Appropriateness of Antibiotic Use in Acute Sinusitis in Adults at FMC

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INTRODUCTION

Initiated in 2012, *Choosing Wisely* is a campaign led by the American Board of Internal Medicine (ABIM) Foundation that aims to mitigate the overutilization of medical resources and foster the doctor-patient relationship by promoting healthcare that is evidence-based, non-redundant, harm-free, and necessary. To accomplish this task, 75 different American medical specialty societies, including the American Academy of Family Physicians (AAFP), collaborated in the creation of a list of 490 recommendations regarding commonly overutilized tests, procedures, and treatments. The list is entitled "Things Providers and Patients Should Question." [1][2]

One such recommendation on the list is: "Don't routinely prescribe antibiotics for acute mild-to-moderate sinusitis unless symptoms last for seven or more days, or symptoms worsen after initial clinical improvement. Symptoms must include discolored nasal secretions and facial or dental tenderness when touched."[3]

Acute sinusitis, inflammation of the nasal and paranasal sinus cavity mucosa, is a clinically diagnosed and usually self-limited illness caused by a viral or bacterial infection, allergy, or irritant.[4] More than 4.3 million adults annually experience symptoms of sinusitis, which include nasal congestion/obstruction, purulent nasal discharge, maxillary tooth pain, facial pain/pressure, fever, fatigue, cough, hyposmia or anosmia, ear pressure/ fullness, headache, and halitosis,[5] resulting in 16 million office visits,[6] up to 21% of antibiotic prescriptions,[7] and $5.8 billion in health care costs annually.[8] Most (90-98%) cases of acute sinusitis diagnosed in the ambulatory setting are caused by viral upper respiratory infections (URI's) and resolve without antibiotic treatment.[9]

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[1] Our Mission.(n.d.).Retrieved from http://www.choosingwisely.org/our mission/

[2] Facts and Figures.(n.d.).Retrieved from http://www.choosingwisely.org/our-mission/facts-and-figures/

[3] AAFP-Antibiotics for Sinusitis.(2012, April 4).Retrieved from http://www.choosingwisely.org/clinician-lists/american-academy-family-physicians-antibiotics-for-sinusitis/

[4] Chow AW, Benninger MS, Brook I, et al. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. *Clin Infect Dis*. 2012;54(8):e72-e112

[5] Harris AM, Hicks LA, Qaseem A, High Value Care Task Force of the American College of Physicians and for the Centers for Disease Control and Prevention. Appropriate Antibiotic Use for Acute Respiratory Tract Infection in Adults: Advice for High-Value Care From the American College of Physicians and the Centers for Disease Control and Prevention. Ann Intern Med 2016; 164:425

[6] AAFP-Antibiotics for Sinusitis.(2012, April 4).Retrieved from http://www.choosingwisely.org/clinician-lists/american-academy-family-physicians-antibiotics-for-sinusitis/

[7] Ahovuo-Saloranta A, Rautakorpi UM, Borisenko OV, Liira H, Williams Jr JW, Mäkelä M. Antibiotics for acute maxillary sinusitis in adults. Cochrane Database of Systematic Reviews 2014, Issue 2. Art. No.: CD000243. DOI: 10.1002/14651858.CD000243.pub3.

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Review of treatment guidelines published by multiple individuals and organizations (including AAFP, American College of Physicians (ACP), American Society of Internal Medicine, Centers for Disease Control, Infectious Disease Society of America (IDSA)) and as summarized in the *Choosing Wisely* recommendation show that there is overwhelming consensus on the appropriate use and timing of antibiotics for sinusitis; antibiotics should not be routinely used in acute mild to moderate sinusitis.[10][11][12][13][14] Randomized controlled trials and meta-analyses have supported the guidelines by demonstrating that antibiotic use results in symptom reduction that is slightly better to no different than placebo. In addition, these studies found that antibiotic use results in more adverse effects. All studies reviewed concluded that antibiotics should not be used as first-line treatment in uncomplicated acute sinusitis.[15][16][17][18][19] Despite the evidence against early antibiotic use, antibiotics are still prescribed in over 80% of cases in the outpatient setting.[20]

Consequently, there have been a number of studies over the years that have evaluated antibiotic prescription patterns (rate as well as type of antibiotic prescribed) and reasons for inappropriate antibiotic prescription (e.g., poor physician diagnostic skills, patient expectations, physician expectations).[21][22][23][24][25][26][27] Prior studies that shared our objective (to determine rate of

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[10] Peters AT, et al. Diagnosis and management of rhinosinusitis: a practice parameter update. *Ann Allergy Asthma Immunol*. 2014; 113(4): 347-385.

