Reduction of Antibiotics Prescribed by APRNs

for Bronchitis in the Urgent Care Setting

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Table of Contents

Abstract

Introduction/Purpose: Bronchitis is a common diagnosis in the urgent care setting. According to clinical practice guidelines, most cases do not require the use of antibiotic therapy. Despite this direction, antibiotics continue to be prescribed for this diagnosis. In the urgent care center of interest, more than 75% of patient encounters that received a diagnosis of bronchitis had an antibiotic prescribed in 2019.

Methods: A voluntary sample of urgent care nurse practitioners received education regarding clinical practice guidelines for treatment of bronchitis. Evaluation of pre- and post-intervention prescribing patterns were analyzed to determine the effectiveness of the intervention.

Results: The results of the intervention demonstrated a statistically significant reduction in antibiotics prescribed by nurse practitioners for the diagnosis of bronchitis (pre-intervention prescribing rate of 86.2%, post-intervention prescribing rate of 64.5%).

Conclusion: Providing an educational intervention aimed at improving adherence to clinical practice guidelines is effective at reducing the number of inappropriate antibiotics prescribed for bronchitis in the urgent care setting.

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Introduction

Beginning in 2013, the Centers for Disease Control and Prevention (CDC) identified the threat of antibiotic resistance as a national health concern (CDC, 2020). Since that time, the CDC have continued the efforts of antibiotic prescribing control with the support of the White House and the United Nations (CDC, 2020). Annually, there have been approximately 2 million people who have been impacted by antibiotic resistance, leading to an estimated 23,000 deaths (CDC, 2020). Thorpe et al. (2018) reviewed data collected from 2002 through 2014 and found that of the 14 million bacterial infections diagnosed annually, up to 1.2 million of them could have been considered antibiotic-resistant infections. The authors estimated that health care spending on these patients was 165% higher than those with non-resistant infections, translating to an additional cost of $1,383 for each bacterial infection associated with antibiotic resistance (Thorpe et al., 2018). Specific to the ambulatory setting, additional literature identified practices where nearly 30% of antibiotics prescribed were for diagnoses for which antibiotics were not indicated (Fleming-Dutra et al., 2016; Schmidt et al, 2018). Of these diagnoses, bronchitis was the most common. Through this data, a clear need for antibiotic stewardship through clinical practices guidelines in the ambulatory setting is evident.

Background

A detailed evaluation in an ambulatory care setting by Fleming-Dutra et al. (2016) demonstrated that over a one-year period, there were 184,032 visits, of which 12.6% resulted in an antibiotic being prescribed. Using evaluation criteria to highlight diagnoses that do *not* routinely require antibiotic therapy, nearly 30% of all antibiotic prescriptions written in the

ambulatory setting were found to be unnecessary with the highest incidence being for upper respiratory complaints (Fleming-Dutra et al., 2016). For the upper respiratory constellation of complaints, which are typically viral in nature, patients were inappropriately treated with antibiotics greater than 50% of the time (Fleming-Dutra et al., 2016).

Using similar criteria for identifying antibiotic inappropriate diagnoses, Schmidt et al. (2018) evaluated provider characteristics for inappropriate prescribing. Based on 448,990 visits over a 17-month period, bronchitis was found to be the most common diagnosis associated with inappropriate antibiotic use with azithromycin being the most frequently prescribed antibiotic. Also, the findings revealed that non-physician prescribers (nurse practitioners and physician assistants) were more likely to prescribe an antibiotic inappropriately when compared to physician providers in the same settings (Schmidt et al., 2018). The current clinical practice guidelines for bronchitis identify that a viral etiology is the cause of at least 90% of all episodes thus do not require antibiotic treatment (Kinkade & Long, 2016). Therefore, the target for prescribing antibiotics for a diagnosis of bronchitis is less than 10%.

