Utilization of Reminders to Promote Bacterial STI Retest:

A Quality Improvement Project

Misbah Shah

Rutgers University

DNP Chair: Peijia Zha, PhD, MA

DNP Team Member: Jeffrey Kwong, DNP, MPH, AGPCNP-BC, FAANP, FAAN

DNP Team Member: Corey DeStefano, Community-based Health Center Director of Research
### Table of Contents

Abstract .................................................................................................................. 5

Introduction .......................................................................................................... 6

Background & Significance .................................................................................. 7
  - Screening ........................................................................................................ 8
  - Epidemiology ................................................................................................. 8
  - Clinical Manifestations & Consequences ...................................................... 10
  - Diagnostic Testing ......................................................................................... 11
  - Treatment Guidelines .................................................................................... 12
  - Reminder Systems ......................................................................................... 13

Needs Assessment .................................................................................................. 14
  - SWOT Analysis ............................................................................................. 15

Problem Statement ............................................................................................... 16

Clinical Question ................................................................................................. 16

Aims & Objectives ............................................................................................... 16

Review of Literature ........................................................................................... 17
  - Search Strategy .............................................................................................. 17
  - Critical Appraisal and Synthesis of Evidence ............................................... 18

Theoretical Framework ......................................................................................... 23

Methodology ......................................................................................................... 24
  - Setting ........................................................................................................... 25
  - Study Population .......................................................................................... 25
  - Subject Recruitment ...................................................................................... 26
Sustainability ..............................................................................................................................................................................43

Plans for Future Scholarship ..........................................................................................................................................................44

Conclusion ..................................................................................................................................................................................................45

References ..................................................................................................................................................................................................46

Appendices ..................................................................................................................................................................................................51
Abstract

**Purpose:** Chlamydia trachomatis and gonorrhea are both bacterial sexually transmitted infections (STIs) that can be spread and acquired through sexual intercourse. Health care providers hold a crucial role in prevention, diagnosis, and treatment of STIs to avoid harmful health consequences from untreated infection. The recommendations per the Centers for Disease Control and Prevention (CDC, 2020b) recommend that individuals diagnosed and treated with bacterial STIs should be retested within the 3-month timeframe. However, many individuals fail to meet this recommended guideline due to multiple factors such as failure to comply, lack of knowledge, or simply forgetting a follow up visit. The main purpose of this quality improvement project was to promote 3-month bacterial STI retest through various reminder interventions in an urban community-based health center.

**Methodology:** The study population consisted of 22 participants who received two mailed letters and three phone call reminders to encourage follow-up appointment for retest. A total of forty-four mailed letters and thirty-nine phone calls were made to the study participants.

**Results:** Three out of the 22 patients returned for retest and both tested negative for recurrent STI infection.

**Implications for Practice:** Overall, multiple obstacles interfered with the study progression, such as the COVID-19 pandemic, which indicates the need for future investigation. In conclusion, the endorsement of the 3-month retest guideline can ultimately promote reduction of cost expenditure, prevention of untreated infection consequences, and minimization of infection spread.

_**Keywords:** chlamydia, gonorrhea, 3-month retest, retest reminder_
Utilization of Reminders to Promote Bacterial STI Retest:
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Sexually transmitted infections (STIs) are a widespread concern that affect all genders and age groups. According to the Centers for Disease Control and Prevention (CDC), 1,758,668 chlamydial cases were reported in the United States in 2018 (2019a). With regard to gonorrhea, in 2018 a total of 241,074 cases were identified among females and 341,401 were reported for males in the United States (CDC, 2019b). Although the treatment for bacterial infections is usually simple, prevalence remains high due to knowledge deficit regarding transmission of the infection, neglecting to complete the prescribed antibiotic therapy, and failing to follow-up for routine retesting within the recommended timeframe (Wong, et al., 2019). Chlamydia and other bacterial STIs are categorized as curable. However, failing to adhere to post-treatment instructions can cause reinfection, continual spread of the disease, and complications such as pelvic inflammatory disease (PID), infertility, chronic pelvic discomfort, epididymitis, and proctitis (Draeger, 2019). The CDC recommends routine retesting for chlamydia and gonorrhea infections 3 months following initial diagnosis and treatment (2016). Healthcare providers must emphasize the importance of reassessment at 3 months to ensure that the bacterial infection has been eradicated.

Rose et al. mentioned, “in the largest US study to date, laboratory data for over 3 million chlamydia tests showed that only 22% of males and 38% of non-pregnant females were retested within 12 months” (2017). A factor to consider is that individuals diagnosed with both chlamydia and gonorrhea are at increased risk for having subsequent positive results, even after completing treatment as prescribed (Rose et al., 2017). As a result, retest for this patient population is crucial due to the increased risk of initial treatment failure. Although follow-up testing may be discussed
at the time of initial diagnosis, follow-up rates remain low (Wong, et al., 2019). In addition the World Health Organization (WHO) identified various barriers in relation to STI screening, such as limited resources and stigmatization (2016). Therefore, verbalizing the need for reevaluation at the time of diagnosis may not always be effective and other approaches should be explored in order to maximize retest rates. Advancements in communication methods have impacted healthcare delivery in both outpatient and inpatient settings. One effective mechanism that has been recommended includes reminder systems to promote retesting (Wong, et al., 2019). This Doctor of Nursing Practice (DNP) Project focuses on evaluating how different reminder approaches can influence an individual’s decision to seek retesting for chlamydia and gonorrhea.

**Background and Significance**

All individuals that participate in oral, anal, and vaginal sexual intercourse can be at risk for becoming infected if exposed to a partner with chlamydia or gonorrhea. Major risk factors for contracting these infections include men who have sex with men (MSM), having multiple sex partners, and young adults under the age of 25 (CDC, 2018). Additionally, chlamydia and gonorrhea can facilitate the transmission of HIV (CDC, 2018). Thus, provision of verbal patient education to high-risk groups is essential during the time of diagnosis, but further actions should be investigated to address this public health concern. The WHO (2016) encourages counselling and behavioral coaching as a primary intervention to prevent the spread of chlamydia along with various other sexually transmitted infections.

Even though there are various antibiotics that treat chlamydia and gonorrhea, these infections remain as the most common STIs that lead to morbidity and financial liability. Wong (2019) mentioned that among all of the bacterial STIs, chlamydia is the most expensive diagnosis costing the U.S. healthcare system approximately $516 million annually in health-
related expenditures. Owusu-Edusei et al (2013) reports the expenditure to diagnose and treat gonorrhea is approximately $162.1 million annually. By applying this DNP project to a community-based health center, there is the potential for reducing prevalence of the infection and promoting health maintenance. It is vital to assess the effectiveness of interventions that are currently being practiced to establish a degree of certainty that the actions are benefiting the patients and healthcare facility. Since chlamydia and gonorrhea are major public health burdens that contribute to economic and health instability, it is imperative to consider the feasibility of interventions that aim to lessen the rate of infection.

