



University of Kentucky
UKnowledge

DNP Projects

College of Nursing

2019

Incidence and Treatment of Acute Sinusitis in Two Outpatient Primary Care Settings and Provider Challenges in Treating Adult Sinusitis

Britney Nicole Perkins
University of Kentucky, bnperk2@uky.edu

[Right click to open a feedback form in a new tab to let us know how this document benefits you.](#)

Recommended Citation

Perkins, Britney Nicole, "Incidence and Treatment of Acute Sinusitis in Two Outpatient Primary Care Settings and Provider Challenges in Treating Adult Sinusitis" (2019). *DNP Projects*. 294.
https://uknowledge.uky.edu/dnp_etds/294

This Practice Inquiry Project is brought to you for free and open access by the College of Nursing at UKnowledge. It has been accepted for inclusion in DNP Projects by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Running Head: TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Incidence and Treatment of Acute Adult Sinusitis in Two Outpatient Primary Care Settings and
Provider Challenges in Treating Adult Sinusitis

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing
Practice at the University of Kentucky

By

Britney N. Perkins, BSN, RN, RN-BC

Louisville, Kentucky

2019

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Abstract

BACKGROUND: Nationally, approximately one third of antibiotics are currently being prescribed unnecessarily. Antibiotic misuse can result in disability, longer hospital stays, increased costs to organizations, antibiotic resistance and death.

PURPOSE: The purpose of this project was two-fold: (1) explore current management of acute adult rhinosinusitis in an outpatient setting (2) assessing providers perceptions on the barriers to preventing antibiotic misuse.

METHODS: A retrospective chart review of 150 charts was performed to examine prescribing practices by providers treating rhinosinusitis at two primary care practices. An interview was conducted with the practice providers on barriers for compliance in antibiotic stewardship.

RESULTS: In the treatment of acute sinusitis within the two sites, antibiotic prescriptions were given for 88% of patients with less than seven days of symptoms, with 93% of patients receiving antibiotics overall in sinusitis treatment and 86% receiving supportive therapies. Reported symptoms and physical exam findings did not impact antibiotic prescription, with reported symptoms not confirmed in the exam. Provider interviews revealed barriers to avoiding prescribing antibiotics included lack of provider and patient education and patient satisfaction.

CONCLUSION: The over prescribing of antibiotics is complex, complicated by patient demand and satisfaction, patients not knowing the risk of antibiotics, and providers not being able to counter patient's request for treatment. Providers identified the need for patient education, but this needs to be provided prior to the office visit. Practices must commit to appropriately prescribing antibiotics. Utilizing the data collected through this project help create education directed toward patients.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Acknowledgements

Thank you to my Advisor Dr. Judith Daniels who has been a resource and helped me mold this project into something great. Thank you to my committee members Dr. Julie Ossege and Dr. Julie Wolford for their support, critiques and presence. Thank you, Dr. Amanda Wiggins our wonderful statistician who provided needed help running, interpreting and analyzing statistics necessary for this project. Thank you, Norton Healthcare for initiating this program and picking me to be among the lucky students blessed with their financial support and the many resources they provide.

Norton Healthcare Scholarship Recipient: This Doctor of Nursing Practice project and program of study was fully funded through the University of Kentucky College of Nursing and Norton Healthcare academic-practice partnership.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Dedication

I would like to dedicate this project to all of the administrators and educators who assisted and worked hard to help me in bringing this DNP project to life. Also, my parents, husband and two precious children, Willow and Oliver, who have sacrificed so much of the last three years to allow me to pursue my DNP goal.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Table of Contents

Acknowledgements.....	1
Dedication.....	2
List of Appendices.....	5
List of Tables.....	5
Introduction.....	6
Background.....	6
Theoretical Framework.....	8
Review of Literature.....	9
Purpose.....	10
Agency Description.....	11
Setting.....	11
Congruence of DNP Project to Selected Organization’s Mission, Goals and Strategic Plan.....	11
Description of Stakeholder.....	12
Project Design.....	13
Target Population.....	13
Project Methods.....	14
Results.....	15
Chart Review Results.....	15
Interview Results.....	17
Discussion.....	19
Limitations.....	24

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Implications for Practice.....	25
Conclusion.....	26
References.....	35

List of Appendices

Appendix 1: *Data Collection Acute Adult Sinusitis Tool*.....27
Appendix 2: *Interview Questions*.....28

List of Tables

Table 1. *Demographic Information*.....30
Table 2. *Symptom Results*.....31
Table 3. *Symptom Characteristics*.....31
Table 4. *Associations Between Symptoms and Antibiotic Prescribed Before or After 7 Days*.....31
Table 5. *Associations Between Symptoms*.....32
Table 6. *Descriptive Summary of Antibiotic Usage*.....33
Table 7. *Treatment Results*.....33
Table 8. *Associations Between Treatment Options*.....34

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Introduction

In the United States, sinusitis affects one in eight adults annually equaling approximately 30 million diagnoses yearly (Blackwell, Lucas & Clarke, 2012). Antibiotic overuse in treating sinusitis is common, with one-third of all prescribed antibiotics unnecessary, within all medical settings (Centers for Disease Control and Prevention [CDC], 2016a). Sinusitis treatment, along with common colds, bronchitis, and viral sore throats have resulted in forty-seven million excess prescriptions given yearly. Within the outpatient setting, overtreating sinusitis is common, accounting for 44% of the antibiotic prescription treatments (CDC, 2016b). The purpose of this DNP project was to determine provider treatment of acute sinusitis in the outpatient setting and barriers that exist to not prescribing antibiotics.

Background

Antibiotic prescribing for viral infections is widely acknowledged in the United States with one-third of all prescribed antibiotics being given unnecessarily (CDC, 2016a). The result of overprescribing has led to antibiotic resistance. This is defined as common bacteria no longer responding to the antibiotics designed to treat them (CDC, 2017a). It is estimated that the national average of inappropriate antibiotic prescribing is 836 antibiotic prescriptions per 1000 patients (CDC, 2016c). Unfortunately, Kentucky ranks first among all the states for prescribed antibiotics exceeding 1270 prescriptions per 1000 patients (CDC, 2016c). The overprescribing of antibiotics for sinusitis and viral infections contributes to antibiotic resistant infections.