Formal efforts to reduce inappropriate prescribing have been defined as an initiative called antibiotic stewardship. Implementing an antibiotic stewardship program in the ambulatory setting that uses either adapted or enhanced interventions can drive inappropriately prescribed antibiotics down by 33% (Yadav et al., 2019). While there are published guidelines regarding antibiotic stewardship programs in the ambulatory care setting, there is not a clear consensus on how such a program should be implemented. Furthermore, there is a paucity of information regarding follow up measures for this type of program. Given that non-physician prescribers in the ambulatory care setting may be responsible for higher rates of inappropriate antibiotic prescribing practices and that bronchitis is the most common viral illness for which antibiotics

are prescribed, further exploration of an antibiotic stewardship program in the urgent care setting

for non-physician providers with attention to the diagnosis of bronchitis is indicated.

Problem Statement

Antibiotic resistance is a serious health problem across the United States. The increased

incidence of resistance is partly due to inappropriate outpatient antibiotic use (CDC, 2020).

The problem of antibiotic misuse in the urgent care setting is very apparent. There is a clear

need for improved standardization of antibiotic prescribing practices. This can be achieved

with focused and intentional antibiotic stewardship education and awareness. Using a well-

developed framework guided by clinical practice guidelines, there is opportunity for providers

in the urgent care setting to reduce unnecessary antibiotic prescribing practices for acute

bronchitis.

Organizational "Gap" Analysis of Project Site

The project site consists of 19 urgent care centers affiliated with a regional health care

system in Florida. In 2019, the organization had 257,714 total patient encounters, of which 854

received a diagnosis of bronchitis and were treated by nurse practitioners. Of these encounters,

75.32% were prescribed an antibiotic. In 2020, the number of encounters was 22% fewer; there

were 371 encounters with nurse practitioners resulting in a diagnosis of bronchitis, of which

66.75% received antibiotics. Current clinical practice guidelines support a target antibiotic

prescription rate of less than 10% for bronchitis. This data indicates the need for a 55-65%

reduction in the number of antibiotics prescribed for bronchitis within this healthcare system.

Review of the Literature

Using the MEDLINE database, a search was conducted using the keyword terms "urgent

care" AND "antibiotic stewardship" AND "antibiotic prescribing". The limits for the first run of

data included the following additional criteria: full-text articles, published in English, date range of 2016-2021, and publication in core clinical journals. The first query returned more than 500 results. After review of the returned titles, articles that did not indicate a direct relationship to urgent care were excluded. Results that included a dental focus, a pediatric focus, long-term or adult care focus, urinary tract infections, foreign studies, in-patient research, hospice care, opioids, insulin and anticoagulants were also excluded. Eighty articles were originally considered. After further review of the abstracts and full-text sources, 31 total articles were selected and categorized into primary themes.

The primary themes found in this review of the literature included broad descriptions of antibiotic prescribers and the settings in which they practice, results of stewardship efforts that were focused on a specific diagnosis and not a group of providers, and results of stewardship efforts for a group of providers without attention to a specific diagnosis. For example, Stenehjem et al. (2020) reported over-prescribing of antibiotics by all urgent care providers for most upper respiratory diagnoses with some prescribers issuing an antibiotic 94% of the time within a single urgent care network. Of the literature reviewed, most data presented characteristics of antibiotic prescribers and their settings. As the focus of the literature review was stewardship in the urgent care setting, it is not surprising that articles detailing patient perspectives of appropriate antibiotic use did not yield a higher return rate.

One theme that was present in the literature centered around the outcomes of antibiotic stewardship interventions that focused on specific diagnoses. Link et al. (2016) demonstrated a 69.1% reduction of antibiotic prescribing for the diagnosis of bronchitis following face-to-face training of the prescribers. In the pediatric population, there is data surrounding asthma and otitis media; however, this data was not considered in this review. Noticeably absent are reports of

antibiotic stewardship interventions that focused on a single diagnosis, particularly in the general urgent care setting.

