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Sustainability of an Outpatient Antibiotic Stewardship Program

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Abstract

Problem: Antibiotic stewardship is an effort to evaluate and improve the use of antibiotics by providers and patients. Antibiotic stewardship programs (ASPs) promote the appropriate use of antibiotics. There is increasing evidence that supports the use of antibiotic stewardship programs in reducing antibiotic prescribing rates while continuing to maintain safe patient care. Research supports approaches with multiple interventions and ongoing commitment to antibiotic stewardship. However, information regarding long-term sustainability of antibiotic stewardship programs is lacking. The purpose of this quality assurance project was to assess long-term sustainability of a previously implemented ASP promoting appropriate prescribing of antibiotics for the treatment of viral upper respiratory tract infections (URIs) in an urgent care setting and identify measures to sustain long term interventions.

Methods: A retrospective medical record review from April 1-30, 2019, and April 1-30, 2020 was completed. Data were compared to data from the earlier project.

Results: A total of 240 charts were used in the retrospective chart review from April 2019 and 2020 for this study. The overall inappropriate antibiotic prescribing rate for 2019 was 6.7%, and for 2020 was 8.3%. These numbers were compared to the previously implemented program's results. The comparison resulted in a sustained improvement in the inappropriate prescribing of antibiotics for URIs.

Implications for practice: Implications for future practice include integrating antibiotic stewardship training and education into new provider onboarding, adding treatment algorithms for diagnoses not maintaining improvement, monthly education, and continuous monitoring and feedback to all providers.

Sustainability of an Antibiotic Stewardship Program

The development of antibiotics revolutionized medicine and transformed healthcare as we know it. In 1929, Alexander Fleming developed the first antibiotic, penicillin (American Chemical Society International Historic Chemical Landmarks [ACSIHCL], 2019). Penicillin's true potential was not realized until the 1940s, when large-scale production of antibiotics began (ACSIHCL, 2019). Since then, a wide variety of new antibiotics have been developed and used to treat infections. When antibiotic production first began, these new medications were being produced faster than the bacteria could develop a resistance to them (ACSIHCL, 2019).

Nevertheless, the bacteria have now managed to affect our ability to improve treatment. Since the 1980s and 1990s, scientists have only enhanced antibiotics within specific categories, allowing these microorganisms to undergo a bacterial transformation, become resistant to the antibiotic, and have limited treatment options (ACSIHCL, 2019). Antibiotic resistance is a continuous public threat and a growing global crisis. Many low-grade bacteria and much stronger, dangerous, often fatal bacteria commonly found in hospitals, nursing homes, and other care centers are now resistant to most available antibiotics. They may only be effectively treated by one or two antibiotics available (ACSIHCL, 2019).

The overuse and overprescribing of antibiotics for diagnoses not requiring treatment with antibiotics can be attributed to the development of these resistant superbugs. In outpatient settings, enough antibiotics are prescribed for nearly every person in the US to have one course of antibiotics annually, equating to almost 835 prescriptions per 1000 people (Centers for Disease Control and Prevention [CDC], 2019).

Unfortunately, each year an estimated 160,000 people in the US will die from antibiotic-resistant infections (CDC, 2019). This new estimate is seven times higher than previous estimates from the CDC (2019). Nationwide efforts have been created to avoid overprescribing and optimize antibiotic use in all clinical settings. ASPs have been designed to maximize patient outcomes while minimizing the unintended effects of inappropriate antibiotic use. ASPs also aim to reduce healthcare costs without changing the overall quality of care (CDC, 2019). However, studies regarding the effectiveness of ASPs are usually conducted over brief periods, making it difficult to assess the programs' long-term effects or the sustainability of quality improvement (QI) interventions (Devers, 2011). Long term studies of other QI interventions have demonstrated that the effects tend to fade over time with attention and focus shifted towards other initiatives (Devers, 2011).