**Screening**

Clinical recommendations indicate that sexually active patients under the age of 25 as well as those at high risk should be offered annual STI screening (Wiesenfeld, 2017). The U.S. Preventive Services Task Force (USPSTF), suggests annual screenings for sexually active women age 24 and younger along with older women who exhibit risk factors for contracting the infection (2019). Risk factors that can maximize an individual’s probability of acquiring chlamydia and gonorrhea include beginning a new relationship, polygamy, partners diagnosed with previous STIs, infrequent use of sexual barriers such as condoms, and risky behaviors involving excessive alcohol intake, recreational drug use, or engaging in sexual activity for money (USPSTF, 2019). Since symptoms are not always present, regular evaluation for STIs is recommended for sexually active individuals (CDC, 2015).

**Epidemiology**

**Chlamydia**

According to the CDC (2018), in 2017 a total of 1,127,651 cases of chlamydia were reported among females and 577,644 cases were reported for the male population in the United
States. Specifically in New Jersey, in 2018 the state had 36,535 positive diagnoses of chlamydia (New Jersey State Health Assessment Data, 2019). In 2018, 6,495 cases of chlamydia were reported in Essex county which accounts for 17.8% of all incidents recorded in New Jersey that year (New Jersey State Health Assessment Data, 2019). Between the years of 2014 and 2018, there was an 11.4% total rate increase of reported incidents for females residing in New Jersey (CDC, 2019a). In regard to the male population, during the years of 2014 and 2018, there was a 37.8% total rate increase of reported incidents. The extensive quantity of reported cases among males can be attributed to improved screening for high risk individuals (CDC, 2019a). Although there is profound escalation in chlamydial detection in males, reported cases for women were two times the rate of males in 2018. Adolescents and young adults between the ages of 15 and 24 demonstrated the highest number of reported cases during 2014 and 2018. In 2018, 97.4% of cases in females and 94% of incidents in males occurred in individuals aged 15-44 (CDC, 2019a). In relation to ethnicity, in 2018 reported chlamydia cases were highest among African American, American Indian/Alaska Native, and Native Hawaiian/Other Pacific Islanders. Elements that affect overall health status, such as income, occupation, insurance coverage, and educational background can influence acquisition of the infection (CDC, 2019a).

**Gonorrhea**

There are approximately 820,000 cases of gonorrhea diagnosed in the U.S. annually (Fyle-Thorpe, 2019). Individuals between the ages of 15 and 24 demonstrate an increased risk for contracting gonorrhea, as with chlamydia. “GC rates are145.8 cases per 100,000 with higher rates among males in 2016” (Fyle-Thorpe, 2019, p. 424). When considering geographic location in the U.S., it appears that southern states demonstrate increased rates of gonorrhea, such as Louisiana, Arkansas, North Carolina, and Mississippi, and the District of Columbia (Fyle-
Specifically in New Jersey, in 2018 there were 36,535 positive diagnoses of chlamydia and 9,080 confirmed diagnoses of gonorrhea (CDC, 2019b). According to New Jersey State Health Assessment Data (2019), in 2018 the total number of positive reported cases of gonorrhea alone in Essex county was 2,019. Overall, individuals who face barriers to healthcare exhibit high risk for developing bacterial STIs due to lack of financial stability and knowledge deficit about the long-term effects STIs can produce.

**Clinical manifestations and Consequences**

One of the main reasons why people may fail to seek prompt treatment is because of the asymptomatic nature of these infections. Nearly 90% of men remain asymptomatic which allows the infection to proliferate and cause further consequences (Wong, 2019). However, men who experience symptoms may have penile discharge, dysuria, or rectal pain (Draeger, 2019). Furthermore, these STIs can lead to epididymitis which involves discomfort and swelling of the testicles (Draeger, 2019). According to Draeger (2019), chlamydia is one the most common bacterial organisms that contributes to epididymitis among sexually active men under the age of thirty-five. Urethritis can also develop as a result of the STI. Some men can exhibit mucoid or clear discharge from the urethra along with dysuria (Draeger, 2019). Chronic prostatitis which causes dysuria, urinary dysfunction, ejaculatory pain, and pelvic discomfort can also be a complication associated with untreated chlamydia and gonorrhea. The STIs can be detected in urine or prostate secretions if prostatitis is suspected. In regard to anal sexual intercourse with an individual infected with a bacterial STI, a person can be at risk for developing proctitis which leads to inflammation of the rectal lining (Draeger, 2019).

In females, clinical manifestations may include dysuria, pyuria, and urinary frequency (Draeger, 2019). Occasionally, women may mistake these symptoms as a simple urinary tract
REMINDERS TO PROMOTE BACTERIAL STI RETEST

infection. If the bacteria affects the cervix, a woman can display cervical discharge and atypical cervical bleeding (Draeger, 2019). However, as with the male population, females may not exhibit symptoms which can cause a delay in care. Wong et al. (2019) state that 70% of females diagnosed with chlamydia are asymptomatic. If the infection is left untreated in women, complications including PID, ectopic pregnancy, tubal infertility, and sexually acquired reactive arthritis can develop (Draeger, 2019). Pregnant women can also transmit the infections to their unborn fetus which can cause fetal pneumonia or neonatal conjunctivitis (CDC, 2016). Treatment of these infections is necessary to prevent complications that can affect genitourinary and sexual health.

**Diagnostic Testing**

In order to diagnose chlamydia and gonorrhea, the nucleotide acid amplification test (NAAT) is considered the gold standard (Draeger, 2019). Male patients who request screening or present with genitourinary symptoms, such as dysuria, frequency, or discharge can provide a urine specimen as the preferred sample. However, NAAT via a urethral swab can also be obtained from this group (Draeger, 2019). On the other hand, females can provide the specimen via collection of vaginal swabs. If discharge or blood are present, the specimen is still viable and can be used for laboratory collection. Unfortunately, chlamydia and gonorrhea are not limited to the genitalia. Patients can also test positive for rectal infections if that area is exposed to the bacteria. If the patient reports participation in anal intercourse, a rectal swab can be utilized for diagnosis (Draeger, 2019). Anorectal and pharyngeal chlamydia/gonorrhea infections are common in the MSM population and women, but these extra-genital infections are often overlooked because testing in these areas are not incorporated in routine screening (Dukers-Muijrrers, 2015). By utilizing the NAAT in the throat or the rectum, clinicians can diagnose and
treat pharyngeal and anorectal chlamydia and gonorrhea (Dukers-Muijrers, 2015). Methods of testing that are not recommended for these STIs include culture, serology, antigen detection, and genetic probe technique due to cost, complexity, and low sensitivity (Draeger, 2019).

