

DOCTOR OF NURSING PRACTICE (DNP) PROGRAM

A DNP PROJECT

EVALUATING NURSE PRACTITIONER PRACTICES IN THE DIAGNOSIS AND TREATMENT OF ACUTE PHARYNGITIS

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Abstract

The use and misuse of antibiotics is a major contributor to the development of antibiotic-resistant bacteria. Forty-four percent of outpatient antibiotic prescriptions are written to treat patients with acute respiratory conditions, such as acute pharyngitis. Half of these prescriptions are unnecessary. The Centor score uses a number system to identify how likely it is for Group A beta-hemolytic streptococcus to be present based on certain criteria. Clinical decision making with the Centor score should be confirmed with laboratory testing, such as rapid antigen detection test or throat culture. The aim of this project overall was to improve quality of care in the management and treatment of acute pharvngitis. Using a pre-post survey design, provider response to an educational intervention was evaluated. Results showed that there was no correlation between provider demographics and current practices. Verbalization on the use of the Centor score increased from 70.8% to 79.2% between the pre and post survey. Evaluation of the educational program was found useful by 87.5% of the participants, and 54.2% stated that it would impact their future practices. There was no increase in the use of diagnostic tools between winters 2017 vs. winter 2018; this could be for a variety of reasons. Subjects verbalized that the main barrier to appropriate antibiotic prescribing was patient's insisting on the need for an antibiotic prescription even when their rapid strep tests were negative.

Keywords: acute pharyngitis, antibiotic overprescribing, antibiotic resistance, treatment and management of pharyngitis, Centor score, Centor criteria, clinical point score, clinical score, clinical decision rule, outpatient setting

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Evaluating Nurse Practitioner Practices in the Diagnosis and Treatment of Acute Pharyngitis

Background and Significance

Acute pharyngitis is one of the most common chief complaints that cause individuals to seek medical treatment. Although most cases are viral, Group A beta-hemolytic streptococcus (GAS), the most common cause of bacterial pharyngitis, does affect over half a billion people a year (Fine, Nizet, & Mandl, 2012). Complications from GAS rarely occur, but can happen if left untreated. Suppurative complications include peritonsillar abscess, or otitis media. Nonsuppurative complications include rheumatic fever, glomerulonephritis, and pediatric autoimmune neuropsychiatric disorder (PANDAS) ("Group A Streptococcal Disease", 2016). Bacterial pharyngitis is most common in children and adolescents, with a peak incidence during late winter, and early spring (Chiappini et al., 2011). Viral and bacterial pharyngitis can sometimes mimic each other, but there are certain symptoms more strongly associated with either viral or bacterial. Symptoms such as sudden onset of fever, cervical node adenopathy, pharyngeal or tonsillar inflammation or exudate, and palatal petechiae are more commonly found in bacterial infections. Cough, rhinitis, conjunctivitis, and diarrhea are some symptoms more commonly find in viral infections. Antibiotics are still commonly prescribed, and sought out by patients, despite the lack of evidence showing its necessity and efficacy (Chiappini et al., 2011). Many patients seek out antibiotics due to lack of knowledge on proper antibiotic use. Inappropriate antibiotic use for upper respiratory infections, including acute pharyngitis, is common in ambulatory care, and contributes to antibiotic resistance (Hersh, Jackson, & Hicks, 2013). This is compounded by the fact that few new antibiotics to treat antibiotic-resistant infections are under development (Hersh et al., 2013).

Antibiotic resistance has become an urgent public health and patient safety priority, and emphasis is being placed on judicious antibiotic prescribing. The rate of antibiotic-resistant infections has about doubled since 2002, and costs about \$2 billion per year in the United States; the incremental cost from each antibiotic resistant infection vs a non-resistant bacterial infection was \$1383 (Kelly, 2018). The overall number of bacterial infections has remained constant; however, the number of antibiotic resistant infections has risen dramatically from 5.2% to 11% (Kelly, 2018). In a retrospective analysis reported by JAMA Internal Medicine, urgent care centers and retail health clinics have a rate of antibiotic prescribing twice as high when compared to emergency departments and medical offices (Bowser, 2018). Antibiotic prescriptions were linked to 39% of urgent care and 36.4% of retail health clinic visits, compared to 13.8% of emergency department and 7.1% of medical office visits (Bowser, 2018). These staggering findings show the necessity of antibiotic stewardship in the outpatient setting. In current practice, parents often ask for antibiotics to help "soothe" their child's throat. Many parents also seek out antibiotics because their previous providers would often give into the pressure without fully educating the parents on the negative aspects of improper usage of antibiotics. Another reason that may contribute to overuse of antibiotics is the providers approach. Providers are selective on whether they should obtain a throat swab to confirm diagnosis or prescribe antibiotics right away. According to Fine (2012) "Physical examination of the posterior oropharynx is an inaccurate method to distinguish GAS from other causes of acute pharyngitis" (p. 848). Signs and symptoms of GAS pharyngitis often overlap with other infections, and it is not recommended to base diagnoses on clinical data alone (Chiappini et al., 2011).

There are five guidelines within the U.S. on the assessment and management of acute pharyngitis; some with slight differences on testing and management. There is consensus among them all that antibiotics should be reserved strictly for those with high likelihood, or confirmed streptococcal infections. These five guidelines stem from the American College of PhysiciansAmerican Society of Internal Medicine (ACP-ASIM), Infectious Diseases Society of America (IDSA), Institute for Clinical Symptom Improvement (ICSI), American Heart Association (AHA), and the American Academy of Pediatrics (AAP). The ACP-ASIM is the only guideline that relies heavily on the Centor score to identify if rapid antigen diagnostic testing (RADT) is necessary. The Centor score is a four-point clinical scoring scale used to help classify the risk of GAS and guide management of acute pharyngitis (Fine, 2012). There are four different symptoms that a provider would add a point for if present, then add or subtract one point, or do nothing, to the total depending on the patient age. Refer to Figure 1 for a visual example of the Centor score. All other guidelines have practitioners relying on their clinical opinion and assessment. In the guideline from the ACP-ASIM, it states that adults with a Centor score of four do not require microbiologic testing, and that treatment should be started immediately. There has been an issue with overtreatment, however, because research has shown that only 50% of patients with a Centor score of four actually have streptococcal pharyngitis (Chiappini et al., 2011). All U.S guidelines agree that confirmation with throat culture should be obtained in children when a negative result is obtained in clinic using RADT (Chiappini et al., 2011). The AHA is the only guideline that recommends obtaining a throat culture for adults when in clinic testing is negative (Chiappini et al., 2011).

There are a number of tools that have been developed to aid practitioners in the assessment, diagnosis, and treatment of acute pharyngitis. The Centor score, uses a number system to identify how likely for strep to be present based on certain criteria. The Centers for Disease Control and Prevention (CDC) and the American College of Physicians-American Society of Internal Medicine (ACP-ASIM), endorse applying the four-point Centor clinical scoring scale to classify risk of GAS and guide management of acute pharyngitis in adults (Fine, et al., 2012). Signs and symptoms of GAS pharyngitis overlap with other infections, and it is not recommended to base diagnoses on clinical data alone (Chiappini et al., 2011). The Centor score was developed to help clinicians distinguish between viral and GAS pharyngitis, and indicate when treatment with antibiotics was appropriate. Despite the fact that the CDC and ACP-ASIM have endorsed the use of clinical scores, particularly the Centor score, they have not gained as much traction as one would think in the clinical setting (Fine et al., 2012).

The Centor score was developed about 30 years ago from a study that evaluated 286 adults at a single emergency room (Fine et al., 2012). More recently, in 2012, a study was published that sought to validate the Centor score on a large, geographically diverse population. Overall the study validated the Centor score in its ability to classify those at risk of GAS infections (Fine et al., 2012). The Centor score received an AUC score of 0.72. The area under the receiver operator characteristic cure (AUC) is a metric that is widely used to reflect the overall accuracy of a diagnostic test or overall performance of a clinical prediction model, with values falling between 0.5 and 1 (Fine et al., 2012). The Centor score is meant to help providers differentiate between viral and GAS pharyngitis, and thus properly prescribe antibiotics if necessary to prevent complications and spread of disease. There are a number of factors that could be contributing to lack of use of the Centor score. One such factor may be lack of provider knowledge. Some providers may not know what the current guidelines state on the management of acute pharyngitis, or what the Centor score is. Time constraints may also be another factor contributing to its lack of use. An additional step would have to be done between physical examination and diagnosis. Providers would have to assign points after analyzing patient symptoms and physical findings. Finally, it may be partly due to the perception that the Centor score was developed from a very small sample.