To sustain any change, QI and quality assurance (QA) must become a standard of care. A QA program continuously evaluates the sustainability maintained from the gains of QI despite changes within the organization. Assessing and ensuring the use of a sustainable model for antibiotic stewardship is vital for the future of healthcare. Appropriate models can reduce negative consequences toward patients, reduce the cost of care, and improve patient outcomes. The purpose of this QA project was to assess the long-term sustainability of a previously implemented ASP, which promoted appropriate prescribing of antibiotics for the treatment of viral URIs in an urgent care setting and to identify any further measures to keep interventions sustained in the long term. This project's primary aim was to determine if antibiotic prescribing rates have been sustained for symptoms related to rhinosinusitis, bronchitis, or pharyngitis over the two years following the initial QI project's completion. The primary outcome measures include diagnosis, antibiotic prescribed (if any), and appropriateness of the treatment (no antibiotic prescribed, or if antibiotic prescribed, was it a recommended antibiotic for the condition). The study attempts to answer how the previously implemented ASP affected antibiotic prescribing related to rhinosinusitis, bronchitis, and pharyngitis in 2020 compared to 2018?

Review of Literature

A literature search was conducted to review current publications in English and practice guidelines between 2011-2019. Key terms used to complete the literature search included: *antibiotics, antibiotic stewardship, quality improvement, sustainability, sustainability of quality improvement projects, antibiotic resistance, antimicrobial resistance, treatment guidelines pharyngitis, treatment guidelines bronchitis, inappropriate antibiotic use*, *urgent care*, *emergency room*, *nurse practitioners* and *evidence-based practice*. Boolean operators used were AND and OR. The Cochrane Database of Systematic Reviews, Cumulative Index to Nursing and Allied Health Literature (CINAHL), National Guideline Clearinghouse, and PubMed databases for the English language were searched. Additional studies were obtained through an ancestry approach from publications and resources used in the original QI initiative. The search was further refined using the inclusion criteria of qualitative or quantitative studies, participants between the ages of 18-60 years, all healthcare providers with prescribing privileges, and publications in and outside the US. Exclusion criteria were participants studied who were less than 18- or older than 60-years of age or healthcare providers without prescribing privileges. Patients with a previous or current diagnosis of chronic obstructive pulmonary disease (COPD), chronic sinusitis, or immunocompromised patients were also excluded. Over 230 publications from 2011 to 2019 were retrieved, with 22 items found through the ancestry approach. A total of ten publications were selected for this review.

There is no single intervention best for any one population or community when it comes to antibiotic stewardship. Every community has its own unique set of obstacles. Van der Velden, Pijpers, Kuyvenhoven, Tonkin-Crine, Little, & Verheij (2012) reviewed 58 trials from 1990 to 2009. Reviewing the effectiveness of provider-targeted interventions to improve antibiotic use for URIs. Many of the interventions discussed were found to improve antibiotic prescription rates successfully. Interventions using more than one element such as educational material for the provider, educational seminars, audit with feedback for providers, educational material, and outreach visits for patients as well as the general public, were found to be more successful than interventions using only one (Van der Velden et al., 2012). Combining educational material for the provider and an educational meeting with the provider had the most significant overall improvement compared to other interventions.

In a study similar to Van der Velden et al. (2012), a randomized control trial of 12,776 acute bronchitis visits in 33 primary care sites studied interventions that affect the overprescribing of antibiotics. Interventions included clinician and patient education, clinician decision support via printed evidence-based guidelines, and clinical decision support strategies, all of which were shown to assist in the overuse of antibiotics in primary care (Gonzales, Anderer, McCulloch, Maselli, Bloom, Graf, & Metlay, 2013). Another study of 68 practices found that clinicians' education, audit, and feedback led to a reduction in antibiotic dispensing (Butler, Simpson, Dunstan, Rollnick, Cohen, Gillespie, & Evans, et al. 2012). These studies all support the combining interventions such as patient/provider education with supporting educational materials and delayed prescribing protocol in an ASP. Alternatively, Drekonja, Filice, Greer, Olson, MacDonald, Rutks, & Wilt, 2015 identified 50 trials in which multiple interventions decreased antibiotic use but did not identify any more successful intervention than another. Drekonja et al. (2015) found evidence that programs, including communication skills training and laboratory testing, successfully reduced prescription rates. Drekonja et al. (2015) also note that incorporating ASPs in outpatient settings resulted in decreased medication costs and cites that the overall effectiveness depends on the program used. Each of these studies highlights the importance of communication between the provider and the patient. Interventions in an ASP should include open communication, along with the use of appropriate shared decision making, conversations related to symptomatic care, and patient education regarding proper antibiotic usage.