**Treatment Guidelines**

The CDC (2020a) advises reassessment three months following treatment of the initial infection even if the pharmacologic therapy is completed as prescribed. Retesting prior to five weeks is not suggested due to the increased possibility of false-positives and recognition of lingering nonviable bacteria (Rose, et al. 2017). Furthermore, even if treatment is administered to the patient’s partner(s), reevaluation is still recommended to confirm that the STI is no longer evident. Medications that are frequently prescribed for chlamydia include doxycycline and azithromycin (Draeger, 2019). However, azithromycin may demonstrate increased compliance since it is a single dose therapy of one gram. On the other hand, doxycycline requires administration of 100 milligram tablets twice daily for seven days (Draeger, 2019). The pharmacologic therapy that is selected for treatment is dependent on the patient’s allergies and potential drug interactions. If both macrolides and tetracyclines cannot be prescribed, alternative options must be explored. For example, quinolones, such as ofloxacin and levofloxacin can be given, but two disadvantages with this therapy include cost and a commitment to week-long antibiotic therapy (Draeger, 2019).

Treatment for gonorrhea includes a one-time dose of ceftriaxone 250 milligrams intramuscularly along with a single one gram dose of azithromycin. However, there is a concern for antimicrobial resistance which occurs when the infection is not eradicated by the standard treatment (Weston et al., 2018). In this case, alternative therapies must be discussed with the patient to ensure the infection has been eliminated. A randomized, multisite, open-label,
noncomparative trial performed by Kirkcaldy et al. (2014) determined that the combination of gentamicin with azithromycin or gemifloxacin with azithromycin are both non-cephalosporin-based regimens that can benefit those who are sensitive to cephalosporins or demonstrated resistance to the standard ceftriaxone treatment. Overall, clinicians should review patient-specific information and discuss the choices to determine the most effective course of action.

The CDC recommends that any person who tests positive for chlamydia or gonorrhea should be re-screened 3 months post-treatment (2015). Not only does retesting ensure that the treatment was effective, but it confirms that reinfection did not occur. Besides completing the prescribed antibiotics, patients must comply with recommendations to prevent reinfection and transmission. For instance, abstinence for 7 days after completing single-dose antibiotics or until completing the full 7-day course of antibiotics is imperative to avoid spreading the bacteria to sexual partners (CDC, 2017). Additionally, notifying partners about the diagnosis is necessary to ensure that adequate testing is performed, and treatment is provided if required.

**Reminder Systems**

Technological advancements in medicine allow patients to be active participants in maintaining their overall health. Patient portals are electronic systems that allow patients to connect with their healthcare providers, ask questions, and review medical information that pertains to them. Not only does this electronic system encourage self-management, but it also allows patients to gain a sense of awareness in regard to test results and scheduled appointments. Sorondo et al., (2016) found that access to portals can improve functional status and aids in the reduction of healthcare costs. However, many patients may not enroll in the service due to its unfamiliarity. Thus, promoting use of patient portals is imperative as this system demonstrates various benefits for the patients along with the provider handling the patient’s healthcare needs.
Needs Assessment

There are multiple challenges and barriers that can hinder patients who are diagnosed with bacterial STIs from seeking care or following up. Shepherd and Harwood (2017) indicate that young adults may be hesitant to visit clinics and other healthcare facilities due to judgement from others and the general stigma associated with having a sexually transmitted infection. In order to address this issue, it is important for healthcare providers to have open communication with their patients and utilize evidence-based practice guidelines to ensure quality care is being delivered.

Wong et al. (2019) highlight that only 10 percent of males and 30 percent of females experience symptoms when diagnosed with chlamydia. This emphasizes the important role that re-testing plays in regard to early identification of disease and control of the epidemic. Wijers et al. (2018) stated that repeat bacterial STI infections over a 3-to-12-month period are fairly common. For instance, a total of 32% of chlamydia and 40% of gonorrhea cases will demonstrate positive results during retest. By sending confidential messages via letters and communicating with patients by phone, individuals can be reminded of recommended follow-up visits which can potentially reduce the spread of STIs.

The clinical site used for this DNP project was a community-based health center located in Essex county that serves the public and allows them to gain access to various services. This facility provides multiple specialties, such as primary care, dental screenings, obstetrics and gynecology, substance abuse, support groups, mental health services, and nutritional counselling. One primary issue that is frequently treated in this health center includes STIs. In 2019, there were approximately 400 confirmed cases of chlamydia and 300 cases of gonorrhea at this specific community-based health center, but only a fraction returned for retest. Since there is a
high MSM population that resides in this community, the majority of chlamydia and gonorrhea cases are male. Other factors to consider in Essex county are the low socioeconomic status and lack of education regarding STI transmission. Patients in this area do not acknowledge the importance of post-treatment recommendations, such as abstinence for seven days after single-dose treatment, notifying their sexual partners, and returning for retest 3 months following diagnosis (CDC, 2017). Due to the high-risk population that the community-based health center treats along with the patients’ lack of understanding regarding STI management, implementation of an intervention to promote revaluation can improve retest percentages in this specific setting.

**SWOT Analysis of Retest Reminders**

By identifying the strengths, weaknesses, opportunities, and threats of a reminder system, the project benefits and limitations can be acknowledged. Strengths of this project include the possibility of reducing reinfection rates, decreasing complications related to lack of treatment, increasing patient portal usage, maximizing patient census in the clinic, and growing clinic revenue. The community-based health center recently transferred their data to another electronic health record (EHR) known as Athenahealth. Not only does this EHR include a patient portal, but it also contains a messaging system that allows communication between the patient and healthcare provider. However, many patients decline enrollment due to unfamiliarity with the portal. The purpose of AthenaNet is to provide patients with convenient, web-based access to their information without interfering with standards mandated by the Health Insurance Portability and Accountability Act (HIPAA). For patients who do not use the portal, voicemails and direct mailing provide another option. A potential weakness related to mailing letters is that some patients may not check their mail regularly or the letter gets lost in transit to the patient’s address. The opportunities involve decreasing spread of infection within the community,
promoting patient education, and implementing technology to allow patients to be active participants in their care. Finally, the possible threats encompass lack of access to transportation to the facility to get retested. This threat can occur to individuals that hold a low socioeconomic status and are unable to supply funds to return for follow-up appointments.

**Problem Statement**

The growth of chlamydia and gonorrhea infections worldwide indicates the need to promote safe sex practices and adherence to recommended screening guidelines. Failing to refrain from sexual activity for 7 days following treatment, lack of partner notification, insufficient use of sexual barriers for protection, and neglecting to complete the entire antibiotic therapy as prescribed are all contributing factors to the spread of the STI. The observed clinical problem is the lack of compliance with the post-treatment retesting recommendation for patients diagnosed with chlamydia and gonorrhea, which may be a contributing factor to increasing rates of bacterial STIs.

**Clinical Question**

For adult patients (18 years and older) previously treated for chlamydia and/or gonorrhea (P), does the implementation of mailed reminders along with phone call reminders (I) compared to usual care (C) increase the rate of retesting (O)?