Figure 1. Centor Score Criteria Adapted with permission from Choby, B. A. Diagnosis and treatment of streptococcal pharyngitis. Am Fam Physician. 2009;79(5):385

Needs Assessment

A popular retail health chain located throughout New Jersey provides care to a number of patients seeking care for minor acute illnesses, including acute pharyngitis. In the year 2015, they announced that their clinics had surpassed 25 million patient visits nation-wide since first opening its doors in the year 2000 (CVS Health, 2015). Many patients present to the clinic with their mind already made up that they need an antibiotic; their infection cannot be anything but bacterial. Many patients that walk in seeking care for a sore throat automatically assume that it must be GAS pharyngitis, whether or not they have had strep throat in the past. Some patients, even with a negative strep test, want something to "soothe" their sore throat; namely antibiotics. This retail health chain provides different resources, such as rapid strep tests and strep DNA probes, to properly diagnose and treat acute pharyngitis. The guidelines set at this organization, including use of the Centor score, closely follow recommendations endorsed by the CDC and

ACP-ASIM. However, providers may lack knowledge of the Centor score, and what purpose it serves in relation to managing acute pharyngitis. The question arises: are nurse practitioners (NP) using the assessment tools provided to them to aid in their assessment and treatment of acute pharyngitis? One must wonder what the barriers are in preventing these practitioners from adopting them in their everyday practice. Provider clinical practices must be assessed, and potential barriers identified to improve the quality of care being provided.

Problem Statement/Clinical Question

Based on the literature there is clearly a need to improve the quality of care when patients present with a chief complaint of acute pharyngitis. One must first assess the providers' level of knowledge to know where to start addressing the problem. Providers should also be questioned on their adherence to current guidelines, and what, if any, barriers exist in adhering to current guidelines. The clinical question guiding this project is "What are nurse practitioner knowledge and practices on the assessment and management of acute pharyngitis?"

Aims and Objectives

The overall aim of this project was to improve knowledge and adherence to current practice guidelines in the management and treatment of acute pharyngitis. Objectives of this project are to:

- Assess nurse practitioner practices in the management and treatment of acute pharyngitis.
- Evaluate NP knowledge of current national guidelines and the Centor score in the management and treatment of acute pharyngitis.
- Assess potential barriers to proper management and treatment of acute pharyngitis.

- Develop, deliver, and evaluate an educational web-based program to increase NP knowledge and increase use of proper resources to manage and treat acute pharyngitis leading to improved quality of care.
- Assess use of rapid strep test and strep DNA probe cultures before and after the educational program

Review of Literature

A three-step search strategy was utilized to find appropriate articles. An initial limited search of CINAHL and PubMed was undertaken, followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. A second search using all identified key words and index terms was then undertaken across multiple databases. Third, the reference list of all identified reports and articles was searched for additional studies. Studies published between 2011 and 2017 were considered for inclusion in this review using the following search terms: *acute pharyngitis, antibiotic overprescribing, antibiotic resistance, Centor score, Centor criteria, clinical point score, clinical score, clinical decision rule, outpatient setting, and treatment and management of pharyngitis.* The databases searched included CINAHL, Medline, PubMed, and Cochrane library.

Studies with an outpatient care setting population that focused on the treatment, management and diagnosis of acute pharyngitis were considered in the literature review. Studies that aimed to reveal the increase in use of antibiotic prescriptions in acute pharyngitis was also considered. The types of studies evaluated were peer reviewed, quantitative studies, randomized control trials, clinical practice guidelines, cross sectional observations, and qualitative studies. Articles included in the literature review span back six years from 2011 to present. International studies were also evaluated and included during this process. Overall, the main interest when searching these articles were prescription practices in the management of acute pharyngitis by providers, the steps taken by providers to diagnose strep pharyngitis, current national guidelines for management of acute pharyngitis, and practitioners' adherence to current guidelines. All articles deemed appropriate were analyzed and included in the literature review. Articles that focused solely on the actual treatment of strep pharyngitis, and appropriate selection of antibiotics were excluded from the literature review. See Appendix A for a table of evidence.

Three studies reviewed revealed that there is significant variability across and within practices in the diagnosis and treatment of acute pharyngitis (Fierro et al., 2014; Hedin et al., 2014; & Urkin et al., 2013). In Barlam, Morgan, Wezler, Christiansen, & Drainoni (2015) and Urkin et al. (2013), family medicine providers were more likely to stray from current guidelines leading to overprescribing of antibiotics for the management of pharyngitis, and younger providers were more likely to adhere to clinical practice guidelines by performing confirmatory testing. Gender was also assessed. It was found that male providers were more adherent than female providers to current guidelines (Barlam et al., 2015; Hedin et al., 2014). However, Urkin et al., (2013) found that non-adherence to current guidelines was more associated with male providers. Three studies specifically focused on provider adherence to current guidelines, and found that most providers, overall, were non-adherent to the current practice guidelines. Barlam et al., (2015) found that in general that the family providers strayed from guidelines; Hedin et al., (2014) also found that majority of general practitioners were non-adherent to the guidelines. Urkin (2013) found that 50% of the physicians included in the study did not adhere to the current national guidelines during practice. Guidelines clearly state that diagnostic testing should be used in order to guide clinical decisions on prescribing antibiotics, but many practitioners would

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prescribe antibiotics despite a negative strep test, before the culture results would be known, or without any testing at all.

Two international studies, Llor, Moragas, Cots, & Lopez-Valcarcel (2016) and Urkin et al., (2013) and one U.S. study, conducted by Little et al., (2014) found that primary care physicians underused rapid antigen diagnostic tests (RADT) leading to empirical and unnecessary use of antibiotics. In the study conducted by Little et al., (2014), clinical scores, RADT, and delayed antibiotic prescribing were compared. There were three control groups: delayed antibiotics, clinical score, and RADT according to a clinical score. The clinical score used in the study was similar to the Centor score point system. This study found that using clinical scoring systems improved symptoms, reduced unnecessary antibiotic use, and were also more cost effective. Fine, Nizet, & Mandl (2012) found that the Centor score was a valid screening tool to identify those at risk for GAS in children and adults. Llor et al., (2016) found that if general practitioners had used RADT, as advised by guidelines, the 49.1% of patients that received antibiotics during their visit for acute pharyngitis would have only been 7.6%; this would have saved 420 unnecessary antibiotic prescriptions. Nakhoul & Hickner (2013) found during their study that 56% of patients diagnosed with acute pharyngitis received an antibiotic prescription, but only 19.5% of patients had a confirmed strep pharyngitis diagnosis.

Current clinical practice guidelines, recommendations, and reports were also included as part of the literature review for this project. All reviews, reports, and guidelines, three in total, agreed that antibiotics should only be prescribed in bacterial infections with a confirmed diagnosis of GAS by RADT or throat culture (Harris, Hicks, & Qaseem, 2016; Hersh, Jackson, & Hicks, 2013; Schulman et al., 2012. The guidelines also stated that back up throat culture to confirm negative RADT results is not necessary in adults (Harris et al, 2016; Hersh et al., 2013; Shulman et al., (2012). Hersh et al., (2013) reported that there is no benefit from antibiotic therapy in viral infections, and increases the risk of adverse events such as diarrhea, C.diff, and antibiotic resistance.

Using the current literature review as a basis to this project, providers will be targeted to address the issues currently present in the management of acute pharyngitis. As per the literature reviewed about the reoccurring problem, and potential solution, focus is on the providers. If providers are following guidelines, and utilizing the resources available to them, then change in the right direction will be seen. For this DNP project providers will be presented with educational resources on the Centor score, a clinical scoring system, in relation to RADT. As per the study conducted by Little et al., (2014) these two combined methods improve the quality of patient care provided to patients in the management and treatment of acute pharyngitis.