Researchers continue to seek out evidence to support ASPs to improve antibiotic use in the outpatient setting. Gerber, Prasad, Fiks, Localio, Bell, & Zaoutis et al. (2013) found little significant improvement in prescribing practices for common viral URI and a complete return to normal prescribing after completing the intervention. These findings highlight the importance of the audit and feedback intervention for continued antibiotic stewardship efforts.

Linder, Meeker, Fox, Friedberg, Persell, Goldstein, & Doctor. (2017) curtail on the findings of Meeker, Linder., Fox, Friedberg, Persell, Goldstein, ... & Doctor (2016), collecting additional data post-intervention. During this 12-month period, Linder et al.

(2017) found no difference between the control group and the suggestive alternative or accountable justification group. The peer comparison group did, however, continue to have statistically significant improved rates. Linder et al. (2017) determined that peer comparison might lead to prudent antibiotic prescribing as part of self-image. Linder et al. (2017) advise institutions to improve antibiotic prescribing rates to apply long-term interventions, such as peer comparison and prescriber feedback. Prescriber feedback is an essential aspect of ASPs. The cessation of audit and feedback is related to a return to baseline prescribing patterns, suggesting that sustained quality improvement includes the use of an audit and feedback system.

An analysis of 405 adults with acute upper respiratory infections in 23 primary care clinics specific interventions, which included delayed antibiotic prescribing, immediate antibiotic, and no antibiotic given, delayed prescribing strategies for acute uncomplicated respiratory tract infections (de la Poza Adbad, Mas Dalmau, Moreno, González, Criado, & Hernández et al., 2016). These interventions were shown to effectively decrease antibiotic use over the short term (de la Poza et al., 2016). However, evidence of sustained improvement required further, long term analysis.

Furthermore, a retrospective study completed by Powelson (2018) aimed to implement and evaluate an ASP's effects when used in an urgent care setting. The QI focused on urgent care providers' who treated viral respiratory tract infections (RTIs) such as the common cold, pharyngitis, and bronchitis. The study included 20 advanced practice nurses (APRNs) who provided care in six urban Urgent Care Centers. Each APRN received education on antibiotic stewardship, recommended evaluation, and treatment for viral RTIs, along with refresher courses on the pathophysiology of included diseases (Powelson, 2018). Patient communication strategies were also reviewed to implement the CDC's Core Elements of Antibiotic Stewardship (CEO ABS) program. Random charts of patients aged 18-65 who received treatment for RTIs during the evaluation period were analyzed. Post-intervention, the overall rate of inappropriate antibiotic prescribing by providers decreased from 21.7% to 8.7%, a 60% decrease in inappropriate antibiotic prescribing (Powelson, 2018). Multifaceted interventions were used in this study as seen in many others, and just as in other articles reviewed, continued follow up was essential to determine long term sustainability.

Devers (2011) identifies several measures that can be used to improve quality improvement efforts and sustainability. The authors used no specific sample or setting; this article is more of a discussion on the limitations of quality improvement efforts. No study design was used. However, several were discussed, including evidence-based medicine, systematic reviews and guidelines, Total Quality Management and Continuous Quality Improvement, PDSA cycles, LEAN, Six Sigma, and other systems re-engineering coupled with EHR and HIT initiatives (Devers, 2011). These are all areas that are incorporated into the everyday practice of healthcare. QI strategies have shown to improve quality by up to 10%. Notable gaps in research include short time frames of studies, making an assessment of the long-term effects difficult (Devers, 2011). This gap was reiterated throughout each of the articles reviewed and confirmed in the Linder et al. (2017) study.

A significant amount of literature and research can be found on antibiotic stewardship and antimicrobial resistance. High-quality, evidence-based clinical practice guidelines offer a means of bridging the gap between policy, best practice, local contexts, and patient choice. Guidelines improve the effectiveness and quality of care; they decrease clinical practice differences and reduce avoidable, expensive mistakes and adverse events. Quality improvement initiatives are linked to clinical practice guidelines as evidence-based recommendations. They form the basis for identifying core outcomes and assessing standards of care. There is, however, a growing number of guidelines used across the world. Some of these are similar, and some have differing information. There is also crucial lacking information on the sustainability of these ASP programs long term, with only one article being found that was published in 1993. The alarming rate at which antimicrobial resistance affects patients' daily leads to question the lack of research on antibiotic stewardship programs' sustainability. Assessing these programs' sustainability allows teams to use targeted tools to eliminate or rectify threats to long-term success and reduce antimicrobial resistance.