**Aims and Objectives**

The overarching goal of this DNP project was to increase rates of chlamydia and gonorrhea by improving adherence with the CDC’s recommendation of routine re-testing in persons treated for this infection. The specific aim of this quality improvement project was to evaluate the feasibility of a reminder system regarding routine 3-month retesting rates among persons treated for chlamydia and/or gonorrhea at a community health center in New Jersey.
This DNP project attempted to identify if routine mailed or phone reminders at a community-based health center would demonstrate positive outcomes for patients and the organization in hopes that it could serve as a model to lessen the burden of STIs within the community.

The main objectives of this project were to:

- Increase compliance to 3-month STI retesting compared to previous years.
- Assess facilitators and barriers that affect the mail and phone reminder system. By recognizing obstacles that interfere with retest, the researchers can identify actions that need to be implemented to encourage patients to return for recommended STI reevaluation.
- Develop recommendations for future technological improvements and advocate for implementation of the patient portal system to facilitate patient care and transform practice.

**Review of Literature**

**Search Strategy**

Databases utilized for the literature review were Google Scholar, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and PubMed. Keywords entered to search for the studies included *chlamydia and gonorrhea retest, chlamydia and gonorrhea treatment recommendations, patient portal reminders, and reminders for bacterial STI rescreening*. The initial search of *chlamydia and gonorrhea retest* generated 8,250 results in Google Scholar, 36 in PubMed, and 19 in CINAHL. By applying limitations to the search such as age over 18 and publication date from 2015-2020, the final search produced 2,040 articles in Google Scholar, 9 in PubMed, and 6 in CINAHL. The final search with the specified date range and age limitation involving *reminders for bacterial STI rescreening* created 2,050 studies from Google Scholar, 6
from PubMed, and 3 from CINAHL. Although the search term patient portal reminders yielded a wide variety of results, several articles were unrelated to STI management. In order to explore more options related to treatment and care of patients affected by STIs, chlamydia and gonorrhea treatment recommendations was searched. This phrase, along with the applied specified limitations, generated 16,500 articles from Google Scholar, 27 from PubMed, and 42 from CINAHL. The only caveat related to the Google Scholar search was the inability to specify age ranges. As a result, when selecting articles from this database, the patient population was analyzed for selected studies to determine if the sample applies to the inclusion criteria.

Exclusion criteria included publications prior to 2015, studies written in non-English language, and those concerning the pediatric population under the age of 18. Studies that were included involved adults 18 years and older that were treated in primary care offices, clinics, and community-based settings worldwide. Based on the database searches that incorporated inclusion and exclusion criteria, 38 studies were chosen to determine their relevance to the clinical question. After critically appraising 38 articles, 13 have been selected for analysis in the literature review. These 13 studies are presented in Appendix A. From the 38 articles that were originally selected, 25 were excluded due to lack of correlation with the proposed intervention or demonstration of exclusion criteria. Although all the studies included in appendix A are not directly about chlamydia and gonorrhea, they all relate to interventions that can positively impact STI management which in turn provides feedback to the clinical question.

Critical Appraisal and Synthesis of Evidence

The 13 selected studies were analyzed by using the John Hopkins Nursing Evidence-Based Practice Appraisal Tools for both research and non-research studies. The information attained from the critical appraisal tool for each article is located in the table of evidence
REMINDERS TO PROMOTE BACTERIAL STI RETEST

One study is recognized as level I evidence (Randomized Control Trial), two studies are level II evidence (Quasi-experimental studies), eight studies are level III evidence (Non-Experimental, descriptive, and comparative), and two studies are level IV evidence (Clinical practice guidelines). The studies that demonstrate level IV evidence offer the researchers insight regarding clinical practice guidelines that highlight important recommendation for evidence-based practice. After examining all the articles, two themes were created to reveal similarities between the various studies. These themes include optimal retest time for bacterial STIs and alternative interventions to promote retest.

**Optimal Retest Time for Bacterial STIs**

By recognizing recommendations regarding optimal retest time, healthcare providers can ensure their patients are returning in a timely manner. This particular theme applies to 6 out of the 13 studies included in the literature review. USPSTF (2019) and CDC (2015) both highlight the importance of retesting 3 months following post-treatment. These two guidelines mention that failure to comply with the retest recommendations can lead to complications for all genders (CDC, 2015; USPSTF, 2019). Other elements that must be considered are risk factors that can increase a person’s possibility of acquiring chlamydia and gonorrhea. Individuals who are diagnosed with bacterial STIs multiple times must follow-up for retest for each diagnosis to identify that the infection is no longer present (CDC, 2015). Healthcare providers must also make reinfection prevention a priority by providing education to their patients about actions that should be avoided during the post-treatment period. For instance, patients should be advised to abstain from sexual intercourse for a week after completing the antibiotic and use sexual barriers such as condoms when engaging in sexual activity (CDC, 2015). According to USPSTF, pregnant women are not excluded from these recommendations. These individuals must also be
Retested 3 months following treatment to ensure the mother and fetus will not experience complications associated with long-term exposure to the bacteria.

Lazenby et al. (2017) suggested that 30 days following diagnosis and single-dose treatment, pregnant and non-pregnant women should be retested to confirm the bacteria has been eliminated. In order to reduce the chance of reinfection, Lazenby et al. (2017) also encouraged the use of sexual barriers, such as condoms during the 30-day time period following treatment. The study conducted by Rose et al. (2017) disclosed that there is a substantial lack of knowledge and awareness concerning bacterial STI retest at the recommended 3-month interval. Thus, researchers should place emphasis on patient education about reinfection and promotion of safe sex practices. Not only will this intervention aid in the reduction of bacterial STI transmission, but it can also prevent the development of consequences, such as PID, infertility, and chronic pelvic discomfort (Rose et al., 2017).

Wijers et al. (2018) measured the amount of patients that actually returned for the 3-month retest. Based on the number of returning patients, the researchers determined that 15.6% of these individuals were either re-infected or never cured by the initial prescribed treatment. Therefore, by following up for retest, individuals that are still positive for the infection can receive additional antibiotics to eradicate the infection. Furthermore, Smith et al. (2017) noted that reinfection rates among the MSM population is high. Healthcare providers must be aware of patients who are categorized as high risk in order to educate these individuals adequately. Additionally, clinicians should highlight the significance of retesting at the recommended 3-month period following treatment to confirm that the patient was not re-infected from a sexual partner (Smith et al., 2017). The recommendations incorporated in clinical practice guidelines correlate with the findings of various research studies. As a result, by abiding to the guidelines,
clinicians can deliver high quality care to their patients and inhibit the development of both short
term and long-term consequences associated with bacterial STIs (CDC, 2015; USPSTF, 2019).