Theoretical Framework

The Donabedian model was used as the conceptual framework guiding this DNP project. Refer to Figure 2 for a visual of this framework. The basis of this model focuses on three main categories: structure, process, and outcome. This framework is used for assessing the quality of care, and is flexible enough to apply to many situations (Moran, Burson, & Conrad, 2017). As this was a quality improvement project, this framework was an appropriate choice. The first aspect, structure, is the physical and organizational characteristics of the healthcare settings. For this specific project it was CVS MinuteClinic, a retail health setting; it is primarily run by family nurse practitioners, who provide acute care for minor illnesses. The second aspect, process, is what will be done and how it will be implemented. This part relies on the structure to provide the resources that will aid in moving through the process. At this time the structure currently provides rapid strep tests and strep DNA probes to aid in the process. In this project, the web-

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based educational program discussing the current guidelines for managing acute pharyngitis with a focus on the Centor score, was added to the structure to hopefully improve the process of how patients were cared for when they presented with acute pharyngitis. The process can include all interactions between patients and providers from diagnosis and treatment, to preventative care and patient education. The last aspect, outcome, is what will be measured, or assessed. In this project what was assessed were provider knowledge and current practices in the use of the Centor score, and also a comparison in use of resources, or rapid strep tests and strep DNA probes, from the previous year. This was done in pre-test and post-test design to see if the educational resources make a difference in provider behavior and practices. All of this was done to improve the quality of care provided to patients presenting to this setting with acute pharyngitis. This model served as a map and connected all the necessary steps needed for successful completion of the project.



Donabedian's Quality Framework

Figure 2. Donabedian Model

Adapted from Boston University School of Public Health. The Donabedian Model. 2016

Methodology

This study was an experimental, longitudinal study, with a pretest-posttest design for evaluation of the intervention. Educational resources were used to influence proper management and treatment of acute pharyngitis as per current national guidelines. Use of rapid strep tests and throat cultures, over a three-month period after the intervention was compared to last year's same three-month period data to measure effectiveness of the educational intervention.

Setting

The project took place in a popular retail health chain in New Jersey. Multiple clinics in a selected region with 26 clinics were included in the study. See Appendix B for documentation of site approval for this project.

Study Population

All study participants were family nurse practitioners employed by this popular retail health chain. Each clinic had two full time family nurse practitioners for a total of 52 possible participants; the majority were female. Casual part time/per diem nurse practitioners were also invited to join in on the study. A final count of 24 NPs participated in the study. Study participants varied as far as age and years of experience. The target sample size was 46 participants. Sample size was calculated using a 95% confidence level and 5% margin of error (Qualtrics, 2018).

Subject Recruitment

Mass emails through the company's internal email system were sent out, by the researcher, to all possible participants requesting their participation in the study (refer to Appendix C). Only practitioners in the selected region received the email inviting them to participate in the study. The emails of the practitioners were found through the directory that is only visible to current employees. Eligibility criteria for participation were current employment with the retail health chain as a family nurse practitioner, and currently practicing in the provider role for at least three months. Exclusion criteria were planned leave of absence anytime during the study period, and practicing outside of a provider role, such as management and field

educators. Email invitations were sent out a week before peak season for streptococcal pharyngitis projected as late December to early January. Links were included within the email that brought participants to the website that had the pre- and posttest surveys, and the educational presentation.

Consent Procedures

A waiver of written consent was obtained through the IRB, due to the fact that no identifiable data would be collected, or stored. Pre and post-surveys were linked by user-created unique four-digit ID numbers that kept their anonymity. The first question of both surveys asked the participants if they consented to participate in the survey. A consent form was attached to the email invitations. The consent form explained the study in its entirety and informed the participants of their rights pertaining to participation in the study. The consent emphasized that participation is voluntary and anonymous. See Appendix D for the consent form.

Risks/Harms

Potential risk/harm from this project was minimal. All collected data from providers within the institution were kept anonymous and were not linked to any specific provider; this aided in honest answers and decreased fear of retaliation. This project did not involve patients, therefore there was no risk to the patients seen during the conduct of the study. A slight economic risk to the clinics was that the demand for resources to aid in the management of acute pharyngitis, such as rapid antigen diagnostic tests and strep DNA probes, might increase.

Subject Costs and Compensation

Subjects did not incur any financial burden. The only cost was their personal time to complete all surveys presented, and complete review of the educational materials provided. There was no compensation connected to the participation in this project.

Study Interventions

Interventions included a self-paced, web-based educational program that included different sections. The first section focused on viral versus bacterial pharyngitis. The second section focused on current guidelines and the proper way to manage, test, and treat acute pharyngitis. The third, and last section, focused on the Centor score, what it is, and how it can aid as a screening tool in acute pharyngitis. There were case study scenarios to help providers understand the application of the Centor Score. The pre- and posttest was designed through Survey Gizmo. The web-based program, created by the researcher, was presented as slides on the free presentation site SlideShare. See Appendices E thru G for a copy of the surveys and educational program that was distributed to the participants. Bi-monthly clinical tips for managing and treating acute pharyngitis were emailed to all providers in the selected region from the researcher through the institution's internal email system. These clinical tips were sent on a bi-monthly basis on Thursdays from January to March. See Appendix H for clinical tips that were sent out via email.

Outcome Measures

Outcome measures included provider knowledge, planned behaviors, number of rapid strep tests, and number of strep DNA probes sent before and after the intervention. All outcomes were expected to increase as a result of the educational intervention. In addition, providers' opinions of barriers to proper management and treatment of acute pharyngitis were assessed. A survey was used prior to intervention to collect provider demographics, knowledge, and current behaviors and practices. A survey was conducted after the intervention to assess change in provider knowledge and practices; provider demographics were again collected. Surveys were linked by a unique 4-digit ID number created by the participants. The number of rapid strep tests, and strep DNA probes sent out when rapid strep tests were negative, were monitored and recorded over a three-month period; providers log in all point of care tests done in the clinic on paper logs that are kept for a period of two years. Comparison was done to the same three months from the previous year to determine if the intervention made a difference in the way providers managed acute pharyngitis. The rapid strep test data only included results, and whether a strep DNA probe was sent out to confirm negative results; no identifiable patient or provider data were collected. Provider demographics were collected to see if there is any correlation between age, gender, and years in practice to provider behavior in the management of acute pharyngitis. Provider knowledge and current behavior were collected pre- and post-implementation to assess if the intervention made an impact. The amount of rapid strep tests was also collected to see if there was an increase in use of current resources available to providers.

Project Timeline

Project and data collection ran from December 2017 to March 2018. Data analysis began April 2018, and ended in September 2018.

Resources Needed

Costs for the researcher was minimal to none. All surveys were created through free survey builder website Survey Gizmo. The educational program was presented through free presentation host website SlideShare. Diagnostic tools that providers were encouraged to use were already made readily available by the institution.

Results

The hypothesis for the results is that provider knowledge and behaviors would improve, and the number of screening and diagnostic tools used would also increase when winter 2018 was compared to winter 2017. The number of participants for this project totaled 24; 23 which were female and one male. Participant age ranged from 25-65 years old, with majority falling between 46-50 years old. Ten participants had greater than five years of experience, nine participants had between two and five years of experience, and five participants had less than two years of experience. These demographics are visually displayed in Table 1 and 2 below.

One outcome was participant verbalization of use of the Centor score during management and treatment of patients with acute pharyngitis by providers via the survey provided by the researcher. The goal was to have this number increase after the educational program. In the presurvey 17 out of 24 participants (70.8%) stated that they use the Centor score to aid in their decision making when managing acute pharyngitis; in the post-survey this number jumped up to 19 of 24 participants (79.2%).





Data on provider behavior, current use of the Centor score, was collected and tested for association between age and years of experience to current behavior; Spearman's rho was used for analysis. When it came to age and use of the Centor score, analysis found no significant correlation between the two ($r_s 0.020$; p 0.926). When it came to years in practice to the use of the Centor score no significant correlation was found ($r_s 0.120$; p 0.578). Knowledge was also assessed by questioning providers about current guidelines in place at the clinic for treating acute pharyngitis. In the pre survey 100% of participants stated that they are aware of the current guidelines. The question asked immediately after asked them to physically write in their own words what they believed the guidelines stated. After analyzing the responses, only 19 out of 24 participants (79%) gave a correct response. In the post survey the same two questions were asked, and again 100% responded saying that they are aware of the current guidelines; 21 out of 24 (87.5%) answered correctly what the guidelines stated.