This QA project utilized the RE-AIM (reach, effectiveness, adoption, implementation, maintenance) framework, which provides practical methods of evaluating health interventions (King, Glasgow, & Leeman-Castillo, 2010). The RE-AIM framework assesses the impact of health promotion interventions (King et al., 2010). The implementation component of RE-AIM is used to examine the consistency with which an intervention was delivered. For this QA project, the RE-AIM framework will be used to evaluate the interventions previously implemented. Forman, Heisler, Damschroder, Kaselitz, and Kerr (2017) reported the "reach" component of the framework should determine if the intervention has reached the targeted population; "effectiveness" should determine if the intervention has accomplished its intended goal; "adoption" should determine the extent of the delivered intervention to those targeted; "implementation" should determine the extent to which participating providers have consistently implemented the interventions; and “maintenance” should determine the extent of the intervention and its integration into practice in maintaining effectiveness.

Method

Design

This QA project used a correlation design based on the RE-AIM framework. A retrospective electronic medical record review was conducted from randomly selected patients presenting for treatment of upper respiratory symptoms from April 1-30, 2019, and April 1-30, 2020. The original QI initiative was completed from January 2018 through April 2018. The data obtained from the original results in 2018 were compared to the data collected over a two-year period (2019-2020) regarding the prescribing practices amongst healthcare providers for patients diagnosed with a URI, specifically rhinosinusitis, bronchitis, or pharyngitis.

Sample

A convenience sample of healthcare providers with prescriptive privileges from a network of six hospital-owned urgent care centers was studied. The urgent care centers are the same centers utilized in the original QI project. The six urgent care centers are located within a Midwestern metropolitan area, with over three million residents. Of the current providers’ employees with prescriptive privileges currently employed within the urgent care network, only four APRN providers were employed during the original QI initiative and remained within the Urgent Care in 2020. The medical record review's inclusion criteria included adult patients aged 18-60 years assessed at one of the six urgent care centers and diagnosed with rhinosinusitis, bronchitis, or pharyngitis. In addition, only medical records completed by a healthcare provider who was employed within the urgent care center network during the original QI initiative in 2018 and remained within the network in 2020 were included [Figure 3]. Exclusion criteria included patients assessed by a healthcare provider who was not employed within the system during the original QI initiative in 2018. Also, patients aged less than 18- or older than 60-years; those treated with antibiotics for sinusitis, pharyngitis, or bronchitis in the previous six weeks; those with chronic sinusitis; those with past sinus surgery; those who are immunocompromised; those with a documented diagnosis of COPD or asthma; those with a positive influenza or COVID-19 test; and patients with multiple diagnoses during one visit were excluded [Figure 4]. A random sample of 120 medical records for each year of study was utilized, for a total of 240 medical records reviewed.

Data Collection and Analysis

Data was obtained through a retrospective medical record review from April 1-30, 2019, and April 1-30, 2020. Data collected was de-identified and numbered A19-1 through A19-120 for records reviewed in 2019 and A20-1 through A20-120 for records reviewed in 2020. The providers will be coded as 1, 2, 3, and 4. The data to be recorded are year, provider, diagnosis, antibiotic prescribed (if any), appropriateness of the treatment (no antibiotic prescribed, or if antibiotic prescribed, was it a recommended antibiotic for the condition). All data will be stored on a password-protected computer owned by the primary investigator (PI). Data analyses completed include descriptive statistics, Chi-square goodness of fit, analysis of variance (ANOVA), and paired t-tests.

Approval Processes

Approval for this QA project was obtained from the administration of the hospital-owned urgent care center network. Additional authorizations from the doctor of nursing practice (DNP) committee, organizational and university institutional review boards (IRB) were acquired. This QA project's benefits include raising awareness in prescribing habits amongst current providers, optimized future patient outcomes, reduced adverse events, and resource utilization optimization. There was minimal risk to healthcare providers or patients since this was a retrospective medical record review. While all data were de-identified, there was very minimal risk for a healthcare provider or patient identification.