The term, antibiotic misuse, is defined as the prescribing of antibiotics when the condition is viral (CDC, 2017a). New resistant bacterial infections are evolving and spreading, and are harder to treat with the available antibiotics being less effective (WHO, 2018). The misuse of antibiotics can lead to disability, or even death from the limited availability of

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

effective antibiotics. It is estimated that two million individuals are being infected with antibiotic resistant bacteria, and at least 23,000 people dying annually in the United States from complications including sepsis (CDC, 2018a). The outcome of overprescribing results in an additional \$20 billion in healthcare expenses and approximately \$35 billion in lost productivity from infections no longer responding to antibiotics (CDC, 2013). Money, resources and lives are being lost due to this misuse.

The problem of antibiotic overprescribing is most often seen in the outpatient setting for the diagnosis of sinusitis. Providers need to ensure they are being antibiotic stewards and utilizing the American Academy of Family Physician clinical practice or evidence-based guideline recommendations in treating acute sinusitis (American Academy of Family Physicians [AAFP], 2015). . The guideline recommends not suspecting bacterial sinusitis (ABRS) or treating with antibiotics unless symptoms last at least seven days and are worsening (AAFP, 2015). The three cardinal symptoms that would warrant an antibiotic are: purulent nasal drainage, facial or dental pain, and nasal obstruction (AAFP, 2015). Ninety-eight percent of rhinosinusitis infections are viral and do not require the use of an antibiotic to be treated (CDC, 2017a).

Antibiotic stewardship is a method to avoid antibiotic misuse that is being used in healthcare inpatient and outpatient settings. It is defined as actions that optimize the treatment of infections while decreasing the adverse events that accompany antibiotic use (CDC, 2017a). Beardsley et al. (2012) provided data to show an almost two-million-dollar savings in a single organization with the implementation of antibiotic stewardship. Thus, antibiotic stewardship can decrease the costs hospitals and healthcare organizations accrue for antibiotic misuse.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Exploring the prescribing patterns of antibiotics and determining the barriers that providers face when treating sinusitis is critical to address and overcome this issue. Many barriers to guideline compliance exist, including patient demand, lack of knowledge of guidelines among and providers, time restrictions and heavy workload, and patient satisfaction (Fischer, Lange, Klose, Greiner & Kraemer, 2016). There has been a call to action by the CDC and WHO to identify the most concerning barriers for providers and design interventions to reduce those obstacles. Understanding their challenges to compliance is vital in creating education or offering resources to assist providers in being better antibiotic stewards.

Theoretical Framework

The Health Belief Model was utilized to guide this project. This model was developed by social scientists in the early 1950s (Boston University School of Public Health, 2018). It is used to explain why individuals may accept or reject preventative health services or adopt health behaviors. The model proposes that there are six constructs that influence an individual's actions based on their perceptions of benefits and barriers related to health behavior. The constructs include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action and self-efficacy (Boston University School of Public Health, 2018).

The Health Belief Model can provide insight on patients who present with sinusitis and their expectations regarding treatment. Within the model it is an equation of reducing barriers and increasing benefits, and the only way to reduce barriers is to understand them. Patients who believe antibiotics must be prescribed for resolution of their symptoms, often base that on history of a similar episode. They fear that symptoms will worsen in severity and time without treatment. Often patients dismiss their own ability to self-manage the illness.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

In order to decrease antibiotic overprescribing for sinusitis, providers must understand the patient's beliefs and perceived barriers towards treatment. Providers can engage patients by discussing their expectations of treatment along with their confidence in self-management. By determining the barriers in place teaching efforts can be directed at overcoming these barriers. The goal should be to empower patients for self-care management. One example of this is by providing an antibiotic prescription to be filled at a later date if symptoms do not resolve. This allows patients to redefine their perception of barriers, severity, increase their own self-efficacy and puts them in charge. Though in this project patient perceptions were not explored, providers were queried of their patient's barriers towards treatment. This may be the first step in helping providers acknowledge they must address the motivations behind patients expecting antibiotics.

Review of Literature

A number of interventions have been utilized to decrease the overprescribing of antibiotics for sinusitis. Quality improvement projects which focus on chart audits and provider feedback alone has resulted in little to no changes in overprescribing. Once these measures are no longer utilized and quality improvement targets have been met, they lose effectiveness in continuing to impact overprescribing (Dobson et al., 2017). These measures need to be combined with provider and patient education (Dobson et al., 2017). Understanding barriers from both the patient and provider perspective is critical to identifying strategies for reducing antibiotic misuse.

Research has shown that provider education and patient information can decrease antimicrobial prescriptions. Drekonja, Filice, Greer, et al. (2014) demonstrated patient and provider education influenced antibiotic prescribing across the most common upper respiratory infections. They found in a group of 200 providers continuing medical education with monthly

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

interactive sessions for providers combined with seasonal education decreased daily doses of antimicrobials by 20% (Chazan, Turjeman, Frost, Besharat, Tabenkin, Stainberg & Raz, 2007).

Patient education is best received when it comes from the provider, not from generic educational materials. It would appear that patients want personalized education that relates to their life and situation. This was identified by Vinnard, Linkin, Localio, Leonard, Teal, Fishman & Hennessy (2013) wherein there was no change in antibiotic prescribing after mailing patient education materials to those with a history of upper respiratory infections. Nor was there a change when providers handed out generic information. Studies that focused on improving provider communication skills resulted in reduced prescribing of antibiotics (Smeets, Kuyvenhoven, Akkerman, Welschen, Schoutenn, van Essen & Verheij, 2009).

One strategy used in treating sinusitis has been delayed prescribing also known as watchful waiting. The purpose is to empower patients to fill an antibiotic prescription if certain parameters are met. Hoye, Frich and Lindboek (2010) performed a qualitative study with 33 providers and found that delayed prescribing especially with acute sinusitis was useful. The providers considered bacterial sinusitis difficult to diagnose, and found the wait-and-see method suitable if patients were seeking care too early in the course of the illness demanding antibiotics. Providers liked issuing wait-and-see prescriptions to prevent patients from seeking after-hours care and receiving treatments they feel are inappropriate (Hoye et al., 2010).

Purpose

The purpose of this project was to examine the treatment of acute adult rhinosinusitis in an outpatient setting and the challenges that exist in unnecessary prescribing of antibiotics. The focus was two-fold (1) explore current management of acute adult rhinosinusitis in an outpatient setting and (2) assess providers perceptions on the barriers to preventing antibiotic misuse. This

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

project was intended to identify barriers and interventions to minimize the overuse of antibiotics in treating acute rhinosinusitis.