Potential barriers were assessed in the management and treatment of acute pharyngitis by providers. Providers were asked if they found the current guidelines posted in their clinic adequate. All participants stated that the guidelines were adequate with 20 of participants (83%) stating that the Centor score was at least somewhat useful during practice. The main barrier was patient's insisting on the need for an antibiotic prescription even when their rapid strep tests were negative in the clinic. In the pre survey, a total of 22 of the 24 participants (91.6%) estimated that patients insist on receiving an antibiotic prescription 25%-100% of the time despite negative rapid test results. For a further breakdown: 14 participants (58.3%) estimated they were asked 25% of the time, 5 participants (20.8%) estimated they were asked 50% of the time, 2 participants (8.3%) estimated they were asked 75% of the time, and 1 participant (4.2%) estimated she was asked 100% of the time.

The last outcome compared utilization of the diagnostic tools used to manage and treat acute pharyngitis from January to March in the years 2017 and 2018 in five different clinic locations. For the five clinics analyzed, there were a total of 10 providers ordering tests. There was a decrease in the number of rapid strep tests and strep DNA probes used in winter 2018 when compared to winter 2017. This could be for a variety of reasons. Table 3 and 4 show side by side comparison of 2017 vs. 2018 for each type of test by month. Table 5 and 6 display the total number of visits for that time period. To evaluate the usefulness of the educational

program, two questions were asked at the end of the post survey. A total of 21 out of 24 participants (87.5%) found the educational program useful, and 13 out of 24 participants (54.2%) stated that the educational program would impact their future prescribing practices.

Table III. Rapid Strep Test				
Rapid Strep Tests				
Month	Year			
	2017	2018		
January	375	314		
February	389	304		
March	523	276		
Total	1,287	894		

Table V. Total visits Jan-March 2017

Month/Year

January 2017

February 2017

March 2017

Total

Table IV. Strep DNA Probes

Strep DNA Probes				
Month	Year			
	2017	2018		
January	220	162		
February	229	147		
March	300	138		
Total	749	447		

Table VI. Total visit Jan-March 2018

Number of Visits	Month/Year	Number of Visits
2,732	January 2018	3,008
2,135	February 2018	2,492
2,292	March 2018	1,572
7,072	Total	7,159

Discussion

Many respondents found the Centor score to be a useful tool when dealing with patients presenting with acute pharyngitis. However, no increase in the number of rapid strep tests and strep DNA probes was documented between the winters of 2017 and 2018. This could be for a variety of reasons, for example: decrease in patient visits for acute pharyngitis, or lack of appropriate documentation by providers after completion of tests in clinic. Another factor could be provider opinions and practices. Providers may be doing more thorough assessments, and finding that some patients do not need testing for strep throat; whether it be rapid strep tests or confirmatory testing with strep DNA probes.

The project had some limitations. Chart reviews were not allowed by the retail health chain during the duration of this project, so the number of patients with an actual diagnosis of acute pharyngitis that were prescribed antibiotics was not obtained. Also unattainable were specific patient demographics that were associated with each rapid strep test and strep DNA probe performed. Sample size was also an unintended limitation for this study; sample size was 24 participants, less than the 46 participants needed to show a difference. Future studies, without the restrictions placed on the researchers for this project, would be beneficial to expand and tackle the problem of inappropriate antibiotic prescribing in acute pharyngitis.

Antibiotic stewardship interventions, and constant education can help properly manage and treat those presenting in the retail health setting with acute pharyngitis, while also reducing the number of inappropriate antibiotic prescriptions.

Implications for Clinical Practice

This overall goal of this project was to reinforce current clinical practice guidelines promoting the use of the Centor score, and to improve clinical practice by limiting the inappropriate prescription of antibiotics for pharyngitis. If the Centor score is a valid screening tool and guide to identify those at higher risk for streptococcal pharyngitis, increasing its use will eventually improve clinical practice. If providers are properly educated, they can then begin to educate their patients on the importance of treating viral and bacterial infections appropriately. Telemedicine patients' overall satisfaction was found to be higher when they receive antibiotics for respiratory tract infections; 66% of patients in the study received antibiotics for respiratory tract infection which are mostly viral in nature (Cohen, 2018). This is twice the rate that would be clinically appropriate. Comparable to the Cohen study, in this quality improvement project, the main barrier to implementing guidelines was patient's insisting on the need for an antibiotic prescription even when their rapid strep tests were negative in the clinic. Having patients understand the risks and harms of over treating with antibiotics may encourage patients to make smarter decisions regarding antibiotics, and decrease the risk of antibiotic resistance in the retail health setting and all outpatient settings such as private practices, urgent care centers, and telemedicine services.

Implications for Healthcare Policy

This project aims to reinforce the current policy that is in place for providers in the retail health clinic where it was implemented. It will reinforce adherence to current guidelines that are in place to aid providers in providing quality care to patients. Having providers screen their patients appropriately as part of protocol may have an impact across the board as far as quality of care, healthcare costs, and improved patient outcomes. Recommended guidelines for the use of the Centor score should be reinforced on a national level, as patients presenting with a chief complaint of acute pharyngitis appear in all setting nationwide.

Implications for Quality/Safety

Overall as providers we have a duty to provide quality care that is not only considered as safe, but also effective; that includes prescribing certain medications only when necessary. Antibiotics may cause adverse reactions and antimicrobial resistance when used inappropriately. Overprescribing of antibiotics is a growing concern in the medical world, and if this continues antibiotics may become completely ineffective (Cohen, 2018). This project reinforced providers' knowledge of guidelines to improve quality, safety, and efficacy of care to patients with acute pharyngitis.

Implications for Education

Many practitioners are unaware of the Centor score, and its role in the management of acute pharyngitis. This study provided retail health clinic providers with in-depth knowledge of the guidelines for management and treatment of acute pharyngitis, and the implications of prescribing antibiotics unnecessarily. Increasing the providers' knowledge base may, in turn, increase provider understanding and compliance.

Economic Implications

The rate of antibiotic-resistant infections has nearly doubled since 2002, and costs about \$2 billion per year in the United States. The incremental cost from an antibiotic resistant infection vs a non-resistant bacterial infection was \$1383 (Kelly, 2018). The overall number of bacterial infections has remained constant; however, the number of antibiotic resistant infections has risen dramatically from 5.2% to 11% (Kelly, 2018). Decreasing the amount of unnecessary antibiotic prescriptions, and encouraging judicious antibiotic prescription costs, and costs for treating adverse events from unnecessary antibiotic prescriptions.

Sustainability/Plans for Future Scholarship

This project will be presented and defended for completion of the DNP program requirements at Rutgers University. After graduation, work with the Antibiotic Stewardship Council at this popular retail health chain will continue to improve the quality of care provided to patients when it comes to antibiotic prescribing.

The results of this study will be reported to the retail health chain's Antibiotic Stewardship Council to review provider response to the educational interventions that were provided to them. With this data, they may be able to identify potential areas for improvement within the organization on a national level.

The Nurse Practitioner journal and Contemporary Clinic are possible options for publication. If education regarding the Centor score proves to be useful to providers at this retail health chain, it could also serve as an aid to other providers in other settings. The project took place in a retail health setting that offers "convenient care", but primary care offices and other urgent care settings also receive chief complaints of sore throat. Education regarding the Centor score may be useful in a variety of patient care settings for adults and children.

Conclusion

This study had an impact in many different ways. This project reinforced the current policy that is in place for providers. It also provided more in-depth knowledge of the policy, therefore increasing provider understanding and compliance. As this was a performance improvement project, its ultimate goal was to improve the quality of care provided to the patients coming to a specific popular chain of retail health clinics. This project educated providers to adhere more closely to the recommended treatment guidelines for acute pharyngitis with an increase in diagnostic testing and a reduction in unnecessary antibiotic prescribing. This small project was simply the beginning to improving the quality of care of one of many upper respiratory infections overly treated with antibiotics.