Procedures

Preliminary work for this QA project included an initial project idea presentation to potential committee members in the Summer of 2019. Afterward, the assignment of committee members was completed by the college of nursing. A proposal was drafted in December 2019 and presented to committee members in February 2020. After revision, proposal approval was obtained in July of 2020, and organizational and institutional IRB approval was obtained. Before starting the data collection, a list of each APRN involved in the original QI project in 2018 was compiled and compared to a current staff list. Next, the APRNs involved in the original QI project in 2018 and were currently still employed within the UC were narrowed down. The staffing schedule was obtained for April 1-30, 2019, to determine which days and locations each of these specific nurses worked. The same was completed with the April 1-30, 2020 staffing schedule. Once the dates and locations were determined, a manual retrospective medical record was completed. The information obtained during the retrospective medical record review included the year coded as 1,2,3, or 4; ID, coded as Apr19 1-120 or Apr20 1-120; location, coded as 1-6; provider coded as 1-4; diagnosis, coded as 2, 3, 4, 5 and 6; antibiotic coded as 1 for Yes if an antibiotic was prescribed or 2 for No if no antibiotic was prescribed; and appropriate treatment coded as 1 for Yes if the treatment follows evidence-based guidelines, if no antibiotic was prescribed in the proper setting, or if an antibiotic was prescribed the correct antibiotic was written for with correct dosage or 2 for No if evidence-based guidelines were not followed, if an antibiotic was prescribed and not called for, or an antibiotic was called for and not prescribed.

Once the data collection was complete, all data from the retrospective medical record review were de-identified and entered into the excel data spreadsheet [Table 1]. The excel spreadsheets with the de-identified data were then uploaded into Intellectus Statistics. Statistical analysis was performed using Intellectus Statistics. The data was stored on a password-protected computer owned by the PI.

Results

Statistical analysis of the collected data was performed after the retrospective medical record review was completed. A frequency distribution of appropriate versus inappropriate antibiotic prescriptions was completed for each year. The previously implemented project reported 21.7% inappropriate antibiotic prescriptions in 2017 and 8.7% inappropriate antibiotic prescriptions in 2018. Further analysis of the data resulted in a 6.7% inappropriate antibiotic prescription rate for 2019 and 8.3% for 2020 [Table 2] (Intellectus Statistics [Online computer software], 2020). The frequency distribution was then used to create line plots for appropriate treatment and inappropriate treatment, grouped by diagnosis for each year [Figures 1 and 2]. Comparisons were made to determine areas of strength and areas needing increased reinforcement through education.

The results of the Chi-Square Goodness of Fit test were significant for 2017 based on an alpha value of 0.05, $\chi^2(1) = 91.85$, $p < .001$, indicating the null hypothesis (the number of inappropriate and appropriate treatment are equally likely) can be rejected [Table 3] (Intellectus Statistics [Online computer software], 2020). The results of the 2018 test were significant based on an alpha value of 0.05, $\chi^2(1) = 208.33$, $p < .001$, indicating the null hypothesis (the number of inappropriate and appropriate treatment are equally likely) can be rejected [Table 3] (Intellectus Statistics [Online computer software], 2020). The results of the 2019 test were significant based on an alpha value of 0.05, $\chi^2(1) = 90.13$, $p < .001$, indicating the null hypothesis (the number of inappropriate and appropriate treatment are equally likely) can be rejected [Table 3] (Intellectus Statistics [Online computer software], 2020). The results of the 2020 test were significant based on an alpha value of 0.05, $\chi^2(1) = 83.33$, $p < .001$, indicating the null hypothesis (the number of inappropriate and appropriate treatment are equally likely) can be rejected [Table 3],] (Intellectus Statistics [Online computer software], 2020).