One group of studies reports on prescribing practices before and after an intervention. Most commonly, pre-intervention data was pulled from chart reviews and then compared to post-intervention prescribing results. The outcomes of focused antibiotic stewardship interventions, with attention to upper respiratory complaints, demonstrated a 6-60% reduction in antibiotic prescribing rates following the intervention (Brown, 2018; Durante et al., 2017, Laude et al., 2020, Link et al., 2016). Limitations of these results include the presence of intervention groups that were a blend of all provider types rather than a focused group of providers in addition to studies that focused on a single medication rather than all antibiotics; and relatively small cohorts of participants.

Reports of antibiotic prescribing practices among a specific cohort of prescribers constituted the most common articles yielded. In these reviews, the types of medications prescribed and the types of prescribers were reported. Yates et al. (2018) discussed factors that contribute to antibiotic prescription decision-making. Furthermore, human factors that potentially contribute to antibiotic stewardship programs were discussed by Keller et al. (2018). Each of these aligns with a study by Fleming-Dutra et al. (2016) that confirms that antibiotics are often inappropriately prescribed.

The thin return of evidence with focused intervention to a specific provider population indicates the need for continued work in this area. Consideration of the patients' perceptions of care and overall patient experience following the implementation of an antibiotic stewardship program is another topic where literature is lacking and should be considered. However, knowing that guidelines for antibiotic stewardship are readily available, application of these

guidelines by urgent care providers is imperative. Cough is a common presenting complaint in urgent care, and the clinical practice guidelines clearly state that antibiotics are unnecessary for most patients presenting with a cough (Kinkade & Long, 2016). Therefore, a focus on the diagnosis of bronchitis is a reasonable place to begin.

<div align="center">**Evidence-based Practice: Verification of Chosen Option**</div>

Clinical practice guidelines clearly indicate that antibiotics are not appropriate for the treatment of acute bronchitis, yet they continue to be prescribed in the urgent care setting for this diagnosis (Kinkade & Long, 2016). Using the systematic approach to formulating a clinical question as outlined by Stillwell et al. (2010), the concept of reducing antibiotic prescribing in the urgent care centers was formulated. Using this guidance, the following clinical question was developed: Among (P) urgent care nurse practitioners, how does an educational intervention (I) aimed at improving antibiotic stewardship for patients diagnosed with bronchitis impact the number of antibiotics prescribed (O) over a six-week period (T) as compared (C) to the number prescribed in the six weeks prior to the intervention?

<div align="center">**Evidence-based Practice Model**</div>

Implementation of this evidence-based project was guided by the Model for Evidence-Based Practice Change (Larrabee, 2009). The Model for Evidence-Based Practice Change is a six-step model as illustrated by Dang et al. (2015) (see Appendix A). The steps include assessing the need for change in practice, locating the best evidence, critically analyzing the evidence, designing a practice change, implementing and evaluating the change in practice, and integrating and maintaining the change in practice (Larrabee, 2009). This model was selected because of the underpinnings of quality improvement that it demonstrates. The model is not a linear flow model; rather, the steps often refer to previous steps to share best practice and yield

high outcomes. The organization where this project was executed has a culture of continuous quality improvement, and using this model mirrors the values of the organization and allows for adoption by leadership for implementation.

Goals, Objectives, and Expected Outcomes

The overall goal and expected outcome of this project was to reduce the rate of antibiotics prescribed by nurse practitioners to less than 10% in the urgent care setting for the diagnosis of bronchitis among adults following. The objective of the project was to educate nurse practitioners about current standards of care for bronchitis.

Methods

The steps needed to reduce antibiotics prescribed in the urgent care setting for the diagnosis of bronchitis by nurse practitioners will be described below.

Project Design

The project was designed as a quality improvement initiative. This quantitative study evaluated the pre-and post-intervention prescribing habits of nurse practitioners for the diagnosis of acute bronchitis among adults in an urgent care setting. Six weeks prior to and six weeks following deployment of the educational materials, antibiotic prescribing practices were tracked.