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Appendix A

Evidence Table

Authors/Date	Evidence Type	Sample, sample	Findings	Limitations	Evidence
		size, setting			level and
					quality
Barlam et al.,	Non-experimental	Visits that had	1. Visits with	Chart reviews	III/Good
2015		an ICD-9-CM	Family Medicine	were not	
		code for	providers, female	performed to	
		respiratory tract	gender, and self-	verify that	
		infection	reported	patients were	
			race/ethnicity as	prescribed	
		Of 5,156 RTI	white or Hispanic	antibiotics for	
		visits during the	were significantly	RTI, or that	
		study period,	associated with	ICD-9 code	
		4,492 visits were	inappropriate	accurately	
		conducted by an	antibiotic	reflected the	
		attending staff	prescribing	reason for the	
		physician (79	,	visit	
		physicians) with	2. Physicians in		
		at least 10 RTI	the lowest quartile	Patient	
		visits, and were	prescribed	symptoms or	
		included in the	antibiotics for 5%–	physical	
		analysis	28% (mean, 21%)	examination was	
			of RTI visits	not examined;	
		USA		prior studies	
			3. Physicians in	indicated this	
			the highest quartile	influenced	
			prescribed	antibiotic	
			antibiotics for	prescribing	
			54%–85% (mean,		
			65%) of RTI visits	The use of	
			4	one hospital and	
			4. High	one geographic	
			prescribers had	area, reduces the	
			fewer African-	generalizability	
			American patients	of the results	
			and more patients		
			who were younger	Analysis of	
			and privately	highest and	
			insured	lowest	
			e II. 1	prescribers had a	
			5. High	limited sample	
			prescribers had	sıze	
			more patients with	TT 11 .	
			chronic lung	Unable to	

			1'	(1	
			disease.	survey the	
				patient	
			6. A GIM practice	population,	
			pod with a low	whose	
			prescriber was 3.0	expectations of	
			times more likely	the medical visit	
			to have a second	may	
			low prescriber than	impact	
			other practice pods,	prescribing This	
			whereas pods with	information	
			a high prescriber	might have	
			were 1.3 times	clarified, for	
			more likely to have	example,	
			a second-high	whether racial	
			prescriber	and gender	
				differences in	
				prescribing	
				were due to	
				patient cultural	
				bias and	
				preferences	
				and/or	
				physician bias	
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Chiappini et	Non-experimental	12 national	1. Because highly	Search	V/H1gh
al., 2011	Non-experimental	12 national guidelines from	1. Because highly sensitive RADT	Search strategy might	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western	1. Because highly sensitive RADT assays are now	Search strategy might have missed	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	1. Because highly sensitive RADT assays are now available, some US	Search strategy might have missed some guidelines,	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	1. Because highly sensitive RADT assays are now available, some US guidelines do not	Search strategy might have missed some guidelines, and the	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	1. Because highly sensitive RADT assays are now available, some US guidelines do not recommend	Search strategy might have missed some guidelines, and the decision to	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	1. Because highly sensitive RADT assays are now available, some US guidelines do not recommend that a negative	Search strategy might have missed some guidelines, and the decision to include only	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	1. Because highly sensitive RADT assays are now available, some US guidelines do not recommend that a negative result be confirmed	Search strategy might have missed some guidelines, and the decision to include only national	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	1. Because highly sensitive RADT assays are now available, some US guidelines do not recommend that a negative result be confirmed by throat culture	Search strategy might have missed some guidelines, and the decision to include only national guidelines has	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	1. Because highly sensitive RADT assays are now available, some US guidelines do not recommend that a negative result be confirmed by throat culture in adults.	Search strategy might have missed some guidelines, and the decision to include only national guidelines has excluded	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	1. Because highly sensitive RADT assays are now available, some US guidelines do not recommend that a negative result be confirmed by throat culture in adults.	Search strategy might have missed some guidelines, and the decision to include only national guidelines has excluded those developed	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	 Because highly sensitive RADT assays are now available, some US guidelines do not recommend that a negative result be confirmed by throat culture in adults. In children a 	Search strategy might have missed some guidelines, and the decision to include only national guidelines has excluded those developed at a regional	V/H1gh
al., 2011	Non-experimental	12 national guidelines from Western countries	 Because highly sensitive RADT assays are now available, some US guidelines do not recommend that a negative result be confirmed by throat culture in adults. In children a culture should 	Search strategy might have missed some guidelines, and the decision to include only national guidelines has excluded those developed at a regional level.	V/H1gh
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			initiated on these		
			initiated on those		
			lab anota my tastin a		
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Fierro et al.,	Non-experimental	222 clinicians	1. Significant	Data was	III/Good
2014		from 25 primary	variability in the	extracted from	
		care pediatric	diagnosis and	an EHR using	
		practice groups	treatment of	ICD-9 codes to	
		located across	pharyngitis exists	identify GAS	
		southeastern PA	across and within	pharyngitis.	
		southern NJ	pediatric practices		
			which cannot be	Analyses was	
		Encounters from	explained by	conducted using	
		January 1 -	relevant clinical or	data from a	
		December 31,	demographic	regional	
		2009	factors	healthcare	
				network, which	
		Children 18		might limit the	
		years or		generalizability	
		younger, 52,658		of results	
		diagnoses of			
		acute		Unable to	
		pharyngitis,		distinguish	
		including 12,445		between	
		diagnoses of		conventional	
		strep pharyngitis		and provisional	
				("watch and	
		USA		wait") antibiotic	
				prescriptions	
Fine et al	Non-experimental	Analysis of data	1. For patients 15	There may be	III/High
2012		collected from	vears and older	some variability	in ingi
2012		206 870 patients	23% tested	in clinical	
		3 years and	GAS positive	interpretation of	
		above who	including: 7% with	the Centor	
		nresented	a Centor score of 0	criteria by the	
		with a painful	12% with $1 - 21%$	nurse	
		throat to a	with 2 38% with	nuise practitioners:	
		United States	3 and $57%$ with 4	whether anterior	
		national ratail	5, and 5770 with 4.	arrying nodes	
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		from Sontombor	2. The patients 5	are emarged, for	
		2006	years and older,	ba more	
		2000- December 2009	2/70 lested GAS	ou more	
		December 2008	positive with: 8%	subjective than	
			of those testing	other criteria	
			positive with	such	

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C streptococcus or Fusobacterium necrophorum, the latter of which may cause severe disease especially in adolescents and young adults. All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			including group	
or Fusobacterium necrophorum, the latter of which may cause severe disease especially in adolescents and young adults. All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			C streptococcus	
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All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.				
necrophorum, the latter of which may cause severe disease especially in adolescents and young adults. All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			Fusobacterium	
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which may cause severe disease especially in adolescents and young adults. All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			the latter of	
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disease especially in adolescents and young adults. All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			cause severe	
especially in adolescents and young adults. All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			disease	
All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			especially in	
All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			adolescents and	
All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.				
All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			young adults.	
All patients in the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.				
the data set were symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			All patients in	
symptomatic with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			the data set were	
with sore throat, so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			symptomatic	
so our analyses do not address the important issue of the asymptomatic streptococcal carrier state.			with sore throat.	
do not address the important issue of the asymptomatic streptococcal carrier state.			so our analyses	
the important issue of the asymptomatic streptococcal carrier state.			do not address	
issue of the asymptomatic streptococcal carrier state.			the important	
issue of the asymptomatic streptococcal carrier state.			the important	
asymptomatic streptococcal carrier state.			issue of the	
streptococcal carrier state.			asymptomatic	
carrier state.			streptococcal	
			carrier state.	
Serologic testing			Serologic testing	

				was not performed, so symptomatic patients with a positive test, were assumed to be true positives, not carriers.	
Harris et al., 2016	Clinical Practice Guideline	Healthy adults presenting with acute respiratory tract infections USA	 Clinicians should test patients with symptoms suggestive of group A streptococcal pharyngitis by rapid antigen detection test and/or culture for group A streptococcus. Clinicians should treat patients with antibiotics only if they have confirmed streptococcal pharyngitis. Clinicians should not prescribe antibiotics for patients with the common cold 		IV/ High
Hedin et al., 2014	Qualitative	25 GP's with a variety of gender, age, educational background, working experience, urban/rural, public or private primary	 Nine GPs were adherent to the current guidelines of pharyngitis, and sixteen were not The two groups differed in terms of guideline knowledge and 	Four different interviewers may have decreased the reliability of the interviews No reports of actual sore throat	III/High