[11] Chow AW, Benninger MS, Brook I, et al. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. *Clin Infect Dis*. 2012;54(8):e72-e112

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[20] Gill JM, Fleischut P, Haas S, Pellini B, Crawford A, Nash DB. Use of antibiotics for adult upper respiratory infections in outpatient settings: a national ambulatory network study. Fam Med 2006; 38:349–54.

[21] Scott JG, et al. "Antibiotic Use in Acute Respiratory Infections and the Ways Patients Pressure Physicians for a Prescription." *Journal of Family Practice*, Oct. 2001, p. 853.

[22] Fairlie T, Shapiro DJ, Hersh AL, Hicks LA. National Trends in Visit Rates and Antibiotic Prescribing for Adults With Acute Sinusitis. *Arch Intern Med.* 2012;172(19):1513-1514. doi:10.1001/archinternmed.2012.4089

[23] Gerber, et al. Variation in Antibiotic Prescribing Across a Pediatric Primary Care Network. J Pediatric Infect Dis Soc. 2015 Dec; 4(4): 297–304. Published online 2014 Oct 30. doi: 10.1093/jpids/piu086

[24] Fleming-Dutra, et al. Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011.JAMA. 2016 May 3;315(17):1864-73. doi: 10.1001/jama.2016.4151.

[25] Grijalva, et al. Antibiotic Prescription Rates for Acute Respiratory Tract Infections in US Ambulatory Settings. JAMA. 2009 Aug 19;302(7):758-66. doi: 10.1001/jama.2009.1163.

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appropriate antibiotic prescription) used data from databases (e.g., Medical Quality Improvement Consortium),[28] surveys (e.g., National Ambulatory Medical Care Survey, National Hospital Ambulatory Medical Care Survey),[29][30][31][32] and multi-clinic EMR review[33] to calculate rates of appropriate antibiotic prescriptions

OBJECTIVES

This study seeks to evaluate the antibiotic prescription pattern, specifically the rate of appropriate antibiotic use, in cases of adults with sinusitis at the UnityPoint Methodist Family Medical Center (FMC), so that more relevant recommendations for improving antibiotic stewardship, decreasing cost, and protecting patients from unnecessary treatment at FMC can be made. In evaluating the appropriateness of antibiotic use, investigators will determine if *Choosing Wisely's* criteria for prescribing antibiotics for the treatment of acute sinusitis was met for each case that was prescribed antibiotics at FMC. By measuring FMC's ability to appropriately treat acute sinusitis, the study's findings will either reinforce current prescribing practices at FMC or encourage the formal or informal implementation of new strategies to create a more cost-effective, conscientious, evidence-based practice in regards to treating acute sinusitis.

It is expected that the majority of patients, who were diagnosed with and prescribed antibiotics for acute sinusitis at FMC between January 1, 2014 and December 31, 2016, should not have received antibiotics according to the *Choosing Wisely* recommendation.

METHODS

A retrospective review of medical records at UnityPoint Methodist Family Medical Center (FMC) was conducted to identify patients who qualified for inclusion into this study. Inclusion criteria was defined as the following: males or females between the ages of 18 and 65 diagnosed with acute sinusitis or a variant of acute sinusitis (ICD 10 codes: J01.00, J01.10, J01.20, J01.30, J01.40, J01.80, J01.90) by residents, attendings, mid-level providers at FMC from January 1, 2014 to December 31, 2016. (The time frame was initially January 1, 2016 to December 31, 2016 but was expanded to include calendar years 2014 and 2015 due a limited number of qualifying cases after manual review). Subjects were excluded from the study if they were pregnant at the time of diagnosis, diagnosed with chronic sinusitis (ICD-10 codes J32.0, J32.1,

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[29] Fleming-Dutra, et al. Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011.JAMA. 2016 May 3;315(17):1864-73. doi: 10.1001/jama.2016.4151.