*Alternative Interventions to Promote Retest*

Patient portal reminder systems are not the only interventions which have been attempted
to promote bacterial STI retest. This section analyzes alternative interventional methods that
have been studied to determine their effect on adherence to follow-up retest. This particular
theme applies to 7 out of the 13 studies incorporated in the literature review. Cope et al. (2019)
discovered that over 90% of the participants that completed the questionnaire in their study
suggested that utilizing an electronic messaging system for gonorrhea and chlamydia
management could not only offer satisfactory outcomes but is also a convenient intervention to
promote retest. By integrating this method, patients can become more involved in their STI
management and remain self-aware about precautions that need to be considered when
undergoing treatment and after the treatment period is complete (Cope et al., 2019). Another
study that utilized an alternative technique was conducted by Dukers-Muijrrers et al. (2015). This
study evaluated the effectiveness of home test kits along with short message service (SMS)
reminders. Not only was this intervention successful, but it also exhibited cost-effectiveness
(Dukers-Muijrrers et al., 2015).

Cohen et al. (2017) also utilized technology in their research study. However, rather than
focusing on text message reminders, their intervention involved an application known as
Healthvana. By implementing this application to assist patients in STI management, Healthvana
demonstrated a substantial reduction in the number of days between initial testing and treatment.
Thus, patients were receiving treatment in a more time-efficient manner. In regard to retest, the
application was able to send notifications to patients to remind them of their upcoming retest
date which promoted adherence. Wong et al. (2019) performed a systematic review which assessed various interventions that involved chlamydia and gonorrhea retest. Overall, the findings from this study suggested that incorporating patient portal systems facilitated retest and was a cost-effective approach. However, age of the affected individual plays a role in the success of an intervention. For instance, Wong et al. (2019) mentioned that the younger population may be more compliant with using patient portals than the elderly due to the comfort with smartphone and computer use. Another systematic review that considered differing methods was conducted by Taylor et al. (2016). Both cost and effectiveness of the interventions were analyzed. For example, the findings suggested that patient reminders for screening or rescreening via text, telephone, and postcards were either highly effective or moderately effective with low to moderate cost.

Although the study executed by de Lima et al. (2016) focused on HIV management, the findings demonstrate that technology communication tools can be beneficial when treating other STIs as well. By integrating the use of information and communication technologies, there is potential for increased accessibility to health services and establishment of a strong relationship between patients and the medical facility they visit. A systematic review performed by Desai et al. (2015) revealed that utilizing active recall reminders such as phone calls, SMS, and home test kits are influential factors in promoting both STI retest and compliance with HIV testing. By incorporating multiple methods of communication to promote adherence to follow-up guidelines, patients can avoid consequences of long-term infection. Overall, alternative interventional methods can be efficacious and should be considered when promoting bacterial STI retest.

**Theoretical/Conceptual Framework**
The knowledge-to-action (KTA) framework seals the breach between evidence and practice by translating knowledge into clinical practice through intervention, resulting in better patient care and outcomes (Graham et al., 2007). The KTA model guides healthcare providers to translate evidence into an intervention by following seven stages: identify the problem, adapt knowledge to local context, assess barriers, share and tailor information, monitor knowledge application, evaluate the outcomes, and confirm sustained knowledge (Field et al., 2014). The KTA model is visualized in Appendix B.

The primary problem recognized for this DNP project was the lack of patient compliance with repeat testing for reinfection of chlamydia and gonorrhea. Patients simply have knowledge deficit about the importance of retest or forgetfulness in regard to repeat testing. The second step in the KTA model is adapting the knowledge to the local context (Field et al., 2014). The local context for this project refers to the community health center located in Newark, New Jersey. In addition, the context involves the educational intervention that were included within the letters and phone call reminders. The educational section of the reminder emphasized the significance of retest and patient portal enrollment.

The third step of the KTA model is assessing the potential barriers (Field et al., 2014). For example, one barrier associated with the intervention is that patients may have limited access to transportation to return for the recommended 3-month follow-up visit. This is important to consider, especially at a community-based health center, because many of the patients demonstrate a low socioeconomic status. Another barrier in relation to patient adherence is the inability to control where patients decide to go for retest. This could have possibly altered the sample size along with the prospective effectiveness of the intervention.
The fourth step of the KTA model is sharing and tailoring information (Field et al., 2014). Patients received educational material along with the reminder. The researchers’ primary goal of including education was to promote patient adherence and knowledge. In general, if patients are aware of the reasoning behind an intervention, then they are more likely to be compliant with their care. The education was tailored to stress the importance of retesting and repercussions associated with untreated bacterial STIs. The next step of the KTA model includes monitoring that the knowledge has been applied adequately (Field et al., 2014). In order to complete this stage of the framework, the researchers monitored the number of recipients who scheduled a follow-up appointment and subsequently attended the visit for retest. Once participants received the mailed letter or answered the phone call, they were exposed to the educational portion to promote retest and patient portal usage.

Furthermore, the last stage of the KTA model includes evaluation of the outcomes (Field et al., 2014). The researchers implemented this step by maintaining a record of how many individuals actually returned for retesting post-intervention within a timely manner. This outcome allowed researchers to analyze the true effectiveness of the intervention. The last step of the KTA model requires confirmation of sustained knowledge in order to evaluate the intervention’s success. After completion of the project, sustained knowledge can ensure that STI retesting and management will continue with the utilization of the reminder system. In conclusion, the integration of the KTA model supports an organized approach that focuses on evidence-based practice and improved patient outcomes.

**Methodology**

The pilot interventional project used a cohort study design. The cohort patients information were extracted from the project site’s electronic medical record (EMR) system. By applying a
quality improvement approach, the effectiveness of reminders via phone and mail along with the benefits of having access to the patient portal were assessed in this project.

**Setting**

The clinical site for this project was a community-based health care center in Newark, New Jersey. The center serves all members of the local community, but the majority of the patient population consist of African American and Hispanic men who have sex with men (MSM). The site offers many services to the community including HIV/AIDS management, STI evaluation and treatment, behavioral health, primary care, and LGBTQ services. The practice sees approximately 10,000 patients a year.

**Study Population**

This project included a purposeful sample of patients who were diagnosed and treated for chlamydia and/or gonorrhea. Inclusion criteria included English speaking women and men over the age of 18 years of age and older with a diagnosis of chlamydia and/or gonorrhea who were diagnosed and treated at a community-based health center. Exclusion criteria were those under the age of 18, non-English speaking individuals, and patients who were diagnosed and received treatment elsewhere. According to the Director of Research at the community-based health center, a total of 400 confirmed cases of chlamydia were identified in 2019. Based on this number, it was previously estimated that the potential sample size for this 3-month pilot project would be approximately 100 individuals. However, given the unforeseen circumstances of COVID-19, the number of participants totaled 22.

**Subject Recruitment**
The patients, who were diagnosed and treated for chlamydia and/or gonorrhea from 05/2020 – 12/2020, their information was obtained via chart reviews. Therefore, no direct or active recruitment was required.

**Consent Procedure**

Not Applicable.

**Risks/Harm**

There was no diagnosis, treatment, or any type of assessment involved in the study. Therefore, no risks of harm apply.