Project Site and Population

The setting for this project was a large network of hospital-based urgent care clinics in Florida (19 clinics). There are a total of 92 providers, 39 of which are physicians, 18 are physician assistants, and 35 are nurse practitioners. Nurse practitioners were the focus of this study. All providers within the organization move between sites, so there were no limitations related to practice sites. All nurse practitioners were eligible for inclusion. Nurse practitioners employed by this organization hold varying levels of employment, including full time, part time

and per diem; there was no exclusion of participation based on level of employment. The project was supported by the organization in which the intervention was implemented (see Appendix B).

All nurse practitioners employed by the urgent care center were sent an email inviting them to view the educational materials (see Appendix C). The email contained an explanation of the project and a link to view the educational presentation. Participants were informed that participation was voluntary and anonymous. A narrated PowerPoint presentation covered the following topics: data surrounding current prescribing practices of providers within the chosen urgent care clinic network, clinical guidelines for the treatment of acute bronchitis, and strategies for managing patients who present with a cough suspicious for bronchitis. The program was 5 minutes, 25 seconds in length. A follow-up email was sent 10 days later as a reminder to participants to view the presentation. Participants had unlimited access to the presentation and could view it as often as they desired.

Measurement Instruments

Raw data from the electronic medical record were filtered for the appropriate study timeframe, prescriber group, and diagnosis. Then data was then exported to an excel spreadsheet where it was saved to a secure location. The data did not contain patient information or specific prescriber identification.

Data Collection Procedure

Pre-intervention data was collected from the 6-week period leading up to the invitation to participate. The deployment of the email invitation to participate marked the onset of post-intervention collection data, which concluded after six weeks.   To be included in the pre- and post-intervention data review, the patient records were required to include an ICD-10 (International Classification of Diseases, Tenth Revision) code of J20, J20.1, J20.2, J20.3, J20.4,

J20.5, J20.6, J20.7, J20.8, or J20.9. A description for each of these diagnoses can be found in Appendix D. Eligible encounters included adults greater than 18 years of age. The structure of the data displays "yes" or "no" from the EMR if an antibiotic was prescribed for the specific visit.

Data Analysis

The number of antibiotics prescribed divided by the number of visits determined the percent of antibiotics prescribed for the diagnosis of bronchitis. The differences between pre- and post-intervention prescribing practices of urgent care nurse practitioners were statistically analyzed using Chi-square analysis.

Cost-Benefit Analysis

There was no cost for this project. The time that was spent in development of the project was uncompensated as part of a doctoral program. As this study focused on all nurse practitioners in the urgent care setting, there was no additional cost associated with their participation. Nurse practitioners were encouraged to view educational materials at their convenience. All applications, software, and electronic devices required for this project were readily available to the principal investigator and thus incurred no charges.

Timeline

The scholarly project was completed in 12 weeks. Following IRB approval, the project commenced on August 1, 2021, and concluded on October 20, 2021. This time frame included deployment of the educational intervention, data collection, and data analysis.

Ethical Considerations/Protection of Human Subjects

This project was approved by the University of Alabama (UA) Institutional Review Board and the medical director of the clinic network (see Appendix B). Patient identifiers and

providers' names were removed from the data prior to review and analysis. Access to stored data was accessible by only the principal investigator and the UA faculty advisor.

Results

Electronic medical records were examined to investigate the association between an educational intervention for nurse practitioners and the impact on antibiotic prescribing practices among patients with acute bronchitis. A total of 135 patient encounters were reviewed during the pre- and post-intervention periods (Table 1). Of these encounters, 75 (86.2%) from the pre-intervention period resulted in antibiotic prescriptions, and 31 (64.5%) resulted in prescriptions in post-intervention period. A Chi-square analysis was conducted to examine the relationship between an educational intervention (pre vs. post) and antibiotic prescribing practices of nurse practitioners in the urgent care setting. The data demonstrate a statistically significant decline in antibiotic prescribing for the diagnosis of bronchitis associated with this educational intervention, $(\chi^2(1) = 8.27, p = .0040)$.