EVALUATING NURSE PRACTITIONER PRACTICES

		healthcare centers, as well as areas with high and low antibiotic prescribing from five different counties in Sweden	patient history and examination3. More men than women adhered to the guidelines.	management by the GPs interviewed	
Hersh et al., 2013	Clinical Report	Healthy pediatric patients presenting with upper respiratory tract infections USA	 Providers should determine likelihood of a bacterial infection. In pharyngitis, diagnosis of GAS requires confirmation by rapid antigen testing or throat culture Weight benefits vs harms of antibiotics. Antibiotics shorten symptoms duration and prevent rheumatic fever and may limit secondary transmission Implement judicious prescribing strategies. No benefits to therapy when bacterial infection is not present as it increases risk of adverse events such as diarrhea, dermatitis, C. diff, and antibiotic resistance 		IV/High

Little et al.,	Experimental/RCT	The setting was	1. Severity of	Although the	I/High
2014	-	UK primary	symptoms was	overall trial	
		care.	lower in the	population (both	
			clinical score	scores) was well	
		Patients	group than in	balanced, the	
		included in the	the delayed	groups for score	
		study were aged	prescribing group;	1 and score 2	
		\geq 3 years and	equivalent to one	were slightly	
		had acute sore	in three rating	unbalanced (in	
		throat.	sore throat a slight	opposite	
			rather than	directions) for	
		3 groups	moderately bad	fever reported in	
		631 patients	problem), and a	the last 24 hours	
		total	similar reduction		
		207 patients in	was observed for	An important	
		delayed	the RADT group	limitation of all	
		prescribing		trials is that	
		group,	2. In the delayed	health	
		211 patients in	group, 75/164	professionals	
		clinical score	(46%) used	may use their	
		only group, and	antibiotics, and	judgement in	
		213 patients in	29% iewer used	selecting trial	
		rapid strep and	antibiotics in the	patients. Time	
		clinical score	group and 27%	the main reason	
			for the	given for not	
			RADT group No	given for not	
			significant	natients but	
			differences in	there was some	
			complications or	evidence of	
			re-consultations	modest clinical	
			were found	selection	
			3. Targeting	This was a	
			antibiotics for	pragmatic trial	
			acute sore throat	so, although	
			using a clinical	clinicians were	
			score improves	encouraged to	
			symptoms and	use the intended	
			reduces antibiotic	strategy, there	
			use. RADTs used	was	
			according to a	variation as	
			clinical score	happens in	
			provide similar	negotiation with	
			benefits.	patients in	
				everyday	

				practice	
Llor et al.,	Non-experimental	Observational	1. Antibiotics	General	III/High
2016		study	were given or	practitioners	_
			patients were	participated on a	
	Primary care	referred in 497	voluntary basis		
		centers in Spain	patients with		
		totaling 126 GPs	pharyngitis	Prescribing	
			(49.1%) and 963	habits may not	
		GPs registered	patients with LRTI	represent the	
		1,212 cases of	(49.9%)	average use of	
		pharyngitis and		antibiotics in	
		1,928 cases of	2. If GPs had	their country	
		lower	appropriately used		
		respiratory tract	rapid antigen	GPs interested	
		infections	detection tests, and	in research	
		(LRTI) during	had strictly	prescribe more	
		15 working days	followed current	appropriately	
		in 2015, by	guidelines,	than GPs in	
		means of a 47-	antibiotics would	general	
		item audit	have been given to		
			7.6% and 15.1%,	Limited	
		Spain	respectively, with	availability of	
			an estimated	point of care	
			saving of 420	testing	
			antibiotics in		
			patients with sore		
			throat (estimated		
			saving of 84.5%;		
			95% CI: 81.1–		
			87.4%) and 672		
			antibiotics in		
			LRTIs (estimated		
			saving of		
			69.8%,95% CI:		
			67.1–72.5%)		
Nakhoul et al.,	Non-experimental	25,130 adult	1. Of 25,130	Of the 6,617	III/High
2013		patients aged 18	patients with acute	patients who had	
		years and older	pharyngitis, 19 %	a negative	
		visiting a	had no testing and	RADT and	
		Cleveland Clinic	81 % were tested	subsequent	
		generalist		negative DNA	
		physician in	2. Of 15,555	probe, chart	
		2009 and 2010	patients that had a	reviews were	
		with a visit	negative RADT	not done on	
		diagnosis of	and follow-up	these patients to	
		acute	DNA probe, 6 %	see if they had a	

1	1	1
pharyngitis	had a positive	household
	DNA probe	contact with
69 % females		confirmed strep
and 31 % males;	3. Of 953 patients	pharyngitis or
mean age was	who had a negative	another co-
40 years	RADT and a	existing
5	positive DNA strep	diagnosis for
822 excluded	probe. 48%	which an
from further	received an	antibiotic might
analysis who	antibiotic	be justified such
had DNA probe	prescription at the	as acute sinusitis
testing alone	time of the visit	
looving 10.652	and 51 % received	It is possible that
netionts who had	and 51 /0 received	it is possible that
Patients who had		some patients
a KADI test	prescription after	were given an
	an average of 2.3	
USA	days	prescription, but
	4 0 1	told to not fill
	4. Only one	the prescription
	patient with a	until the culture
	negative RADT	result was
	and no follow-up	returned.
	DNA probe	
	developed a	Clinicians face a
	peritonsillar	dilemma in
	abscess	using backup
		strep testing. On
	5. Overall, of the	the one hand,
	15,555 DNA	the longer a
	probes performed,	clinician waits
	management was	before
	altered in only 3 %	prescribing an
	of the patients at a	antibiotic, the
	total cost of	less likely the
	\$1,757,715	patient is to
	\$1,707,710	benefit from it
	6 56% received	But on the other
	on ontibiotic while	band if a
	only 10 5 % had a	clinicion
	only 19.5 % had a	
	throat diamania	presentoes an
	uiroat diagnosis	
		without waiting
		for the DNA
		probe results,
		this leads to
		significant over-

				prescribing.	
Shulman et al.,	Clinical Practice	Adult and	1. The diagnosis		IV/High
2012	Guideline	pediatric	of GAS pharyngitis		C
		patients with	can only be		
		acute	established by a		
		pharyngitis	rapid antigen		
			detection test		
		USA	(RADT), or a		
			throat culture		
			2. Negative RADT		
			tests in children		
			and adolescents		
			should be backed		
			up with a throat		
			culture		
			3. Routine use of		
			back-up throat		
			cultures for those		
			with a negative		
			RADT is not		
			necessary for		
			adults in usual		
			situations		
			4. Diagnostic		
			studies are not		
			routinely indicated		
			for children under		
			3 years old because		
			acute rheumatic		
			fever is rare in		
			children under 3		
			years old.		
			5. Diagnostic		
			testing or empiric		
			treatment of		
			asymptomatic		
			household contacts		
			is not routinely		
			recommended		
Urkin et al.,	Non-experimental	Summarizes	1. Throat cultures	Reliance on	III/Good
2013		28,311 episodes	were performed in	computerized	

	that occurred in	14.847 episodes	records, as there	
	19.865 children	(52%), with tests	is no control	
	up to age 18	more common	over the	
	-r	among	accuracy and	
	Israel	pediatricians and	completeness of	
		vounger physicians	the data	
		jounger physicians		
		2. Antibiotics	The	
		were purchased in	'negotiation'	
		24.8% of these	process between	
		cases, without	physicians and	
		knowing the result,	parents, on when	
		and were more	and whether to	
		commonly	use antibiotics	
		associated with	or take a throat	
		male physicians,	culture, is not	
		family	reflected	
		practitioners,		
		children living in	The information	
		rural areas and	about antibiotics	
		drugs bought	is based on the	
		before the weekend	pharmacy	
			database.	
		3. About 50% of	The study is	
		the physicians did	missing cases	
		not adhere to the	where the	
		guidelines	physician	
			generated a	
		4. Factors	prescription,	
		influencing	but the parents	
		adherence included	did not purchase	
		physician training,	the antibiotics	
		years in practice		
		and patients		
		nonmedical		
		cnaracteristics		
		5 The study found		
		that in too many		
		episodes of couto		
		nharvngitis		
		prim yrigius,		
		prina y care		
		not able to predict		
		GABHS infection		
		and they underused		
	L	and mey underused	L	

throat cultures,
leading to
empirical and
unnecessary use of
antibiotics
5. The probability
of prescribing early
antibiotics
increased when the
physician was
older, the child was
older, geographical
access to
laboratory services
was poor and when
the consultation
was towards the
weekend
6. Throat cultures
were more likely to
be performed when
the physician was
younger, a
pediatrician, and
the consultation
was at the start of
the week