Agency Description

Setting

Assessing the treatment of adult sinusitis and provider barriers in not overprescribing antibiotics was explored in two urban outpatient settings. Setting A was located in Louisville, Kentucky, where 82% of the area is Caucasian, the median household income is \$57,284, and only 10% of individuals are below the poverty level (Neighborhood Scout, 2019). Setting B was located in Lagrange, Kentucky, just outside of Louisville, where 87% of the area is Caucasian, the median household income is \$60,690, and the overall poverty rate is 14% (World Population Review, 2019). These two offices are part of a larger system that serves the Louisville and Southern Indiana regions. Within this system there are over 250 primary care practices, 14 Immediate Care Centers, and five hospitals with attached Emergency Departments (Norton Healthcare, 2018). This entire healthcare system utilizes the same electronic medical record which was used for the chart audit.

Congruence of DNP project to selected organization's mission, goals, and strategic plan

The DNP study was conducted within a large urban medical system. Their mission is to provide quality health care to all they serve, with values encompassing stewardship of resources, continually improving care and service, and succeeding with integrity (Norton Healthcare, 2018). Antibiotic stewardship is a focus within the inpatient setting and pediatric outpatient clinics. Hospitalized patients have the advantages of Infectious Disease Pharmacists who monitor antibiotic use. In the outpatient setting the primary focus is on provider and patient education.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

The expectation is all providers will become stewards with antibiotic use in order to prevent the negative consequences of overprescribing.

Description of stakeholders

There are a number of stakeholders impacted in identifying the inappropriate use of antibiotics in an outpatient setting. These include the healthcare leadership team, both medical doctors (MD) and advanced practice registered nurse (APRN) providers, the system's quality improvement council, practice managers, and patients. The project was approved by the Medical Group Director and the Chief Nursing Officer (CNO) who gave approval to the project as it is of interest to the system.

The Quality Improvement Council determines projects to pilot and support that work to improve quality care. Their approval is critical in order to design educational opportunities to reduce barriers for overprescribing of antibiotics. This is an interdisciplinary council that reviews opportunities for improvement and meeting quality metrics.

There are a number of stakeholders within each practice setting. Practice managers supervise the overall flow of patient care within the practice setting. They coordinate projects or studies so to not overburden staff or providers. They work alongside leadership to ensure provider and patient needs are being met. Primary Care providers are responsible for patient care, using the best evidence and documenting patient visits for optimal reimbursement.

Primary Care patients are also important stakeholders. They have expectations of receiving quality care under the umbrella of what they know. Their level of satisfaction is often based on receiving antibiotics for any signs of infection, viral or bacterial. They also expect to be seen in a timely manner and at a reasonable cost. Antibiotic stewardship can be difficult given patient expectations.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Potential stakeholders include insurance companies who reimburse providers for sinusitis diagnoses. Antibiotics and primary care visits for sinus infections are covered by most insurance companies, with typically a co-pay involved for the visit. Intrinsic within the reimbursement from Medicare and Medicaid is the patient satisfaction with their provider. The role patient satisfaction plays in reimbursement could be a barrier to antibiotic stewardship if that is the patient's expectation.

Project Design

This project was a mixed design using qualitative and quantitative methods. It was completed in two parts. Part one was a retrospective chart review to examine the current prescribing practices by providers in treating rhinosinusitis at two urban primary care sites. The qualitative piece involved interviews with providers at each practice to elucidate their perceptions on the barriers toward antibiotic stewardship. This project was submitted and approved by the University of Kentucky Institutional Review Board. Approval was also obtained from the health care system Office of Research Administration.

Target population

The population of interest were adult patients who were diagnosed with sinusitis or rhinosinusitis from January 2018 to December of 2018. The demographics for the primary care offices included in this project do not serve a diverse population as the majority are Caucasian (75%) or African American (22%). In addition, there is a near equal distribution of males (48%) to females (52%).

The sample was randomly selected from 1041 patients who met the following criteria: were over the age of 18 and had a diagnosis of acute sinusitis or rhinosinusitis within the study period. Exclusion criteria included: a diagnosis of any underlying chronic respiratory conditions

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

(i.e. asthma and COPD), the presence of an autoimmune disease or prescribed immunosuppressive medications, and ages less than 18. From the list of patients meeting the inclusion criteria 150 patients were randomly selected.

The provider interviews were conducted by the PI with the providers at the two practice sites. In total there were six medical doctors (MD's) and four advanced practice nurse practitioners (APRN). These providers were varied in both age and experience. The APRNs were primarily master prepared with only one having a Doctor of Nursing Practice (DNP). All provider interviews were voluntary and at their convenience.

Project Methods

A data information request was submitted to the Norton Healthcare Data Analytics Department to obtain records for evaluation. For the chart review independent variables were abstracted and reviewed to identify symptoms used for the diagnosis of sinusitis. The current guidelines established by the American Academy of Family Physicians was used to construct the data extraction variables (American Academy of Family Physicians, 2015). Each chart was reviewed for demographic data as well as the number of days reported since onset of symptoms, symptoms present related to rhinosinusitis and treatment recommended for diagnosis. (See Appendix 1 for data collection tool)

The electronic medical record (EMR) was used to extract the data as each site uses the same EMR associated with their parent corporation. All data was evaluated for each specific site. A crosswalk table was used to link the study number and the patient's EMR, it was kept separate from the study data. The data is stored on a password protected H drive maintained by the healthcare system. The crosswalk was destroyed at the end of data analysis, while study data will be retained for 6 years.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Part two of the study involved the use of an open style interview. The providers who volunteered to be interviewed were asked to respond to six questions on perceived barriers regarding antibiotic stewardship in treating rhinosinusitis. Interviews were conducted at their specific site and at their convenience. (See Appendix 2 for the Interview Questions). Each provider was consented, and subjects answered questions privately with only the private investigator (PI) present. Interviewees were not identified by name, email address or any identifying demographic information. Interviews were transcribed on a secure password protected H drive at Norton Healthcare.

Results

Chart Review Results

The data request resulted in 1041 charts being made available that had the diagnosis of acute sinusitis and met the determined criteria. A total of 150 patients were randomly selected for chart review. The quantitative data resulting from the chart audits was initially compared between the two site locations demonstrating no significant practice patterns. Subsequently the data was aggregated together for analysis.

In total the sample consisted primarily of females (66%) and overwhelmingly Caucasian (89%). The average age of the participants was 51, the majority were under the age of 59 (73%). The majority had private health insurance with only 8% having Medicaid. (See Table 1: Demographic Information for demographic data).

Symptom onset was documented between seven to nine days by slightly half of the sample with 25% reporting symptoms for less than 6 days. (See Table 2: Symptom Results for symptom data). The majority of the patients had at least two symptoms (90%). The most common were facial pain, pressure or fullness occurring with nasal congestion/obstruction

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

(68%), and purulent rhinorrhea (50%). (See Table 5: Associations between symptoms for symptom correlations).