Table 1. Impact of an educational intervention on antibiotic prescription practices among patients with acute bronchitis

			Educational Intervention		
		Total (N=135)	Pre (N=87)	Post (N=48)	p-value
Antibiotic Prescription, N (%)					.0040
	Yes	106 (78.5)	75 (86.2)	31 (64.5)	
	No	29 (21.5)	12 (13.8)	17 (35.4)	

Chi-Square test; likelihood ratio p-value. p-values ≤ 0.05 considered meaningful.

Discussion

The educational intervention was associated with improvement in the number of antibiotics prescribed for bronchitis in adults by nurse practitioners. Factors that contributed to the study's success were the convenience of the intervention and the various learning methods it provided. The educational intervention was sent to the nurse practitioners for asynchronous review at their convenience. The link allowed for unlimited views. The study's design included audio and visual educational elements that met the needs of various learning styles.

On the contrary, this study had several limitations. There was a disparity in number of patient encounters between the pre- and post-intervention periods. As noted, there were 87 pre-intervention encounters for bronchitis as compared to 48 post-intervention encounters. This reduction could be related to the seasonality of the types of visits seen in urgent care but could also have been impacted by an increase in the prevalence of COVID-19 within the community during the time of the study. At an urgent care organization based in Florida, the volume of patients seen through the clinics typically decreases by 20-25% in the warmer seasons. Also, during the study period, the incidence of COVID-19 in the community was experiencing a steep rise. During the pre-intervention timeframe, there was a 10.91% COVID-19 positivity rate within the health system, and during the post-intervention timeframe this rose to 23.95%. It is very likely that the increase in COVID-19 positive patients impacted the number of patients that were subsequently evaluated for and diagnosed with bronchitis.

Another possible limitation was a potential Hawthorne type effect. While details of the study design were not disclosed to participants and no demographic information was obtained, nurse practitioners were aware that an educational intervention was being performed as part of a Doctor of Nursing Student Project. The narrow window of time for the post-intervention period

lends itself to influence by the Hawthorne effect in which baseline behaviors return over time after a brief, perceived observation.

Another limitation included voluntary participation. There was no way to track how many nurse practitioners viewed the educational materials. Also, within the study design there was no method of confirming the diagnosis of bronchitis. The design is dependent on accurate provider assessment and diagnosis assignment.

Lastly, the study period was limited by the structure of the doctoral program for which it was completed. Application of the Model for Evidence-Based Practice Change for a study period longer than six weeks may have resulted in an outcome that was closer to the current clinical standard and the desired goal. As the model is designed to offer continuous feedback, it seems reasonable to conclude that an increase in cycles through the model would continue to drive results closer to the goal. In a longer study, the Model for Evidence-Based Practice Change would allow for prolonged engagement by offering feedback for the providers with attention to the behavior of interest. It is reasonable that this model of study could be expanded for a period of six months, or more, which would allow for a more lasting change in how bronchitis is treated in the urgent care setting.

Given the results of this study, it is reasonable to suspect that future studies involving other diagnoses of interest could experience similar results by applying the Model for Evidence-Based Practice Change. Future studies could also include a different prescriber focus, such as physicians or physician assistants, while maintaining a focus on bronchitis and antibiotic prescribing reduction.

Conclusion

The results of this project demonstrate effectiveness of an education intervention aimed at

reducing the number of antibiotics improperly prescribed for acute bronchitis in adults. This type of educational intervention may prove useful for educating staff about other established clinical practices guidelines across all settings (e.g., emergency departments, primary care, etc.). Ideally, information regarding antibiotic stewardship should be included in the curriculum for educating advance practice nurses. The importance of continued diligence with antibiotic prescribing, regardless of tenure or licensure, has far reaching impacts to improve the health of individual patients but also the global community.