**Subject Costs and Compensation**

There was no cost to participate in this project. Subjects did not receive monetary compensation for their participation in the project.

**Study Procedure**

The following steps were implemented to perform the project. After IRB approval was obtained, the researchers accessed the community-based health center’s EMR system to identify all persons diagnosed with chlamydia and/or gonorrhea between May 2020 and December 2020. The names of participants within the study sample were de-identified and assigned a patient identification number. Next, the patient charts were reviewed using the data abstraction tool (Appendix D) and the pre-intervention section was completed. The chart review focused on inspection of data pertinent to the data abstraction tool. No other additional information with protected health information (PHI) was reviewed. Patients were mailed letters to their home addresses twice and called three times over the span of three weeks using the number provided in the EMR system (See Appendix C). In order to maintain confidentiality, the researchers utilized
an application known as CorNexa to call the patients. Not only did this application allow researchers to communicate with patients without disclosing their personal phone numbers, but it also allowed the community-based health center’s primary phone number to appear on the call receipt. These interventions were performed in accordance with the 3-month retest recommendation. For instance, if a patient was diagnosed and treated for chlamydia on July 15th, 2020, they were contacted via mail and telephone no earlier than October 15th, 2020.

In the phone conversations and mailed letters, the researchers included patient education regarding the importance of retest along with promotion of patient portal enrollment. On the post-intervention portion of the data abstraction tool, the researchers noted when the letter was sent, and the phone call attempts. Data on whether or not the patients scheduled a follow up appointment for bacterial STI retest was recorded on the post-intervention section of the data abstraction tool. If the patient scheduled an appointment, then the researchers analyzed if the patient attended the scheduled visit. For those patients who returned for a 3-month retest, data was collected to determine if the patients had any symptoms and was retested during the follow up visit. For patients who are retested the results of the retest was collected as part of the data analysis.

Due to the extent of the project, various participants had to be given the interventions at different timings depending on the date of initial diagnosis and treatment. Thus, the intervention was promoted three months following the positive diagnosis. For example, one patient was diagnosed in the middle of July, thus the earliest the participant could be contacted for retest could not be until mid-October in order to adhere to the 3-month retest guideline. Regardless of intervention timing, all participants received the same interventions including mailed letters and phone calls depending on the CDC 3-month retest recommendation.
Sixteen of the twenty-two participants were diagnosed in May, June, and July 2020. As a result, these individuals were mailed their letters on 10/28/2020 and 11/11/2020. Phone calls were made to each participant individually on 11/13/2020, 11/18/2020, and 11/23/2020. The remaining 6 participants had initial diagnosis within the months of August and September. As a result, these individuals were mailed their letters on 12/4/2020 and 12/18/2020. Phone calls were made to each participant individually in this group on 12/9/2020, 12/14/2020, and 12/21/2020.

**Measured Outcomes**

After assigning a patient identification number, patient charts were reviewed to determine the important information pertinent to the project. Pertinent information was identified within the data abstraction tool. A copy of the data abstraction tool can be found in Appendix D. This tool captured de-identified patient demographics, initial date of chlamydia and/or gonorrhea diagnosis, if the patient presented with any symptoms at initial evaluation, treatment prescribed, and post intervention data such as date the reminder letter was sent and when the patient was called, if an appointment for follow up was made, and the results of any follow-up testing. Neurotesting, if an appointment for follow up was made, and the results of any follow-up testing.

**Project Timeline**

The project followed a start to finish timeline duration from May 2020 to January 2021. Unanticipated or external factors altered the original timeline, including length of time to receive IRB approval and issues related to the national COVID-19 pandemic. The project timeline is included in Appendix E.

**Resources Needed**

There were no costs associated with this project. Minimal resources were needed to complete this project. The electronic medical record at the community-based health center and
the CorNexa phone dialing application are both part of their normal operating systems. These systems were utilized for this project and did not require further manipulation or costs to be operated.

**Evaluation Plan**

Data obtained from the chart reviews was categorized and analyzed by the researchers. The data collected provided a variety of demographic information along with post-intervention results demonstrating how different communication methods influence bacterial STI retest. The ultimate goal was to deliver a comprehensive analysis of the patient characteristics, feasibility of implementation, and associated outcomes from the mail and phone call reminders to help establish guideline recommendations. This information was then be validated and reviewed by the Principal Investigator (PI) and assigned team members to formulate conclusions regarding the effectiveness of the intervention.

**Data Analysis Plan**

A data abstraction tool was created to identify study variables. The data abstraction tool is included in Appendix D. Statistical analysis was used to assess the effectiveness of the reminder methods. Descriptive statistical analysis was used to summarize the frequencies and proportion of all study variables. Categorical variables were presented as frequencies and percentages. Continuous variables were presented as means and standard deviations. Proportions were used to examine the difference between the number of patients who answered the phone calls and the number who returned for reevaluation during the study intervention. Proportions were used to examine the difference between the number of patients who responded to the interventions and the number who returned for reevaluation during the study intervention. All statistical analyses procedures were conducted using Microsoft Excel.
Data Maintenance/Security

Patient records were assigned a randomized study ID number and no protected health information (PHI) data was collected as part of this quality improvement program evaluation. The master list linking the patient record to the random ID code was kept separately from the actual data in a password protected electronic file maintained by the co-investigators. Data was de-identified upon completion of data collection and only de-identified data was used for analysis. Upon completion of the project, closure of the IRB, and final writing of the manuscript all data was destroyed in accordance with Rutgers University guidelines.

Results

A total of 22 participants were selected for this project. The intervention and data collection occurred over a 12-week period. At the conclusion, all demographic and implementation findings were uploaded into Microsoft Word and Microsoft Excel to create tables and pie charts. Descriptive statistics were performed to determine the effectiveness of the project interventions.

Results of Participant Demographics

Demographic data for the 22 participants included in this analysis are summarized in Appendix F. With regard to age, 9 of the participants were within the 20-29 age range, 10 were between 30-39, 1 participant was within the 40-49 age range, and 2 individuals were age 50-59. With regard to gender, the majority of the sample, 19 out of 22 were male. The remaining three participants were of female gender and no patients identified themselves as transgender. Fifty percent (50%) of the sample was of African American decent while the remaining consisted of the following: 8 White, 1 Asian, 0 unknown, and 2 participants declined to identify their race. When reviewing ethnicity, the researchers found that 50% of the sample was not
Hispanic/Latino/Spanish, 10 participants identified themselves as Hispanic/Latino/Spanish, and 1 patient declined to specify. In relation to marital status, none of the participants were married, divorced, separated, widowed, or in a partnership. 90.9% of the population was single while 2 patients reported an unknown marital status. Within the population sample, none of the patients identified themselves as women who have sex with women (WSW) or bisexual. Three were heterosexual, four were MSM, and the remaining 15 participants had an unknown sexual risk history. Obtaining demographic information was an essential component of the data abstraction tool since it demonstrated the similarities and differences of the study sample.