There was a positive and significant relationship between the patient reported symptoms and the providers physical exam for facial pain, pressure or fullness and purulent rhinorrhea ($p < .001$). Mucosal edema/nasal congestion ($p = 0.794$) was not seen consistently on the physical examination. (See Table 5. Associations between symptoms for symptom correlation data). There was no significant relationship between patient symptoms and provider exam with antibiotic prescribing. Antibiotics were prescribed a majority of the time even without the physical exam findings matching the reported symptoms. No association found between facial pain, pressure or fullness ($p = .690$), purulent rhinorrhea ($p = 1.0$) and mucosal edema/nasal congestion ($p = 1.0$) with antibiotics being prescribed.

Length of time of symptoms did not correlate with being prescribed antibiotics. The Independent Samples T-Test resulted in a non-significant relationship ($t(130) = .066$, $p = 0.947$). In a quarter of the cases symptoms were present for less than seven days, with an antibiotic being prescribed a majority of the time (88%). In less than 10% of the sample antibiotics were not prescribed regardless of reported symptoms and either none or one physical finding was documented on exam.

An antibiotic was prescribed in 93% of the sample for the treatment of acute sinusitis. The most common antibiotic prescribed was amoxicillin with clavulanic acid (36%) and the macrolide, azithromycin, the second most chosen antibiotic (26%). The remaining antibiotics ranged from amoxicillin to fluoroquinolones. These antibiotics on average were prescribed for 8 days. The majority were treated for 7 to 10 days. Those on macrolides were given for a 5-day course. The symptoms reported and found on physical exam did not have any effect on the type

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

of antibiotic prescribed. The top three antibiotics prescribed were Augmentin (36%), macrolides (26%), and cephalosporins (16%). (See Table 6. Descriptive summary of Antibiotic Usage for antibiotic data).

Treatment options for symptom management included increasing fluids (38%), rest (30%), oral antihistamines (29%) and guaifenesin/mucolytic/Mucinex (26%). There was no pattern of symptom management treatments. Treatment options included both prescribed and recommended medications as well as non-pharmaceutical management techniques. Saline and water cleanses were prescribed frequently with Neti pots/nasal saline washes (6%) and intranasal saline (23%). Steroids were ordered intranasally (19%), intramuscularly (9%) and orally (25%). (See Table 7. Treatment Results for supportive treatment data).

Interview Results

Four of the ten possible providers consented and participated in the interview. Six were either not in the office on scheduled visits or were not interested in participating. Consent was reviewed and obtained for those who participated, and the interviews took place in their private offices. The four providers experience levels ranged from less than a year to over 30 years, with three having over 17 years of experience. Only one of these providers was a medical physician and the remainder were nurse practitioners. Among the nurse practitioners one was doctorally prepared. All practiced in a primary care setting where the average number of patients seen per day ranged from 20-30.

Providers reported diagnosis of sinusitis was typically established from the history and physical exam. Three of the providers specifically identified sinus/face pain, with half of them further identifying fever, ear pain, and purulent drainage/rhinorrhea. The majority of the

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

providers considered sinusitis to be bacterial when at least one week of symptoms had occurred, with one considering it bacterial if symptoms lasted for over 10 days.

The providers, when asked how patients determined they had sinusitis, had a variety of responses. Responses ranged from the color of their nasal drainage to simply waking up with any symptoms thus believing they have an infection. Providers also commented that patient experience with sinus infections and simply “being miserable and wanting to be fixed” were also noted patient complaints.

All of the providers’ treatment options for bacterial sinusitis were to initiate an antibiotic. First-line therapy was to prescribe amoxicillin with clavulanic acid, with three fourths agreeing on the macrolide, Azithromycin, as an additional option. Other choices included amoxicillin, doxycycline, cefdinir and fluoroquinolones. For those who did not meet criteria for a bacterial etiology a number of options for symptom management were given to patients. The majority of the providers agreed on topical intranasal steroids, intranasal saline, nasal saline irrigation (Neti-pot), oral decongestants and guaifenesin being recommended for symptom relief. Half of the providers also recognized watchful waiting/delayed antibiotics for patients as an option.

Providers were queried regarding the barriers toward prescribing antibiotics. They cited lack of provider and patient education on best treatment practice to avoid antibiotic overuse. Patient satisfaction was also identified as contributing to inappropriate antibiotic prescriptions. Providers reported many patients come prepared to primary care visits with all the reasons why an antibiotic is needed to treat their infection. These types of demands contributed to over prescribing. In general, the providers voiced frustration with managing patient satisfaction and appropriate treatment.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

The providers offered thoughts on how best to avoid overprescribing antibiotics. The majority identified increasing patient knowledge as one way in overcoming the barriers to prescribing antibiotics. Patient education must focus on how overprescribing of antibiotics for viral illnesses is contributing to antibiotic resistance. Ideas such as use of media, discussing education for patients in the online patient portal, training and scripting for educating patients on guidelines, and more efficient use of the after-visit summary (AVS) given at the end of visits were the patient education is recorded were discussed

Discussion

In 2017, in the United States 12% (30.8 million Americans) were diagnosed with sinusitis (CDC, 2017b). It was the second most common respiratory disease among adults with women having twice the incidence of men (CDC, 2017b). Even though the majority of sinusitis tends to be viral in nature many are treated as bacterial with antibiotics being prescribed. Nurse Practitioners have been recognized as the second leading professional group to prescribe antibiotics (CDC, 2019). As a profession Nurse Practitioners should be leaders in providing the safest care with the best outcomes.

The patient sample in this project consisted primarily of females (66%) and was overwhelmingly Caucasian (89%). The ethnicity was not unexpected given the locations of the offices, which are in predominately Caucasian areas. Females have a history of visiting their primary care provider more than men which would account for the higher reported incidence of sinusitis (Thompson, et al., 2016). Men may be receiving the best treatment for sinusitis by not seeking treatment from a healthcare provider.

The patients in this sample had private health insurance with only 8% having Medicaid. Private insurance has its own set of complexities, due to the co-pay and patients not wanting to

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

be off work. This adds to the demand on providers with meeting patients' expectations of treating their symptoms without having to return to the office.