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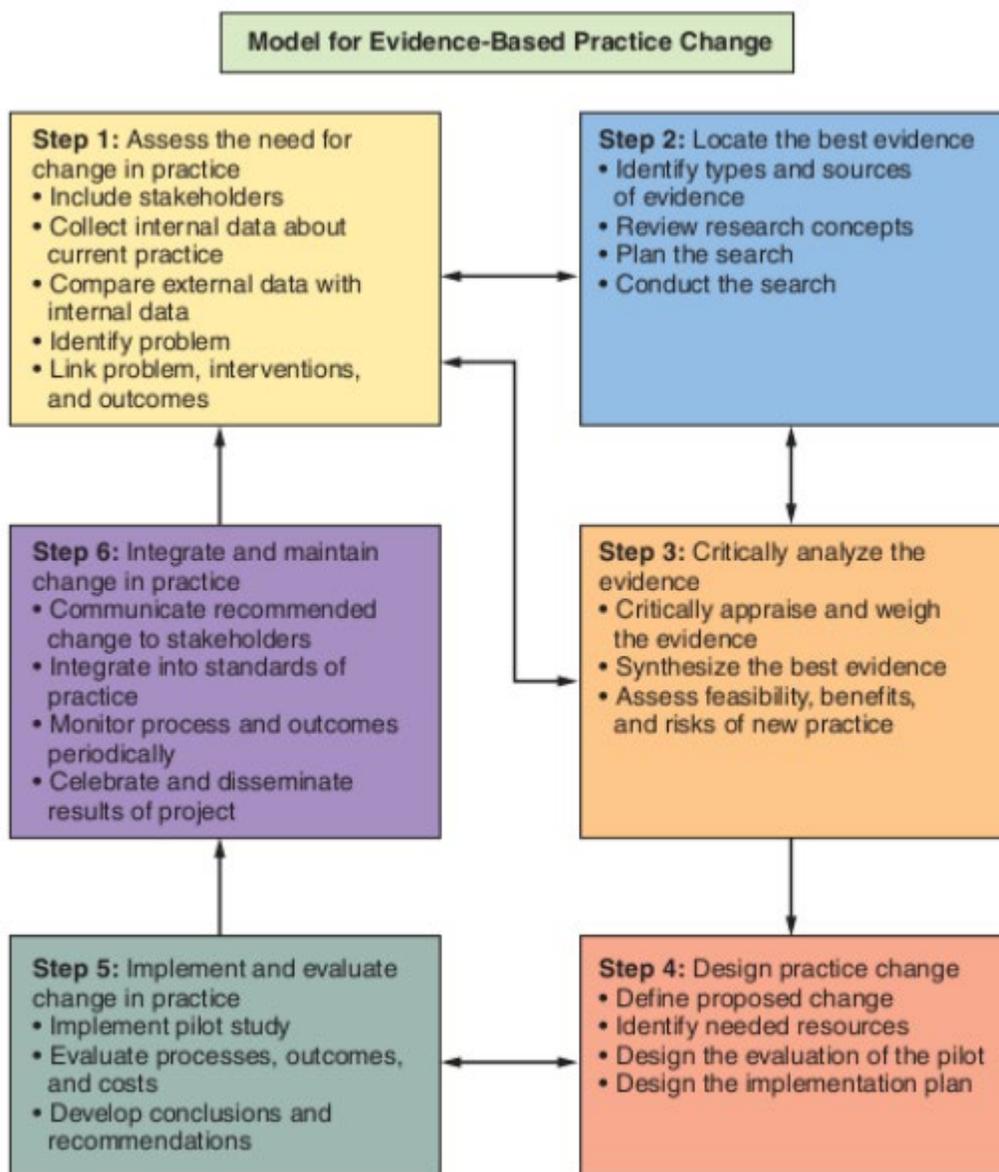Stillwell, S., Fineout-Overholt, E., Melnyk, B., & Williamson, K. (2010). Asking the clinical