[30] Fairlie T, Shapiro DJ, Hersh AL, Hicks LA. National Trends in Visit Rates and Antibiotic Prescribing for Adults With Acute Sinusitis. *Arch Intern Med.* 2012;172(19):1513-1514. doi:10.1001/archinternmed.2012.4089

[31] Grijalva, et al. Antibiotic Prescription Rates for Acute Respiratory Tract Infections in US Ambulatory Settings. JAMA. 2009 Aug 19;302(7):758-66. doi: 10.1001/jama.2009.1163.

[32] Smith SS, et al. Variations in antibiotic prescribing of acute rhinosinusitis in United States ambulatory settings. Otolaryngol Head Neck Surg. 2013 May;148(5):852-9. doi: 10.1177/0194599813479768. Epub 2013 Mar 5.

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J32.2, J32.3, J32.4, J32.8, J32.9), or had recurrent sinusitis (diagnosed with acute sinusitis on 4 or more occasions in 1 year or using ICD-10 codes J01.01, J01.11, J01.21, J01.31, J01.41, J01.81, J01.91). Subsequent visits for the same episode of acute sinusitis by the same patient were also excluded; initial visits for each discrete episode of acute sinusitis (less than 4 per year) were included in the study.

A request was submitted to Dr. David Trachtenbarg for a list of records that met the inclusion criteria. Data collection personnel identified and shared the resultant list of records (which included patient identifiers - name, date of birth - along with diagnosis name and code, date and type of encounter, department name) with the principal investigators. Both investigators reviewed and applied the exclusion criteria to finalize the list of records that were ultimately included in the study. This resulted in a population size of 125 outpatient non-pregnant adults aged 18 to 65 years old.

Individual medical records (specifically encounters labeled “Office Visit”, “Procedure Visit”, “Orders Only”, “Telephone”, and “Refill”) from the start date (January 1, 2014) to the end date (December 31, 2016) related to the diagnosis of acute sinusitis for those subjects that were ultimately chosen for inclusion in the study were reviewed by both investigators to determine if *Choosing Wisely’s* recommended criteria for prescribing antibiotics (symptoms lasted 7 or more days OR symptoms worsened after initial clinical improvement; symptoms must have included discolored nasal discharge and facial/dental tenderness to palpation) were met prior to antibiotics being prescribed (if antibiotics were prescribed at all).

Data was recorded on spreadsheets. Recorded data included the presence or absence of discolored nasal discharge, facial/dental tenderness to palpation lasting more than 7 days, or symptoms worsened after initial clinical improvement and whether or not an antibiotic was prescribed for each case (randomly numbered). The total number of cases of sinusitis diagnosed, the total number of cases where an antibiotic was prescribed, and the total number of cases where supportive care was prescribed was also calculated and recorded. The percentage of cases treated appropriately based on *Choosing Wisely’s* recommendation was calculated. See sample spreadsheet attached. No protected health information (PHI), personal identifiers, or identifying information for any subject was recorded in the spreadsheet, published, or maintained in a linked database. All data collected was classified as unlinked.

The data was submitted to statistician Yanzhi Wang for analysis. In this study, means and standard deviations will be reported for continuous variables, and percentage values will be reported for categorical variables. Chi-square tests will be used to check on the associations with categorical variables; t tests, or, when appropriate, nonparametric equivalent tests will be used to evaluate the associations with continuous variables. Other appropriate descriptive statistics, such as frequency, median may be used to summarize the data results. The ninety-five percent confidence interval will be calculated for the rate of appropriateness of antibiotics prescribing. $p <= 0.05$ is considered the statistical significant test. All statistical analyses will be performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA).