The results of this study identified that providers, in the two practice sites reviewed, are not consistently following the guidelines for acute sinusitis published by the American Academy of Family Physicians. Findings indicated that before seven days of symptoms, antibiotics were prescribed 88% of the time and 93% of patients received antibiotics overall in the treatment of sinusitis. Sinusitis was associated with the most antibiotic prescriptions (56 per 1000 population) in the US (Fleming-Dutra, Hersh, Shapiro, et al, 2016). This is despite the fact 85% of patients will have a reduction or resolution of symptoms within seven to fifteen days without antibiotics (Rosenfeld, 2016). Fleming-Dutra et al (2016) report that an estimated 27-59% of antibiotic prescriptions for sinusitis are appropriate. Meaning 73% of antibiotics are inappropriately prescribed.

Within this study physical findings confirmed what the patient was reporting only for the symptom of facial pain. Otherwise the reported symptoms did not always correlate with the providers documented assessment. The reported symptoms or physical exam did not correlate to an antibiotic being prescribed, with antibiotics being prescribed 93% of the time regardless of findings. Providers were more willing to prescribe based on reported symptoms than their own findings. This is confirmed through the literature wherein patients who requested an antibiotic were more likely to receive one based on the urgency of how symptoms were reported and the length of symptoms (Strumilo, Chlabicz, Pytel-Krolczuk, Marcinowicz, Rogowska-Szadkowski & Milewska, 2016). Providers prescribed antibiotics even if they believed the sinusitis to be viral (Strumilo et al., 2016). These factors indicate wanting to have patients leave satisfied.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Even though antibiotics were prescribed 93% of the time in this study sample non-pharmacological measures were recommended in 86% of the cases. There was no pattern of recommended treatments, with many including both prescribed and recommended medications as well as non-pharmaceutical management techniques. These therapies are recognized by the American Academy of Family Physicians (AAFP) 2015 guideline for sinusitis, though there is not sufficient evidence to support the use of oral antihistamines, guaifenesin and dextromethorphan (AAFP, 2015).

The antibiotics prescribed correlated with those recommended by AAFP (2015). The AAFP considers Amoxicillin with clavulanic acid first-line therapy and macrolides not recommended for initial therapy, due to high levels of resistance and treatment failure (2015). Doxycycline or fluoroquinolones are recommended for penicillin allergy, but not first line due to adverse events being higher (AAFP, 2015).

During provider interviews the diagnosis of sinusitis was typically established from the history and physical exam. Identifying sinus/face pain, fever, ear pain, and purulent drainage/rhinorrhea were correlated with a sinus infection, as well as symptoms that lasted over one week differentiating viral from bacterial infection. This conflicts with how antibiotics were prescribed as 88% of the sample received antibiotics for symptoms less than 7 days and physical findings did not support symptoms. Providers stated patients determined they had sinusitis based on the color of nasal drainage, waking up with any symptoms, previous sinus infections and simply being miserable. All of this is complicated with the fear of missing work. This correlated with the Strumilo et al. (2016) study that discovered patients emphasized the need for quick recovery, severity of symptoms, recalled family members and past experiences that necessitated antibiotic use in order to pressure providers into prescribing antibiotics.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

During provider interviews they cited a lack of provider and patient education on best treatment practices as barriers towards not prescribing antibiotics. However, providers were able to identify the conditions in acute sinusitis that would warrant an antibiotic prescription. It is possible the underlying issue is not provider education but trying to meet patient satisfaction. Patient expectations were identified as contributing to inappropriate antibiotic prescriptions. Providers voiced frustration with matching appropriate treatment with patient satisfaction. This is a problem throughout healthcare with patient satisfaction driving treatment. In facilities where patient satisfaction scores impacted provider compensation or had negative professional consequences, half of providers reported prescribing inappropriate antibiotics (Zgierska, Rabago & Miller, 2014).

The changes in reimbursement to include patient satisfaction makes it difficult for providers to ignore patient requests as their expectations of the visit will influence providers income (Zgierska, Rabago & Miller, 2014). Patients are able to use internet medical consultation services such as CallonDoc to pick their problem and receive treatment, which includes antibiotics (CallonDoc, 2017). These services undermine providers in treating sinusitis using best practice but also brings into question the provider patient relationship. The internet provides so much information that patients have become their own providers. These services are just unfolding but experience with telemedicine has shown the overprescribing of antibiotics (NIH Research Matters, 2019).

Providers identified increasing patient knowledge in overcoming the barriers to prescribing antibiotics with focus on the hazards of taking antibiotics for viral illnesses. Interventions that could be utilized by providers to decrease the overprescribing of antibiotics for sinusitis include personalized patient education and resources to improve provider

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

communication skills (Dobson et al., 2017; Chazan et al., 2007; Vinnard et al., 2013; Smeets et al., 2009). During provider interviews many similar ideas resulted including use of media, discussing education for patients on online patient portals, training and scripting for educating patients on guidelines, and more efficient use of the after-visit summary (AVS). Utilizing these methods will allow patients to receive education prior to visits and provide more education to providers.

Delayed prescribing is a tool that could be utilized to address overprescribing of antibiotics in treating acute sinusitis. It empowers patients to fill antibiotic prescriptions if parameters are met (Hoyt et al., 2010). This allows providers to meet patient expectations of providing an antibiotic, but delays the use early in the diagnosis of an unnecessary antibiotic. Symptoms will hopefully resolve on their own and prevents patients from seeking after-hours care or going to other providers for antibiotics (Hoyt et al., 2010).

Education on the current guideline needs to be effectively disseminated to the public prior to coming into the office. This could detour an expectation of antibiotics and possibly prevent an unnecessary appointment being made. Ninety-eight percent of rhinosinusitis infections are viral, not bacterial and do not require the use of an antibiotic (CDC, 2017a).

Antibiotic stewardship works to avoid antibiotic misuse in the outpatient setting. The goal of antibiotic stewardship is to optimize the treatment of infections while decreasing antibiotic use (CDC, 2017a). Organizations that utilize antibiotic stewardship programs will contribute to saving millions of dollars in the healthcare system (Beardsley et al., 2012). Within the adult population setting programs exist and can be implemented to effectively reduce antibiotic misuse. The Kentucky Outpatient Antimicrobial Stewardship Implementation Workbook has links, resources and education that can be downloaded and utilized. This is

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

mainly used in pediatric settings, but the goal is to move toward adult outpatient settings within Louisville, Kentucky.

Limitations

There were several limitations to this study. The sample was not diverse as the majority were Caucasian, and most had private insurance. The clinics were located in an urban area, and could not reflect issues of those in a rural setting. There was no diversity in the type of healthcare setting where patients were seen for example, urgent treatment centers and emergency departments (ED) were not considered.