Appendix B

Site Approval



Health is everything

September 15, 2017

Dear Junique

Your DNP Capstone project, as outlined on your latest PICOT proposal (Antibiotic stewardship in pharyngitis with Centor score training) was approved on 09/14/2017, You may proceed with your project however I ask that you keep us posted of your progress and please be sure to contact us with any questions.

Thank you!

All the best wishes in this endeavor!

Kris

Kristene Diggins, FAANP, DNP, MBA, DCC, CNE, NEA-BC| CVS Health - Senior Clinician Minuteclinic / National SLC Chair & Doctorate NP Research cell 7045798210 <u>KDiggins@cvs.com</u>



Kristene Diggins, FAANP, DNP, MBA, DCC, CNE, NEA-BC CVS Health -MinuteClinic | National SLC Vice-Chair & DNP Research Committee Facilitator | cell <u>7045798210</u> <u>KDiggins@cvs.com</u>

Appendix C

Email to Practitioners



Hello Fellow Nurse Practitioners,

Some of you may know me, and some of you may not. For those that do not allow me to introduce myself. My name is Junique Elysee, and I am currently a full-time nurse practitioner in Cedar Grove, clinic number 617. I am currently enrolled in a DNP program at Rutgers University. I am reaching out to all of you, in region 28, to help me conduct and complete my DNP capstone project

You are invited to participate in a research study that is being conducted in the School of Nursing at Rutgers University.

The purpose of this study is to assess current knowledge and management style of acute pharyngitis, with relation to the Centor score, in children and adults by family nurse practitioners employed at CVS Minute Clinic. Taking part in this study is completely voluntary and anonymous and will last approximately 45 minutes. You are not required to complete all in one sitting. This mean the study will not collect any identifying data from you. If you decide to take part, you are free to withdraw at any time.

I am asking you to take part because you are currently a full-time, part-time, or casual part-time family nurse practitioner employed in the clinics. Senior practice managers and field educators are not eligible for this study. Practitioners currently staffed in the clinics, actively seeing patients are to be included in this study. The study is entirely web based and can be completed on the computer of your choice in approximately 45 minutes.

It would be greatly appreciated if you were to choose to partake in this study, as your help is essential in my completion of this doctoral program, and the improvement of quality of care provided to patients.

Please carefully read through the consent form before participating in the surveys.

If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Rutgers Institutional Review Board (IRB) at 973-972-3608 or access their website at http://www.eirb.rutgers.edu.

Please follow the links below in chronological order for pre survey, educational material, and post survey:

Thank you,

Junique Eysee, MSN, RN-BC, FNP-C DNP Student Rutgers School of Nursing 65 Bergen Street Newark, NJ 07107 Cell: 908-875-9035 Fax: 908-688-1994 Email: je339@sn.rutgers.edu junique.elysee@minuteclinic.com jelysee25@gmail.com Appendix D



Online Survey

Informed Consent Form

Study Title: Evaluating Nurse Practitioner Practices in the Management and Treatment of Acute Pharyngitis

You are being asked to participate in a research study that is being conducted by School of Nursing at the Rutgers University. This is a study in the School of Nursing that is being conducted by Junique Elysee MSN, RN-BC, FNP-C.

Purpose of the study:

The purpose of this research study is to assess current knowledge and management style of acute pharyngitis, with relation to the Centor Score, in children and adults by family nurse practitioners employed at CVS MinuteClinic. You will be one of approximately 52 subjects. Participants are current nurse practitioners with a position in the clinic actively seeing patients. Senior practice managers and field educators are excluded from this study.

What will be done?

You will complete two surveys (pre and post) and an educational program, which will take 45 minutes to complete. You do not have to complete all in one sitting, and may complete on any computer of your choice. The survey includes questions about current knowledge on national guidelines, the Centor score, and management styles. After you complete the questionnaire, we will examine your demographics and answers, and will record information showing any correlation between your demographics and survey responses. (For example, years in practice correlates with more frequent testing using rapid strep tests).

We expect the study to last about three months. Participation in this study is voluntary. The only alternative to this study is not to participate.

Risks or discomforts:

There are no risks anticipated from taking part in this study. If you feel uncomfortable with a question, you can skip that question or withdraw from the study altogether. If you decide to quit at any time before you have finished the questionnaire, your answers will NOT be recorded.

Benefits of this study:

There is no direct benefit to you for participating in this study. You will be contributing to knowledge about current provider practices in the management of Acute Pharyngitis, and identifying areas for improvement.

Confidentiality:

Your responses will be kept completely confidential. We will NOT know your IP address when you respond to the Internet survey. We will ask you to include a unique 4digit identifier when you complete the Internet survey to link your pre-survey to your post-survey. Your name and address will not be stored with data from your survey. Instead, you will create a unique 4-digit identifier to link your pre-survey to your post-survey. This code will be kept securely by the research team only until study completion in April of 2018. The researcher will see your individual survey responses and the results. All information you provide will be treated confidentially. Once data collection is complete, there will be no link between the survey data and identity. There are no foreseeable risks to participation. The principal investigator has put in place adequate protections for your privacy in that all information provided will be kept confidential. All surveys will be produced by Survey Gizmo, and stored accordingly to an excel spreadsheet.

Compensation:

There will be no compensation for participation in this study.

Withdrawal:

Your participation is voluntary; you are free to withdraw your participation from this study at any time. If you do not want to continue, you can simply leave this website. If you do not click on the "submit" button at the end of the survey, your answers and participation will not be recorded. You also may choose to skip any questions that you do not wish to answer.

How the findings will be used:

The results of the study will be used for educational purposes. The results from the study will be presented in the School of Nursing at Rutgers University.

Contact information:

If you have concerns or questions about this research study, please contact the PI Junique Elysee at 908-875-9035

If you have questions about your rights as a research subject, please contact the Rutgers NewarkIRB Director at (973)-972-3608.

By beginning the survey, you acknowledge that you have read this information and agree to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty.

Appendix E

Pre-Intervention Survey Questions

Demographics

- Gender: Age: Title: Years in practice: Current employment status with MinuteClinic: FT, PT, or CPT Clinic #: 4-digit Unique Identifier:
- 1. Are you aware of the current practice guidelines on how to manage and treat acute pharyngitis in adults and children at MinuteClinic?
- 2. Are the current guidelines adequate in aiding you to manage and treat acute pharyngitis?
- 3. How often do you do strep DNA probes following a negative strep test in children? In adults?
 - 1 Never
 - 2 Sometimes
 - 3 Always
- 4. What do the guidelines recommend in regards to follow up strep DNA probes after a negative rapid strep test in children? In adults?
- 5. Are you aware of what the Centor score is?
- 6. Are you aware of what the points represent in the Centor score?
- 7. Are you aware of where to find the Centor score in the chart in EPIC after documenting your physical exam?
 - 1 Under the Vitals tab
 - 2 Under the wrap up tab
 - 3 -Under the smart sets tab
 - 4 Under the assessment tab
- 8. Do you use the Centor score to aid in your decision on how to manage and treat acute pharyngitis?
- 9. On a scale of 1 to 5, with 5 being most useful, rate how useful you feel the Centor score is in aiding you in the management and treatment of acute pharyngitis?
 - 1 Not at all Useful
 - 2 Somewhat Useful
 - 3-Neutral