An analysis of variance (ANOVA) was completed using all data from 2017-2020. The ANOVA was examined based on an alpha value of 0.05. The results of the ANOVA were significant, F (4, 837) = 38.82, $p < .001$, indicating there were significant differences amongst appropriate versus inappropriate treatment based on the year and whether or not an antibiotic was prescribed [Table 4]. The main effect, Year, was significant, F (3, 837) = 10.95, $p < .001$, $\eta_p^2 = 0.04$, indicating significant differences in appropriate treatment throughout the four years. The main effect, Antibiotic, was significant, F (1, 837) = 113.93, p < .001, $\eta_p^2 = 0.12$, indicating there were significant differences in Appropriate treatment based on the prescribing of an antibiotic (Intellectus Statistics [Online computer software], 2020).

Discussion

The results of this QA show that the antibiotic stewardship program initially implemented in 2018 has sustained its effects over the two years following the completion. The providers' prescribing practices have maintained improvement despite the challenges of an ever-changing healthcare environment, including staff turnover and the COVID-19 pandemic. The frequency distribution shows that the initial pre-intervention percentage of inappropriately prescribed antibiotics of 21.7% has sustained the post-intervention percentage of 8.7% or less in the following years, which is a continued 60% overall improvement. Specific highlights from the data include a 93.75 % decrease in the number of inappropriate prescriptions for pharyngitis diagnosis, a 100% decrease in the number of inappropriate prescriptions for strep throat, and an 81.8 % decrease in the number of inappropriate prescriptions for the diagnosis of bronchitis. Dr. Powelson's (2018) ongoing efforts through continued monthly education for providers and provider audit and feedback through HEDIS measures have enabled the sustained improvement over the past three years.

Further implications for practice include integrating antibiotic stewardship training and education into new provider onboarding, adding treatment algorithms for particular diagnoses not maintaining improvement, continuous monitoring and feedback to all providers, and continued education. Dissemination of this valuable information to other healthcare providers includes a poster presentation of the results submitted to the CON at UMSL. The information will also be submitted to the Urgent Care leaders as well as the hospital IRB.

Conclusion

Antibiotic stewardship is an essential part of healthcare. Outpatient settings equate for most of the inappropriately prescribed antibiotics every year. The literature cites that the sustainability of QI interventions is difficult to ascertain due to the short time frames that projects occur over. Furthermore, the literature mentions that nearly 70% of all organizational change and 33% of QI projects are not sustained after one year of implementation (Silver et al., 2016). Through continued efforts over the past three years, this QA project proves that those odds can be overcome. Continued monthly education and the audit and feedback given to providers have maintained the relevance needed for any change to endure. This QA has shown that implementing a quality antibiotic stewardship program can positively impact healthcare providers over time. It has proven that introducing a program such as the one implemented in the initial project can effectively improve the quality of care patients receive while maintaining efficient treatment.

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Appendix A

Table 1

Sample data collection tool Excel Worksheet

Date	Location	Provider	Diagnosis	Antibiotic	Appropriate

Note: Dates were identified as A19-# or A20-# based on the year obtained and the number entry; location were identified as # (1-6); providers were identified as # (1-4); antibiotic 1 for Yes if an antibiotic was prescribed or 2 for No if no antibiotic prescribed; appropriate-1 for Yes if what was done in the antibiotic column was appropriate based on current guidelines and 2 for No if what was done did not follow current guidelines.

Appendix B

Table 2

Frequency Distribution of Appropriate vs. Inappropriate by Year

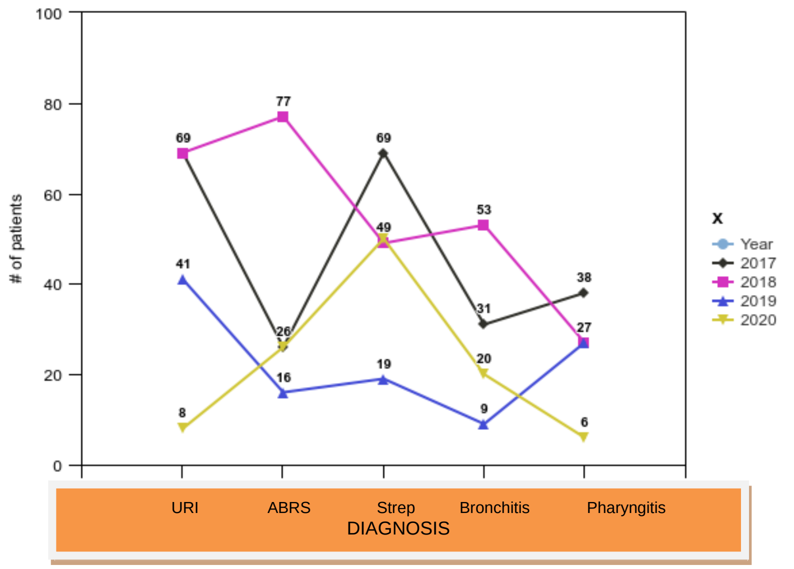
Year	# appropriate	# inappropriate	% inappropriate
2017	235	65	21.70%
2018	274	26	8.70%
2019	112	8	6.70%
2020	110	10	8.30%