**Baseline Evaluation**

Chart reviews were performed for the 22 participants to relay pre-intervention data and the information was categorized within patient specific data abstraction tools. The pre-intervention data included primary diagnosis (dx), month of dx, symptoms with dx, dx treatment, previous history of GC and/or CT, and other concurrent STIs identified at time of primary dx. When evaluating primary dx, the majority of the study sample demonstrated dual diagnoses of both GC and CT (63.6%). The remaining participants included 6 individuals who only had chlamydia and 2 that only presented with gonorrhea as their primary diagnoses. In relation to the month of dx, 1 participant was diagnosed in May 2020, 7 in June 2020, 8 in July 2020, 1 in August 2020, and 5 in September 2020.

Symptoms of dx varied among the sample with the majority of the participants reporting dysuria and penile discharge. Since the majority of the population consisted of males, penile discharge along with dysuria was reported among 9 participants. 8 participants did not present with any symptoms or the diagnosis was established as a result of routine lab work. Symptom outliers included 1 individual complaining of vaginal discharge, 1 with rectal pain and bleeding,
1 with rectal discharge, 1 with eye irritation and discharge, and 1 with lower abdominal cramping. Since the majority of the population had a dual dx of CT and GC, those 14 participants were treated with a combination therapy of oral azithromycin and intramuscular (IM) ceftriaxone. The 6 participants treated for CT were treated with oral azithromycin while the remaining 2 participants with GC received IM ceftriaxone.

Seventy two percent (72%) of the study population had no previous documented history of CT or GC at the community-based health center. However, 5 participants did have a history of both CT and GC. There was one individual who had a single previous diagnosis of CT. The researchers also evaluated whether the participants had a concurrent STI dx during the time of primary dx of CT and/or GC. Seventeen participants did not have any concurrent STIs. However, 4 patients had HIV and 4 had syphilis when they were diagnosed with CT and/or GC. Some participants had a dual dx of HIV and syphilis during the time of initial diagnosis.

By obtaining pre-intervention data, the researchers were able to determine each participant’s personal history in order to properly promote bacterial STI retest. The inclusion criteria for the study population required participants to be previously diagnosed and treated at the community-based health center in order to promote the CDC’s 3-month retest guideline. A table was created to demonstrate pre-intervention data, which is located in Appendix G.

**Post-Intervention Evaluation**

Prior to making the first set of phone calls, chart reviews were performed to determine if the participants still qualified for the phone call intervention. At that time, 7 of the individuals were identified as not applicable for the phone call reminder as they already followed up and had completed retest results. One individual had a negative retest result completed on 11/11/2020. It is possible that the mailed letter influenced this participant’s follow-up retest appointment. One
person was unreachable for all three phone calls as the number listed in the EMR was not in service. Therefore, the researchers were unable to leave voicemails for this patient. Voicemails were left for 25.6% of the first set of phone calls, 25.6% of the second set, and 23.1% of the third set. A total of 7 of the 22 participants answered their phone when called. Three people answered during the first set of calls, two participants answered during the second set, and two more individuals answered when the researchers called for the third time. By implementing a method that entailed multiple phone calls, researchers were able to contact participants at different times leading to a possibility of increased retest compliance.

Bar graphs are displayed in Appendix J to illustrate the findings of the three phone calls to all participants. In relation to retest findings, 3 individuals returned for retest appointments and both demonstrated negative results. The retest findings are presented in Appendix I.

**Effectiveness of Intervention**

In relation to the effectiveness of the study intervention, a retest rate was calculated. The retest rate was calculated using the following formula for each interventional method: retest rate = number of retest / total number of performed intervention. In regards to the mailing intervention, one participant returned for retest solely from this intervention from a total of forty-four mailed letters. The mailed letter intervention was the motivating factor for this patient to retest. This statement was valid because at the time of the patient’s retest date, 1 set of mailing letters was sent a week prior and the phone call intervention was not yet initiated. Thus, the retest rate for the mailed letters intervention calculated to 2.3%.

In regard to the phone call intervention, a total of 39 phone calls were made. Out of the 39 phone calls, multiple patients answered and spoke to the researchers stating they plan to return for retest. However, only two of the participants returned for retest after the phone call
intervention. Thus, the retest rate for the phone call intervention calculated to 5.1%. The retest rate findings are presented in Appendix K.

Discussion

Promoting retest for patients diagnosed with bacterial STIs including CT and GC is essential especially in a community-based health center that treats patients with high-risk sexual behavior. Adhering to the CDC’s 3-month retest recommendation is necessary to ensure prevention of long-term consequences along with spread of the infection. With this in mind, the purpose of this DNP project was to assess if retest reminders have an effect on follow-up rates for retest. Two methods were implemented to communicate with patients regarding the importance of returning for revaluation. Both phone call reminders and mailed letters were utilized as interventions to encourage patients to return for retest. Previous studies have found that the utilization of patient portal systems and other technological approaches can be beneficial tools in the management of STIs (Wong et al., 2019; Cohen et al., 2017, Cope et al., 2019; Dee et al., 2019; de Lima et al., 2016; Looker et al., 2019; Rose et al., 2017; Smith et al., 2017; Smith et al., 2015). Chlamydia and gonorrhea infections are also expected to decrease as patients begin to be more compliant with retest recommendations. Thus, a dual approach involving written and verbal methods was executed to contact patients.

The primary objectives of this project involved increasing compliance to 3-month STI retest and assessing facilitators and barriers affecting the implementation of the interventions. Researchers were able to demonstrate the feasibility and importance of a reminder system to promote retesting. This has implications for expanding and incorporating a reminder system with other patient engagement tools, such as a patient portal system. Overall, 3 out of the 22 participants in this study were compliant with the 3-month retest recommendation. Thus, 13.6%
of the patients were positively influenced by the mailed letters and phone calls. The study findings support the need to provide mechanisms that promote STI re-testing in persons diagnosed with gonorrhea or chlamydia.

Multiple facilitators and barriers affected the implementation phase of the study. The DNP chair and team members were major facilitators in providing constant guidance and suggestions to alternative intervention options when obstacles were presented. Even though only a couple of hours of EMR orientation was provided to researchers, the simplicity of the system was beneficial when accessing charts before and after the interventions were applied. Once EMR access was granted to the researchers, the easy accessibility of patient charts allowed researchers to obtain data and perform chart reviews. Lastly, the collaboration between the researchers and the project site was also a facilitator that demonstrated benefits for both academia and healthcare practice. The easy accessibility and convenient location of the project site was an advantage for the researchers. Healthcare clinics that allow students to implement various interventions within the practices can pose a positive effect on the clinic’s policies and procedures. These facilitators promoted benefits to the overall success of the project.