Patient's perceptions were not elicited limiting knowledge of how they define acute sinusitis and the expected treatments. Patient knowledge on the hazards of taking antibiotics was not assessed. Equally non-pharmaceutical treatments were not explored with patients which may have contributed to why they presented for an antibiotic. A further limitation was the number of providers not willing to participate in the interview. Only 40% of providers were able to accommodate the interview which limited the variation in responses. Though the provider interviews were conducted at their convenience it still required making time in their day during their complex schedule. There were also concerns that patient satisfaction interfered with their ability to treat by guidelines. This may have influenced overall willingness to be interviewed.

Accuracy in how visits were documented could not be verified because of the use of scripted phrases in their charting. Within the EMR exists phrases with drop-down options allowing the provider to choose what needs to be charted related to a sinus infection. This can contribute to over charting resulting in more patients appearing to meet the criteria of a bacterial sinus infection.

Implications for Practice

The basis of this study is a foundation for future research surrounding the barriers to avoiding antibiotic use. Many of the provider's thoughts centered on educating patients about acute sinusitis and antibiotic use. There may be opportunity to provide education prior to a provider visit for patients to understand best treatment options. This could be combined with a next day follow-up phone call to check on patient symptoms, offer further reassurance and recommend non-pharmaceutical treatment.

The use of watchful waiting was not utilized throughout this study. Research has demonstrated benefit to its use and finding ways to integrate it into provider practice could be valuable. Delayed prescribing could be utilized when patients are being prescribed antibiotics before seven days of symptom onset. This would need to be evaluated to determine its efficacy and whether or not prescriptions are filled too early or filled at all.

Patient satisfaction now contributes to provider reimbursement. Patients may not be satisfied if they do not feel adequately treated, which often includes the use of antibiotics. This variable was not fully explored in this study and may have influenced how providers prescribe antibiotics.

There needs to be community wide initiatives that center on antibiotic misuse. The Louisville Metro Department of Public Health and Wellness would be a good resource to utilize and partner with. Utilizing the partnership to post flyers within hospital and offices, erect billboards around the city and speak at healthcare and community events. A partnership exists among Kentucky Cabinet for Health and Family Services with the University of Louisville and Norton Healthcare that is responsible for the creation of the Kentucky Outpatient Antimicrobial Stewardship Implementation Workbook, showing an interest in and work around antibiotic

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

stewardship. This relationship needs to continue and develop expanding to include the adult representatives within Healthcare.

Conclusion

In 2018 Kentucky led the country in the prescribing of antibiotics exceeding 1270 prescriptions per 1000 patients. The over prescribing of antibiotics is complex, complicated by patient demand and patient satisfaction, patients not knowing the risk of antibiotics, and providers not being skilled in countering what the patient's wishes are for treatment. There has to be a commitment within practices and the use of social media and public education on the appropriateness of antibiotics. Through this study the overprescribing of antibiotics was noted based on a review of the reported symptoms and physical exam documentation. Providers verified the need for patient education, but this must come before the illness versus after diagnosis. Utilizing the data accrued through this study, education can be created and disseminated to patients before they are seen for acute sinusitis in the office.

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Appendix 1

Data Collection Acute Adult Sinusitis

Unique ID	Age	Gender	Race	Insurance Type	Number of days since symptom onset	Symptoms related to sinusitis	Treatment
Continuous	Continuous	Nominal	Nominal	Nominal	Interval	Nominal	Nominal
1A							
1B							
1C							
1D							
1E							
1F							
1G							
1H							
1I							

Appendix 2

Interview Questions

Participant ID:

Norton Healthcare Provider:

1. How many years have you been practicing as a Provider?

2. How do you diagnosis acute sinusitis/rhinosinusitis?

3. How do you treat sinusitis/rhinosinusitis? When do you treat it as bacterial vs viral?

4. How do you think patients come to the conclusion they have a bacterial infection?

5. When treating acute sinusitis with symptoms lasting longer than 7 days what antibiotics do you typically prescribe as first-line therapy?

Amoxicillin

Amoxicillin with clavulanate

Doxycycline

Fluoroquinolone

Clindamycin/Cephalosporin

Macrolide

Trimethoprim/sulfamethoxazole

Other:

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

6. Recommendations when treating acute sinusitis with symptoms lasting less than 7 days.

Watchful waiting	Topical decongestants
Analgesics	Oral decongestants
Topical intranasal steroids	Oral antihistamines
Nasal saline irrigation	Guaifenesin
Intranasal saline	Dextromethorphan

Other:

7. What is the biggest barrier avoiding prescribing antibiotics in treating acute rhinosinusitis?

Patient demand

Lack of knowledge

Patient satisfaction

Lack of follow-up availability

Other:

8. What would be most helpful in overcoming these barriers?

Education on clinical guidelines for providers

More same day appointment slots

Training and scripting for educating patients on guidelines

Education for patients on Norton eCare

Education for patients on utilizing MYCHART messaging

Other:

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Table 1. *Demographic Information* (N=150)

Characteristic	Mean (SD); median (range); n (%)
Gender	
Male	51 (24%)
Female	99 (66%)
Race	
White	133 (88%)
African American	15 (10%)
Hispanic	1 (1%)
Other	1 (1%)
Age	
20-29	15 (10%)
30-39	24 (16%)
40-49	24 (16%)
50-59	46 (30%)
60-69	19 (13%)
70-79	15 (10%)
80-89	6 (4%)
92	1 (1%)
	(SD-51)
Insurance	
Anthem	67 (45%)
United Healthcare	13 (9%)
Cigna	4 (3%)
Passport (Medicaid)	15 (8%)
Medicare	24 (16%)
Health Insurance Exchange	3 (2%)
Humana	18 (12%)
Aetna	3 (2%)
Tricare	1 (1%)
Self-Pay/None	1 (1%)
Other	1 (1%)

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Table 2. *Symptom Results* (n=132)

Characteristic	Mean (SD); median (range); n (%)
Number of days since symptom onset	
1-6	33 (25%)
7-9	61 (46%)
10-14	25 (19%)
21	6 (5%)
21+	7 (5%)
	(SD-7)
	(Range-7)

Table 3. *Symptom Characteristics* (N=150)

Characteristic	Mean (SD); median (range); n (%)
Symptom	
Fever	11 (7%)
Purulent rhinorrhea	82 (55%)
Facial pain, pressure or fullness	124 (83%)
Maxillary toothache	3 (2%)
Congestion	118 (79%)
Nasal obstruction	47 (31%)
Physical findings	
Facial tenderness	97 (65%)
Rhinorrhea/purulent drainage	38 (25%)
Mucosal edema/nasal congestion	26 (17%)

Table 4. *Associations between symptoms and antibiotic prescribed before or after 7 days* (N=150)