4 – Useful 5 – Very Useful

10. Do you ever prescribe antibiotics to patients despite a negative rapid strep test and/or negative strep DNA probe? If so select the reason why below:

Patient insistence Co-morbidity Specific symptoms such as fever, tonsillar exudate, etc. Other (specify) _____

- 11. How often you patients insist on antibiotic treatment when you think it is not warranted for acute pharyngitis?
 - 1 0% of the time
 - 2-25% of the time
 - 3 50% of the time
 - 4 75% of the time
 - 5-100% of the time
- 12. How do you handle the patients that insist on an antibiotic prescription for acute pharyngitis?
 - 1 Wait and see prescription
 - 2 Provide patient education (ex. viral vs. bacterial)
 - 3 Explain significance of tests results
 - 4 Tell them if they are not happy they can go elsewhere

Appendix F

Post-Intervention Survey Questions

Demographics

Gender: Age: Title: Years in Practice: Current employment status with MinuteClinic: FT, PT, or CPT Clinic #: 4-digit Unique Identifier:

- 1. Do you feel that this educational session was helpful in adding to your body of knowledge as a practitioner in the management of acute pharyngitis?
- 2. Will this educational session impact your future prescribing practices in any way?
- 3. Are you aware of the current practice guidelines on how to manage and treat acute pharyngitis in adults and children at MinuteClinic?
- 4. Are the current guidelines adequate in aiding you to manage and treat acute pharyngitis?
- 5. How often do you do strep DNA probes following a negative strep test in children? In adults?
 - 1 Never
 - 2 Sometimes
 - 3 Always
- 6. What do the guidelines recommend in regards to follow up strep DNA probes after a negative rapid strep test in children? In adults?
- 7. Are you aware of what the Centor score is?
- 8. Are you aware of what the points represent in the Centor score?
- 9. Are you aware of where to find the Centor score in the chart in EPIC after documenting your physical exam?
 - 1 Under the Vitals tab
 - 2 Under the wrap up tab
 - 3 Under the smart sets tab
 - 4 Under the assessment tab
- 10. Do you use the Centor score to aid in your decision on how to manage and treat acute pharyngitis?

- 11. On a scale of 1 to 5, with 5 being most useful, rate how useful you feel the Centor score is in aiding you in the management and treatment of acute pharyngitis?
 - 1 Not at all Useful
 - $2-Somewhat \ Useful$
 - 3-Neutral
 - 4 Useful
 - 5 Very Useful
- 12. Do you ever prescribe antibiotics to patients despite a negative rapid strep test and/or negative strep DNA probe? If so select the reason why below:

Patient insistence Co-morbidity Specific symptoms such as fever, tonsillar exudate, etc. Other (specify) _____

- 13. How often you patients insist on antibiotic treatment when you think it is not warranted for acute pharyngitis?
 - 1 0% of the time
 - 2 25% of the time
 - 3 50% of the time
 - 4 75% of the time
 - 5-100% of the time
- 14. How do you handle the patients that insist on an antibiotic prescription for acute pharyngitis?
 - 1 Wait and see prescription
 - 2 Provide patient education (ex. viral vs. bacterial)
 - 3 Explain significance of tests results
 - 4 Tell them if they are not happy they can go elsewhere

Appendix G

Educational Presentation





Current National Guidelines

Per the CDC website "history and clinical examination can be used to diagnose viral pharyngitis when clear viral symptoms (e.g., cough, rhinorrhea, hoarseness, oral ulcers, conjunctivitis) are present; these patients do not need testing. However, clinical examination cannot be used to differentiate viral and group A strep pharyngitis in the absence of viral symptoms, even for experienced clinicians."



Current Guidelines at MinuteClinic

- MinuteClinic guidelines currently follow those recommended by the CDC and ACP-ASIM
- Use of Centor score to identify patients of low risk for strep pharyngitis
 Strep testing may be omitted for Centor score of -1, 0, or +1
- Centor Score > +1: Rapid strep testing is indicated
- Antibiotics are prescribed only when the rapid strep test or strep DNA probe/culture is positive
- Confirmatory testing for adults is not necessary unless they meet the high risk criteria

What is the Centor Score?

- The Centor score was developed about 30 years ago from a study that evaluated 286 adults at a single emergency room
- The Centor score is a points system meant to help providers differentiate between viral and GAS pharyngitis
- It is meant to help properly prescribe antibiotics, if necessary, to prevent complications and spread of disease

High Risk Criteria

- ▶ ≤ 18 years old
- College dormitory residence
 Close association/contact with children
 - Ex. School teachers
- Parent of a school aged child
- Presence of endemic/epidemic rheumatic fever or GABHS
- History of rheumatic fever
- Valvular heart disease or valve replacement
- Immunosuppression
- Recurrent/chronic pharyngitis
- s/s present for > 7 days
 Resides in non-industrialized country



Patient Education

- Educate patients on viral vs bacterial
 - CDC patients resources, brochures, and posters
 Discuss the research and current guidelines
- Provide alternatives to antibiotic prescriptions
 - OTC cough and cold medications
 - Watchful waiting (offer to call later in the week to check on patient)
 - Delayed or wait and see prescriptions
- Educate on medication compliance and usage
 - Finish full course of antibiotics
 - Do not save half for later use
 - Do not start a left over prescription

Case Study

- A 22 year old female appears to the clinic with chief complaint of a sore throat and cough for a duration of 2 days. She is non febrile
- Provider physical examination finds non exudate mildly erythematous throat with post nasal drip, and mucosal edema. All vitals are within normal range
- What is her Centor score and what is your approach as per the guidelines?

Answer

- Centor score is 0
 - Risk of strep pharyngitis is low
 - Rapid strep testing is optional but not needed
 - Does not meet high risk criteria for confirmatory testing if rapid was negative
 - Symptomatic treatment is recommended; No antibiotic therapy





Case Study

- A 16 year old male appears to the clinic with complaint of a sore throat, cough, nausea, and fevers for 2 days. Parent reports temp as high as 102°F
- Provider physical examination reveals severely erythematous throat, tonsillar exudate, and cervical node adenopathy
- What is his Centor score and your management approach as per guidelines?

Answer

- Centor score is 3
 - +1 for temperature > 100.4°F
 - +1 for swollen and tender cervical lymph nodes
 - +1 for tonsillar exudate
 - 0 for age 15-44 years
 - Strep very likely
- Rapid strep testing indicated
 - Patient meets high risk category
 - < 18 years old</p>
 - Confirmatory testing indicated if rapid strep test is negative

References

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Appendix H

Bi-Weekly Email Clinical Tips

To run from January to March for total of 6 clinical tips

Clinical Tip #1: Remember most cases of acute pharyngitis are viral, and bacterial pharyngitis cannot be distinguished from viral pharyngitis on physical examination alone. Use the Centor score to screen those that may be at high risk for strep pharyngitis. Swab those throats!

Clinical Tip #2: Remember confirmatory testing is not needed for adults unless they meet one of the high-risk criteria:

- \leq 18 years old
- ► College dormitory residence
- Close association/contact with children
 - Ex. School teachers
- Parent of a school aged child
- Presence of endemic/epidemic rheumatic fever or GABHS
- ► History of rheumatic fever
- ► Valvular heart disease or valve replacement
- Immunosuppression
- Recurrent/chronic pharyngitis
 - s/s present for > 7 days
- Resides in non-industrialized country

Clinical Tip #3: Educate, Educate! Educate your patients on viral vs. bacterial and the treatment options for both. Emphasize that antibiotics do **NOT** help with viral infections, and cause more harm than good when used inappropriately

Clinical Tip #4: The Centor score is here to help you identify those more at risk for strep pharyngitis. It is a screening tool, and not to be used as a diagnostic tool. The Centor score is automatically calculated for you from your documentation, and can be found under the Smart Sets tab in EPIC

Clinical Tip #5: Do not forget to consider other cause of acute pharyngitis, such as post nasal drip associated with allergies. Recommend OTC remedies

Clinical Tip #6: Empiric treatment for household members is not recommended. If members experience symptoms, test before you treat!