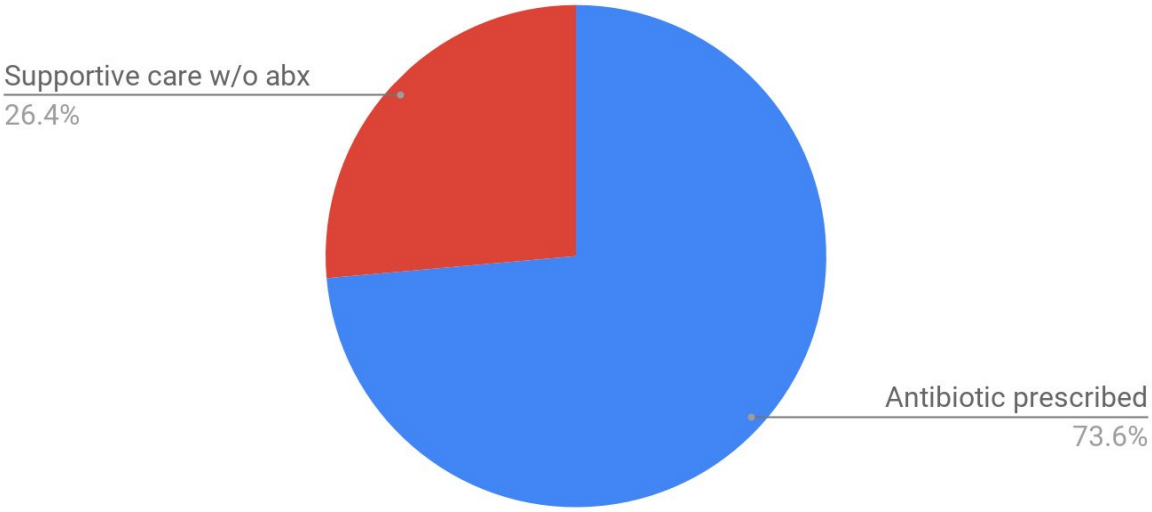
RESULTS

Primary Results:

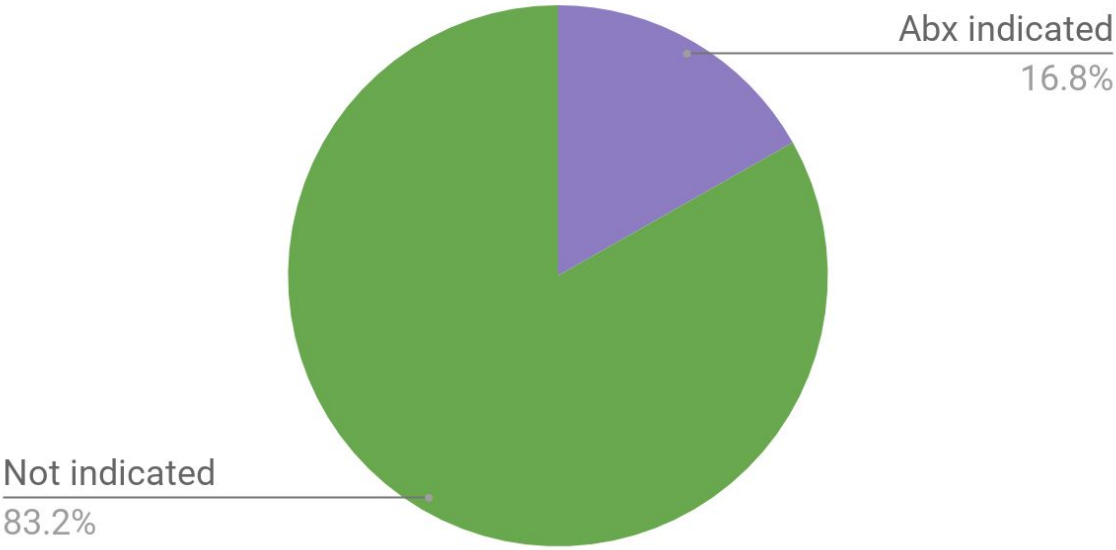
A total of 125 patient records were analyzed and included in the data set. An antibiotic was prescribed in 92 (73.6%) of reviewed cases, and supportive care without an antibiotic was prescribed in 33 (26.4%). When evaluated with regards to the Choosing Wisely guidelines, antibiotics were indicated in 21 (16.8%) of these cases.