Intellectus Statistics [Online computer software]. (2020).

Appendix C

Figure 1

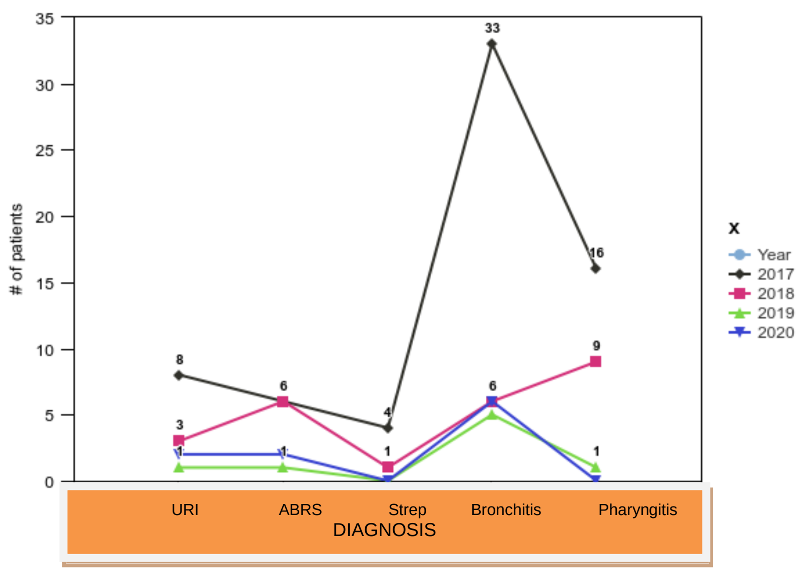
Line plot of Appropriately Treated Patients by Diagnosis Grouped by Year



Intellectus Statistics [Online computer software]. (2020).

Figure 2

Line plot of Inappropriately Treated Patients by Diagnosis Grouped by Year



Intellectus Statistics [Online computer software]. (2020).

Appendix D

Table 3

Chi-Square Goodness of Fit Test for Appropriate

Year	Chi-Square	df	p-value
2017	96.33	1	<.001
2018	208.33	1	<.001
2019	90.13	1	<.001
2020	83.33	1	<.001

Intellectus Statistics [Online computer software]. (2020).

Appendix E

Table 4

Analysis of Variance Table for Appropriate by Year and Antibiotic

Term	*SS*	*df*	*F*	*p*	η_p^2
Year	3.17	3	10.95	< .001	0.04
Antibiotic	10.98	1	113.93	< .001	0.12
Residuals	80.66	837			

Intellectus Statistics [Online computer software]. (2020).

Appendix F

Figure 3

Inclusion Criteria

• Adult patients aged 18-60 years who have been assessed at one of the six urgent care centers and diagnosed with an upper respiratory infection, strep throat, rhinosinusitis, bronchitis, or pharyngitis. • Medical records completed by a healthcare provider who was employed within the urgent care center network during the original QI initiative in 2018 and remained within the network in 2020	Symptoms included: • runny nose • nasal congestion/drainage • sinus pressure • sore throat • cough • chest congestion

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

Figure 4

Exclusion Criteria

• Patients assessed by a healthcare provider who was not employed within the system during the original QI initiative in 2018. • Patients aged less than 18- or older than 60-years; • those who had been treated with antibiotics for sinusitis, pharyngitis, or bronchitis in the previous six weeks • Patients with chronic sinusitis	• Patients with past sinus surgery • Patients who are immunocompromised • Patients with a documented diagnosis of COPD or asthma • Patients with a positive influenza or COVID-19 test • Patients with multiple diagnoses during one visit will be excluded

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