	Antibiotics before 7 days symptoms	Antibiotics after 7 days symptoms	P (Fisher's Exact Test)
	Mean (SD) or n (%)	Mean (SD) or n (%)	
Symptom			
Fever	4 (14%)	7 (7%)	0.286
Purulent rhinorrhea	19 (66%)	49 (52%)	0.286
Facial pain, pressure or fullness	24 (83%)	81 (86%)	0.764
Congestion	21 (72%)	78 (83%)	0.282
Nasal obstruction	6 (21%)	26 (28%)	0.629

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Table 5. Associations between symptoms (N=150)

	Facial pain, pressure or fullness occurring	Facial pain, pressure or fullness not occurring	P (Fisher's Exact Test)
	Mean (SD) or n (%)	Mean (SD) or n (%)	
Symptoms			
Fever	11 (7%)	0 (0%)	0.213
Purulent rhinorrhea	75 (50%)	7 (5%)	.002
Congestion	102 (68%)	16 (11%)	.032
Nasal obstruction	38 (25%)	9 (6%)	0.816
	Congestion occurring	Congestion not occurring	P (Fisher's Exact Test)
	Mean (SD) or n (%)	Mean (SD) or n (%)	
Symptoms			
Fever	11 (7%)	0 (0%)	0.121
Purulent rhinorrhea	66 (44%)	16 (11%)	0.556
Facial pain, pressure or fullness	102 (68%)	22 (15%)	.032
Nasal obstruction	32 (21%)	15 (10%)	.052
	Documented physical finding occurring	Documented physical finding not occurring	P (Fisher's Exact Test)
	Mean (SD) or n (%)	Mean (SD) or n (%)	
Symptoms			
Facial tenderness	97 (78%)	27 (22%)	<.001
Rhinorrhea/purulent drainage	32 (39%)	50 (61%)	<.001
Mucosal edema/nasal congestion	5 (12%)	38 (88%)	0.794

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Table 6. *Descriptive summary of Antibiotic Usage (N=150)*

Characteristic	Mean (SD); median (range); n (%)
Antibiotic Prescribed	139 (93%)
Antibiotic Type	
Amoxicillin	7 (5%)
Amoxicillin with clavulanate	50 (36%)
Doxycycline	9 (6%)
Fluoroquinolone	15 (11%)
Cephalosporin	22 (16%)
Macrolide	36 (26%)
Number of days on Antibiotics	
3	1 (1%)
5	35 (25%)
7	41 (30%)
10	56 (40%)
14	6 (4%)
	(SD-8)
	(Range-7)

Table 7. *Treatment Results (N=150)*

Characteristic	Mean (SD); median (range); n (%)
Symptom Management	
Neti-pot/nasal saline wash	9 (6%)
Oral antihistamines	43 (29%)
Guaifenesin/Mucolytic/Mucinex	39 (26%)
Oral decongestant	13 (9%)
Analgesics	16 (11%)
Topical Intranasal Steroids	28 (19%)
Intranasal Saline	34 (23%)
Cough Medicine/Dextromethorphan	20 (13%)
Fluids	57 (38%)
Oral steroids	37 (25%)
Intramuscular steroids	13 (9%)
Rest	44 (30%)

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

Table 8. Associations between treatment options (N=150)

	Given with oral antihistamine	Not given with oral antihistamine	p
	Mean (SD) or n (%)	Mean (SD) or n (%)	
Treatments			
Analgesics	12 (8%)	4 (3%)	<.001
Topical Intranasal Steroids	19 (13%)	9 (6%)	<.001
Intranasal Saline	14 (9%)	20 (13%)	.085
Cough Medicine/ Dextromethorphan	20 (13%)	0 (0%)	<.001
Fluids	18 (12%)	39 (26%)	0.579
	Given with fluids	Not given with fluids	p
	Mean (SD) or n (%)	Mean (SD) or n (%)	
Treatments			
Oral antihistamines	18 (12%)	25 (17%)	0.579
Guaifenesin/Mucinex	19 (13%)	20 (13%)	0.127
Oral Steroids	20 (13%)	17 (11%)	.031
Analgesics	13 (9%)	3 (2%)	<.001
Topical Intranasal Steroids	12 (8%)	16 (11%)	0.667
Intranasal Saline	26 (17%)	8 (5%)	<.001
Cough Medicine/ Dextromethorphan	15 (10%)	5 (3%)	<.001
Rest	44 (29%)	0 (0%)	<.001

References

- American Academy of Family Physicians. (2015). Adult Sinusitis. Retrieved from <https://www.aafp.org/patient-care/clinical-recommendations/all/adult-sinusitis.html>
- Association for Professionals in Infection Control and Epidemiology. (N.D.). Antimicrobial stewardship. Retrieved from <https://apic.org/Professional-Practice/Practice-Resources/Antimicrobial-Stewardship>
- Beardsley, J.R., Williamson, J.C., Johnson, J.W., Luther, V.P., Wrenn, R.H. and Ohl, C.C. (2012) Show Me the Money: Long-Term Financial Impact of an Antimicrobial Stewardship Program. *Infection Control and Hospital Epidemiology*, 33(4), pp.398-400. <http://dx.doi.org/10.1086/664922>
- Bonevski, B., Randell, M., Paul, C., Chapman, K., Twyman, L., Bryant, J., Brozek, I. & Hughes, C. (2014). Reaching the hard-to-reach: A systematic review of strategies for improving health and medical research with socially disadvantaged groups. *BMC Medical Research Methodology*, 14(42), 1-29.
- Boston University School of Public Health. (2018). The Health Belief Model. Retrieved from <http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories2.html>
- CallonDoc. (2017). How It Works. Retrieved from <https://www.callondoc.com/en/how-it-works>
- Chazan, B., Turjeman, RB., Frost, Y., Besharat, B., Tabenkin, H., Stainberg, A. & Raz R. (2007). Antibiotic consumption successfully reduced by a community intervention program. *The Israel Medical Association Journal*, 9 (1), 16-20. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/17274349>
- Dobson, E., Klepser, M., Pogue, J., Labreche, M., Adams, A., Gauthier, T., Turner, R., Su, C., Jacobs, D. & Suda, K. (2017). Outpatient antibiotic stewardship: Interventions and opportunities. *Journal of the American Pharmacists Association*, 57 (4), 464-473. <https://doi.org/10.1016/j.japh.2017.03.014>
- Drekonja, D., Filice, G., Greer, N., Olson, A., MacDonald, R., Rutks, I. & Witt, T. (2014). Antimicrobial Stewardship Programs in Outpatient Settings: A Systematic Review. Washington (DC):Department of Veterans Affairs (US), 2014 Feb. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK274574/>