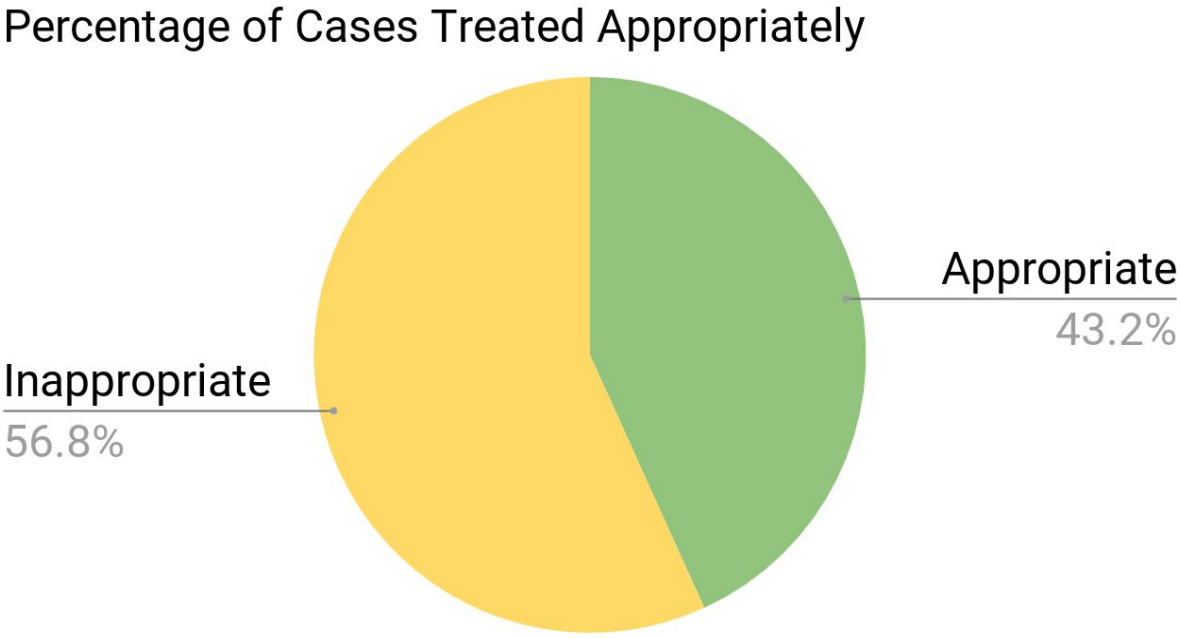
This data was then analyzed to determine in how many cases the provider prescribed appropriate treatment. In 54 cases (43.2%), the patient received the appropriate treatment. In 71 cases (56.8%), the patient received inappropriate treatment. In all 71 cases where the patient received inappropriate treatment, an antibiotic was prescribed, but not indicated. Of 33 cases where symptomatic care without antibiotics was prescribed, none met Choosing Wisely Criteria for treatment with antibiotics.

Treatment chosen of 125 total patient records evaluated



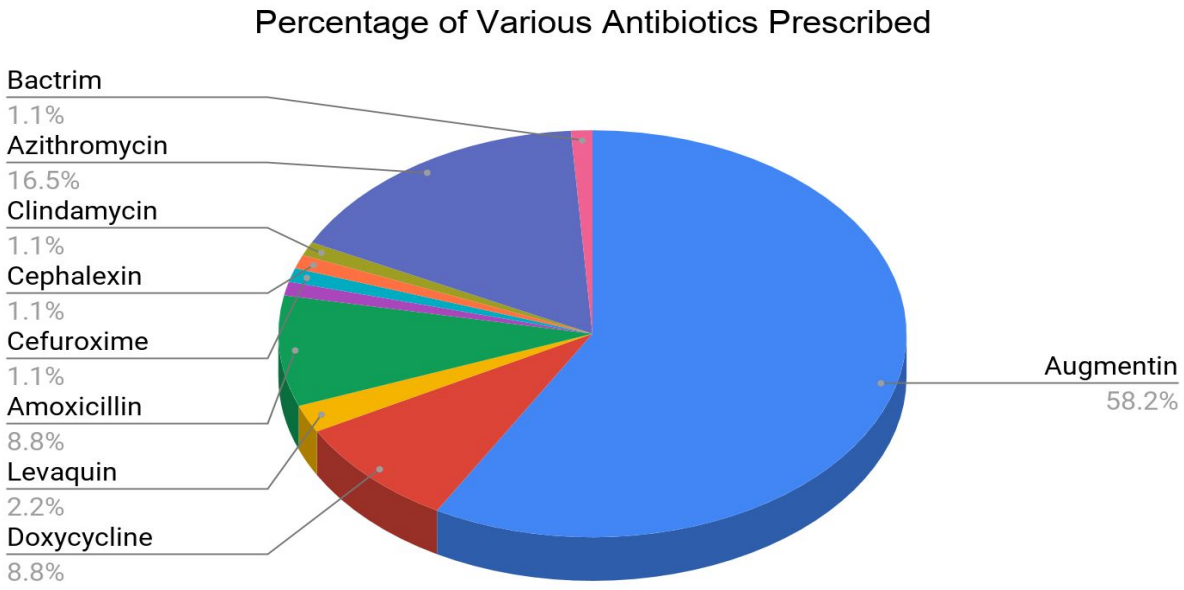
Of 125 patient encounters evaluated with sinus complaints, antibiotics were indicated in 21 of them