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Appendix A

Model for Evidence-Based Practice Change

Step 1: Assess the need for change in practice
- Include stakeholders
- Collect internal data about current practice
- Compare external data with internal data
- Identify problem
- Link problem, interventions, and outcomes

Step 2: Locate the best evidence
- Identify types and sources of evidence
- Review research concepts
- Plan the search
- Conduct the search

Step 6: Integrate and maintain change in practice
- Communicate recommended change to stakeholders
- Integrate into standards of practice
- Monitor process and outcomes periodically
- Celebrate and disseminate results of project

Step 3: Critically analyze the evidence
- Critically appraise and weigh the evidence
- Synthesize the best evidence
- Assess feasibility, benefits, and risks of new practice

Step 5: Implement and evaluate change in practice
- Implement pilot study
- Evaluate processes, outcomes, and costs
- Develop conclusions and recommendations

Step 4: Design practice change
- Define proposed change
- Identify needed resources
- Design the evaluation of the pilot
- Design the implementation plan

Dang et al. (2015).

Appendix B

BayCare
Urgent Care

711 S. Belcher Rd.
Clearwater FL, 33764

March 3, 2021

To Whom it May Concern:

Please allow this letter to acknowledge my support of the DNP project being conducted by Lindsay Summer to investigate the antibiotic prescribing practices of nurse practitioners surrounding the diagnosis of bronchitis. Lindsay has permission and support to use the data collection tools available within BayCare Urgent Care to measure the effectiveness of her proposed intervention.
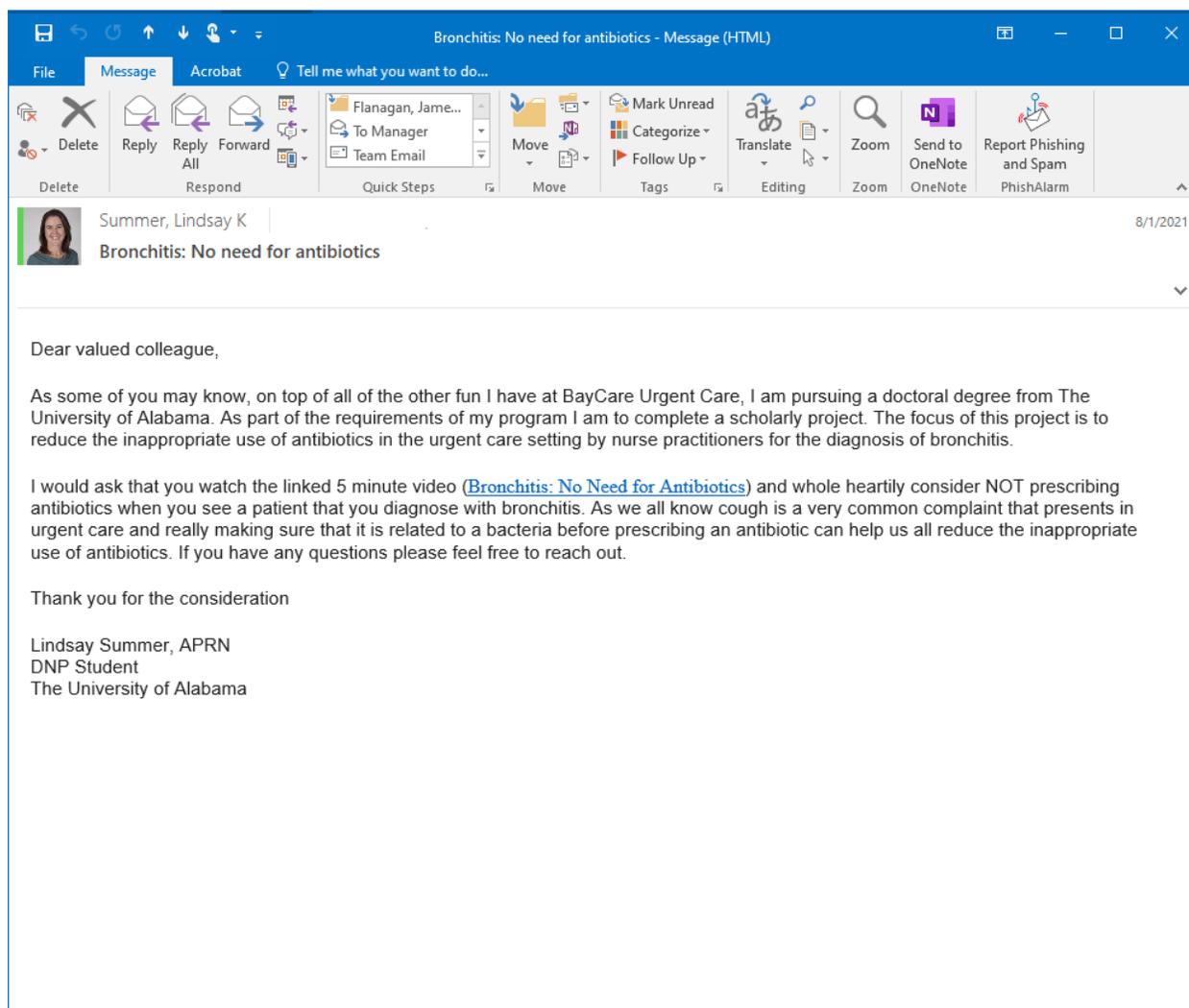
Sincerely,