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

- Fischer, F., Lange, K., Klose, K., Greiner, W. & Kraemer, A. (2016). Barriers and Strategies in Guideline Implementation-A Scoping Review. *Healthcare (Basel)*, 4(3), 36. Doi:10.3390/healthcare4030036
- Fleming-Dutra KE, Hersh AL, Shapiro DJ, et al. (2016). Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011. *JAMA*, 315(17),1864–1873. doi:10.1001/jama.2016.4151
- Hoye, S., Frich, J. & Lindboek, M. (2010). Delayed prescribing for upper respiratory tract infections: a qualitative study of GPs' views and experiences. *British Journal of General Practice* 2010. 60 (581), 907-912. DOI: <https://doi.org/10.3399/bjgp10X544087>
- Kentucky Cabinet for Health and Family Services. (2018). Kentucky Outpatient Antimicrobial Stewardship Implementation Workbook. Retrieved from <https://louisville.edu/medicine/departments/pediatrics/divisions/child-adolescent-research-design/KYAbxAwareness/kentucky-antibiotic-awareness-implementation-workbook>
- Lee, C.R., Cho, I.H., Jeong, B.C., Lee, S.H. (2013). Strategies to minimize antibiotic resistance. *International Journal of Environmental Research and Public Health*, 10(9), pp. 4274-4305. doi: 10.3390/ijerph10094274.
- Neighborhood Scout. (2019). St. Matthews, KY Demographic Data. Retrieved from <https://www.neighborhoodscout.com/ky/st-matthews/demographics>
- NIH Research Matters. (2019). Antibiotics prescribed more often during telemedicine visits. Retrieved from <https://www.nih.gov/news-events/nih-research-matters/antibiotics-prescribed-more-often-during-telemedicine-visits>
- Norton Healthcare. (2018). About Norton Healthcare. Retrieved from <https://nortonhealthcare.com/about-us/>.
- Norton Healthcare. (2018). Norton Medical Group. Retrieved from <https://nortonhealthcare.com/about-us/norton-medical-group>.
- Ohl, C. & Luther, V. (2014). Health Care Provider Education as a Tool to Enhance Antibiotic Stewardship Practices. *Infectious Disease Clinics of North America*, 28 (2), 177-193.
- Programs: Overcoming 5 Barrier to High Performance. *Health IT Outcomes*. Retrieved from <https://www.healthitoutcomes.com/doc/antimicrobial-stewardship-programs-overcoming-barriers-to-high-performance-0001>
- Rosenfeld, R.M. (2016). Acute Sinusitis in Adults. *The New England Journal of Medicine*, 375, 962-970. doi: 10.1056/NEJMcp1601749
- Smeets, HM., Kuyvenhoven, MM., Akkerman, AE., Welschen, I., Schoutenn, GP., van Essen, GA. & Verheij, TJ. (2009). Intervention with educational outreach at large scale to

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

- reduce antibiotics for respiratory tract infections: a controlled before and after study. *Family Practice*. 26 (3), 193-187. doi: 10.1093/fampra/cmp008.
- Strumilo, J., Chlabicz, S., Pytel-Krolczuk, B., Marcinowicz, L., Rogowska-Szadkowska, D., & Milewska, A. J. (2016). Combined assessment of clinical and patient factors on doctors' decisions to prescribe antibiotics. *BMC Family Practice*, 17, 63. doi: 10.1186/s12875-016-0463-6
- Thompson, A., Anisimowicz, Y., Miedema, B. Hogg, W., Wodchis, W., & Aubrey-Bassler, K. (2016). The influence of gender and other patient characteristics on health care-seeking behaviour: a QUALICOPC study. *BMC Family Practice*, 17(38). Doi:10.1186/s12875-016-0440-0
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2019). Antibiotic Use in Outpatient Settings, 2017. Retrieved from <https://www.cdc.gov/antibiotic-use/stewardship-report/outpatient.html>
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2018a). Antibiotic/ Antimicrobial Resistance. Retrieved from <https://www.cdc.gov/drugresistance/>
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2018b). Antibiotic Resistance Questions and Answers. Retrieved from <https://www.cdc.gov/antibiotic-use/community/about/antibiotic-resistance-faqs.html>
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2017a). Adult Treatment Recommendations. Retrieved from <https://www.cdc.gov/antibiotic-use/community/for-hcp/outpatient-hcp/adult-treatment-rec.html>
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2017b). Summary Health Statistics: National Health Interview Survey, 2017. Retrieved from https://ftp.cdc.gov/pub/Health_Statistics/NCHS/NHIS/SHS/2017_SHS_Table_A-2.pdf
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2016a). Core Elements of Outpatient Antibiotic Stewardship. Retrieved from https://www.cdc.gov/mmwr/volumes/65/rr/rr6506a1.htm?s_cid=rr6506a1_e
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2016b). CDC:1 in 3 antibiotic prescriptions unnecessary. Retrieved from <https://www.cdc.gov/media/releases/2016/p0503-unnecessary-prescriptions.html>
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2016c). Antibiotic Prescriptions Dispensed in U.S. Community Pharmacies Per 1000 Population. Retrieved from <https://gis.cdc.gov/grasp/PSA/AUMapView.html>

TREATING ADULT SINUSITIS IN AN OUTPATIENT SETTING

- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2015). Antibiotic Prescribing and Use in Hospitals and Long-Term care. Retrieved from <https://www.cdc.gov/antibiotic-use/healthcare/implementation/core-elements.html#track>
- U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2013). Untreatable: Report by CDC details today's drug-resistant health threats. Retrieved from <https://www.cdc.gov/media/releases/2013/p0916-untreatable.html>.
- Vinnard, C., Linkin, DR., Localio, AR., Leonard, CE., Teal, VL., Fishman, NO. & Hennessy, S. (2013). Effectiveness of interventions in reducing antibiotic use for upper respiratory infections in ambulatory care practices. *Population Health Management*. 16 (1), 22-27. doi: 10.1089/pop.2012.0025.
- World Health Organization. (2018). Antimicrobial resistance. Retrieved from www.who.int/en/news-room/fact-sheets/detail/antimicrobial-resistance
- World Population Review. (2019). La Grange, Kentucky Population 2019. Retrieved from <http://worldpopulationreview.com/us-cities/la-grange-ky-population/>
- Zgierska, A., Rabago, D., & Miller, M. (2014). Impact of patient satisfaction ratings on physicians and clinical care. *Patient Preference and Adherence*, 8, 437-446. doi: 10.2147/PPA.S59077