Percentage of Cases Treated Appropriately
Appropriate
43.2%
Inappropriate
56.8%

Secondary results:

Antibiotics prescribed in 92 cases (73.6%) of 125 cases. The particular antibiotic that was prescribed is unknown in 1 of the 92 cases.



DISCUSSION

Limitations:

There was noted to be significant variation of ICD-10 codes used by providers. This may have affected the patient charts included in this study. For example, patients seen and treated for sinusitis, but coded as a more general infection (i.e. J32.9), may not have been included in our data due to the way our patient encounters were extracted from the electronic medical record.

The study was limited to 3 years due to time constraints and availability of researchers to review the data. This limited our population size, and therefore the power of the study.

Documentation varied between providers. Many encounters did not comment on certain aspects of the Choosing Wisely criteria. Misinterpretation of the documentation may have affected the results of the study.

How do we compare?

Gill JM, et al. Use of antibiotics for adult upper respiratory infections in outpatient settings: a national ambulatory network study. Fam Med - In 81% of cases, an antibiotic was prescribed for acute sinusitis. This study did not evaluate in what percentage of those cases the antibiotic was indicated.[34]

Smith SS, et al. Variations in antibiotic prescribing of acute rhinosinusitis in United States ambulatory settings. Otolaryngol Head Neck Surg - In 82.3% of cases, an antibiotic was prescribed for acute sinusitis. This study did not evaluate in what percentage of those cases the antibiotic was indicated.[35]

Fairlie T, et al. National Trends in Visit Rates and Antibiotic Prescribing for Adults With Acute Sinusitis. Arch Intern Med - In 83% cases, an antibiotic was prescribed for acute sinusitis.[36]

Fleming-Dutra, et al. Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011. JAMA. - 353 of 506 (69.8%) antibiotic prescriptions were deemed to be appropriate. This study was not limited to sinusitis.[37]

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[34] Gill JM, Fleischut P, Haas S, Pellini B, Crawford A, Nash DB. Use of antibiotics for adult upper respiratory infections in outpatient settings: a national ambulatory network study. Fam Med 2006; 38:349–54.

[35] Smith SS, et al. Variations in antibiotic prescribing of acute rhinosinusitis in United States ambulatory settings. Otolaryngol Head Neck Surg. 2013 May;148(5):852-9. doi: 10.1177/0194599813479768. Epub 2013 Mar 5.

[36] Fairlie T, Shapiro DJ, Hersh AL, Hicks LA. National Trends in Visit Rates and Antibiotic Prescribing for Adults With Acute Sinusitis. *Arch Intern Med.* 2012;172(19):1513-1514. doi:10.1001/archinternmed.2012.4089

[37] Fleming-Dutra, et al. Prevalence of Inappropriate Antibiotic Prescriptions Among US Ambulatory Care Visits, 2010-2011.JAMA. 2016 May 3;315(17):1864-73. doi: 10.1001/jama.2016.4151.

Conclusion:

There is room for improvement in antibiotic stewardship at UnityPoint Methodist Family Medical Center. In order to decrease inappropriate antibiotic use, physicians should review Choosing Wisely guidelines, educate patients regarding antibiotics' unintended consequences and limited benefits of use when used inappropriately, and prepare themselves to address various patient pressures to prescribe antibiotics.

Future Research Implications:

A similar study could be performed and expanded to include a longer time period, and other clinical locations or settings. For example, similar research could be performed in a prompt care or emergency department setting, and expanded to multiple sites. Similar research could be performed for other common infections. Clinic or system wide programs to improve antibiotic stewardship of providers could be designed and implemented, and the effectiveness of these programs then studied.

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