Nathan Keith Waldrep, MD

CMO-Urgent Care and Occupational Medicine

Appendix C

Bronchitis: No need for antibiotics - Message (HTML)

File | Message | Acrobat | Tell me what you want to do...

Delete | Reply | Reply All | Forward | Flanagan, Jame... | To Manager | Team Email | Move | Mark Unread | Categorize | Follow Up | Translate | Zoom | Send to OneNote | Report Phishing and Spam

Delete | Respond | Quick Steps | Move | Tags | Editing | Zoom | OneNote | PhishAlarm

Summer, Lindsay K   8/1/2021

Bronchitis: No need for antibiotics

Dear valued colleague,

As some of you may know, on top of all of the other fun I have at BayCare Urgent Care, I am pursuing a doctoral degree from The University of Alabama. As part of the requirements of my program I am to complete a scholarly project. The focus of this project is to reduce the inappropriate use of antibiotics in the urgent care setting by nurse practitioners for the diagnosis of bronchitis.

I would ask that you watch the linked 5 minute video (Bronchitis: No Need for Antibiotics) and whole heartily consider NOT prescribing antibiotics when you see a patient that you diagnose with bronchitis. As we all know cough is a very common complaint that presents in urgent care and really making sure that it is related to a bacteria before prescribing an antibiotic can help us all reduce the inappropriate use of antibiotics. If you have any questions please feel free to reach out.

Thank you for the consideration

Lindsay Summer, APRN
DNP Student
The University of Alabama

Appendix D

2020 and 2021 ICD-10 Expanded descriptions:

J20 Acute bronchitis ** is not listed in 2021 guidelines

J20.0 Acute bronchitis due to Mycoplasma pneumoniae

J20.1 Acute bronchitis due to Hemophilus influenzae

J20.2 Acute bronchitis due to streptococcus

J20.3 Acute bronchitis due to coxsackievirus

J20.4 Acute bronchitis due to parainfluenza virus

J20.5 Acute bronchitis due to respiratory syncytial virus

J20.6 Acute bronchitis due to rhinovirus

J20.7 Acute bronchitis due to echovirus

J20.8 Acute bronchitis due to other specified organisms

J20.9 Acute bronchitis, unspecified

(Centers for Medicaid and Medicare services, n.d.)