78.5
3	4	.7	.7	79.2
4	7	1.2	1.2	80.3
5	11	1.8	1.8	82.2
6	12	2.0	2.0	84.2
7	13	2.2	2.2	86.3
8	9	1.5	1.5	87.8
9	8	1.3	1.3	89.2
0	5	.8	.8	90.0
1	9	1.5	1.5	91.5

2	10	1.7	1.7	93.2
3	19	3.2	3.2	96.3
4	9	1.5	1.5	97.8
5	13	2.2	2.2	100.0
tal	600	.00.0	100.0	

Table 2B: Breakdown of age

Table 3

Statistical Analysis of Antibiotic Prescribing by Illness.

Time_frame * Appropriate * Diagnosis Crosstabulation

Diagnosis	Timeframe		Appropriate		Total
			Yes	No	
URI	Preintervention	Count	71	7	78
		within Time_frame	91.0%	9.0%	100.0%
		within Appropriate	51.1%	70.0%	52.3%
	Postintervention	Count	68	3	71
		within Time_frame	95.8%	4.2%	100.0%
		within Appropriate	48.9%	30.0%	47.7%
	Total	Count	139	10	149
		within Time_frame	93.3%	6.7%	100.0%
		within Appropriate	100.0%	00.0%	100.0%
ABSR	Preintervention	Count	30	5	35
		within Time_frame	85.7%	14.3%	100.0%
		within Appropriate	28.6%	41.7%	29.9%
	Postintervention	Count	75	7	82
		within Time_frame	91.5%	8.5%	100.0%
		within Appropriate	71.4%	58.3%	70.1%
	Total	Count	105	12	117
		within Time_frame	89.7%	10.3%	100.0%
		within Appropriate	100.0%	00.0%	100.0%
Pharyngitis	Preintervention	Count	39	16	55
		within Time_frame	70.9%	29.1%	100.0%
		within Appropriate	59.1%	64.0%	60.4%
	Postintervention	Count	27	9	36
		within Time_frame	75.0%	25.0%	100.0%

		within Appropriate	40.9%	36.0%	39.6%
	Total	Count	66	25	91
		within Time_frame	72.5%	27.5%	100.0%
		within Appropriate	100.0%	00.0%	100.0%
Strep Pharyngitis	Preintervention	Count	68	3	71
		within Time_frame	95.8%	4.2%	100.0%
		within Appropriate	57.6%	75.0%	58.2%
	Postintervention	Count	50	1	51
		within Time_frame	98.0%	2.0%	100.0%
		within Appropriate	42.4%	25.0%	41.8%
	Total	Count	118	4	122
		within Time_frame	96.7%	3.3%	100.0%
		within Appropriate	100.0%	00.0%	100.0%
Bronchitis	preintervention	Count	27	34	61
		within Time_frame	44.3%	55.7%	100.0%
		within Appropriate	33.3%	85.0%	50.4%
	postintervention	Count	54	6	60
		within Time_frame	90.0%	10.0%	100.0%
		within Appropriate	66.7%	15.0%	49.6%
	Total	Count	81	40	121
		within Time_frame	66.9%	33.1%	100.0%
		within Appropriate	100.0%	00.0%	100.0%
Total	preintervention	Count	235	65	300
		within Time_frame	78.3%	21.7%	100.0%
		within Appropriate	46.2%	71.4%	50.0%
	postintervention	Count	274	26	300
		within Time_frame	91.3%	8.7%	100.0%
		within Appropriate	53.8%	28.6%	50.0%
	Total	Count	509	91	600
		within Time_frame	84.8%	15.2%	100.0%
		within Appropriate	100.0%	00.0%	100.0%

Table 2: Statistical analysis of antibiotic prescribing breakdown by illness.

Table 4

Chi-Square/McNemar Tests
All Diagnosis

Diagnosis		'alue	t Sig. (2-sided)
URI	1cNemar Test		.000[a]
	of Valid Cases	149	
ABSR	1cNemar Test		.000[a]
	of Valid Cases	117	
Pharyngitis	1cNemar Test		.126[a]
	of Valid Cases	91	
rep Pharyngitis	1cNemar Test		.000[a]
	of Valid Cases	122	
Bronchitis	1cNemar Test		.042[a]
	of Valid Cases	121	
Total	1cNemar Test		.000[a]
	of Valid Cases	600	

a. Binomial distribution used.

Table 4; Chi Square/McNemar test results by diagnosis

Table 5
Final Overall Analysis

Chi-Square Tests

	Value	Exact Sig. (2-sided)
McNemar Test		.000[a]
N of Valid Cases	600	

a. Binomial distribution used.

Table 5: Overall McNemar Test results.