There were numerous barriers throughout the study timeframe that differed from previous studies. In December 2019, the community-based health center transferred to a different EMR system that included patient portal capabilities such as patient-provider communication and patient accessibility to their personal medical records. Due to the unfamiliarity with the new system, there were delays in provision of access to the researchers. Although IRB approval was originally granted in April 2020, the investigators were unable to perform chart reviews until September 2020 as access was unintentionally postponed.
The initial project implementation idea was to promote 3-month retest reminders by utilizing the patient portal messaging system. However, the researchers quickly discovered through chart reviews that the majority of the participants denied or only partially completed access to the portal system. Since many patients in the study population did not have account access to the patient portal, this was a major disadvantage to the primary plan. According to Kooij, Groen, and van Harten (2018) a couple reasons why the study population lacked patient portal access was due to inadequate resources, time, and low health literacy. Although internet networks are available in urban locations, disparities in internet usage are evident due to financial barriers and lack of knowledge regarding how to utilize internet resources. For instance, In general, Newark demonstrates challenges regarding literacy in approximately 52% of the adult population (Council of New Jersey Grantmakers, 2021). As a result, the investigators had to consider alternative intervention possibilities including phone calls and mailed letters. Since limited patient portal access was evident within the study population, the researcher had to request permission from the Director of Research at the project site regarding different communication approaches. After approval was obtained from the site, the IRB protocol was adjusted prior to submitting for modification. Along with the alteration of the study procedure, another barrier that needed to be addressed was the insufficient amount of participants who had a single diagnosis of chlamydia. Only 6 participants were diagnosed and treated for chlamydia between May 2020 and September 2020. Therefore, the researchers had to examine incorporation of other bacterial STIs to broaden the study’s inclusion criteria. Gonorrhea was selected as an additional STI to analyze as many participants demonstrated a dual diagnosis of CT and GC and the CDC’s retest recommendation for both of these bacterial STIs is identical. The main purpose of submitting the IRB modification was to change the interventional method
and add gonorrhea as the additional bacterial STI. The modification was submitted on October 15th, 2020 and approved on October 21st, 2020.

Coronavirus (COVID-19) pandemic began in March 2020 and had a major impact on all aspects of the project. During this time, the state of New Jersey, along with other states in the nation were in lockdown from March 2020 to mid-June 2020. For example multiple sexual health clinics within New York City were closed during this timeframe, resulting in absence and delay in care (Nagendra et al., 2020). According to Nagendra et al (2020), “the NYC Department of Health and Mental Hygiene informed the community that 7 of 8 sexual health clinics would close” during the lockdown. The limitation of sexual health services along with the rising COVID-19 cases caused less patients to seek treatment and return for three-month retest. Additionally, Nagendra et al. (2020) mentioned STI testing for both symptomatic and asymptomatic patients was dramatically decreased in the nation during this time, 75% and 79%, respectively. Due to the constraint of STI testing during the pandemic, less patients received treatment. Various factors may have affected STI testing such as limited test kits, apprehension of acquiring COVID-19, and appointment restrictions secondary to social distancing (CDC, 2020b).

All non-essential workers were included in the stay-at-home executive order per the Governor of New Jersey. As a result, the community-based health center was completely closed from March 2020 to mid-May 2020. Due to this closure, the researchers were unable to consider participants prior to May 2020. Although the community-based health center reopened in May 2020, access to appointments was limited due to CDC’s COVID restrictions, such as social distancing of 6 feet or more, extensive facility sanitation procedures, and limitation of the amount of individuals within a given facility. These restrictions caused minimal appointment
availability. Furthermore, patients were apprehensive to follow-up for retest due to fear of exposure to the virus. When considering the patient population in this urban setting, many individuals rely on public transportation as their primary mode of travel. However, during the pandemic, public transit was restricted. Due to the CDC’s social distancing restriction, the community-based health center only allowed essential workers and scheduled patients to present at the site. Consequently, the researchers were unable to physically go to the project site to perform phone calls. The pandemic presented various challenges that caused the researchers to modify the project methodology.

Since the investigators were unable to physically be at the facility, HIPAA-compliant online networking applications were considered to make phone calls including Doximity and CorNexa. CorNexa is an application used by the center’s staff for both administrative matters and communications with patients. This application allowed the users to make phone calls from anywhere and the caller ID on the receiver’s phone showed as if the call was from the community-based health center. By having this feature, the researchers were able to ensure that patients would possibly be more willing to answer phone calls as the phone number was part of the professional organization. However, delay of access to CorNexa due to technical issues prevented researchers from implementing the project in a timely manner.

Another barrier that could have potentially affected study outcomes was the nationwide shortage of chlamydia and gonorrhea nucleic acid amplification tests. According to the CDC (2020b), due to the shortage patients were empirically treated if suspicion of bacterial STI was present through signs and symptoms or exposure to disease (CDC, 2020b). The scarcity of the test kits and limitation of clinic appointments could have possibly caused disruption in retest
within a timely manner. Overall, the barriers caused many halts in progression of the project, but over time various adjustments were made to support completion.

**Implications**

The *Knowledge to Action* model is the theoretical foundation of this DNP project. When considering the various steps included within this model, evaluation and adjustment of the study procedure should be completed to determine sustainability and potential for future scholarship. The implications of this project are divided into six sections which include clinical practice, healthcare policy, quality and safety, education, economic, and patient portal system.

**Clinical Practice**

Healthcare providers must comply with evidence-based practice in order to support quality care for their patients. In regard to treatment of bacterial STIs, clinicians in all healthcare settings should adhere to the CDC’s 3-month retest guideline to ensure that the prescribed therapy was effective, and reinfection did not occur. Since this is an established protocol published by the CDC, all providers should practice in accordance to the regulation. Not only does it provide benefits to patients who have been affected by bacterial STIs, but it also ensures that there is consistency in care among clinicians nationwide. Guidelines are presented to healthcare workers in order to enhance clinical practice. Therefore, by implementing a simple method encouraging patients to return for 3-month retest following their initial diagnosis and treatment, providers can promote reduction of infection transmission.

Untreated bacterial STIs can cause harmful health consequences such as pelvic inflammatory disease (PID) and infertility in women and chronic epididymitis and proctitis in men. PID, epididymitis, and proctitis can cause chronic pain and discomfort. However, these harmful consequences can be avoided with timely diagnosis and treatment. Thus, the 3-month
REMINDERS TO PROMOTE BACTERIAL STI RETEST

retest is essential to confirm that treatment was successful, and eradication of the infection has occurred.

During the chart reviews, the researchers discovered that multiple participants were diagnosed with either GC and/or CT when routine lab work was performed. Another consideration to acknowledge is that all the participants that were found to be positive based on routine lab work presented as asymptomatic. Thus, healthcare providers should recognize the significance of the USPSTF guideline stating that high risk patients should be screened annually for bacterial STIs. The high-risk population includes “having a new sex partner, more than 1 sex partner, a sex partner with concurrent partners, or a sex partner who has an STI, inconsistent condom use among persons who are not in mutually monogamous relationships, previous or coexisting STI, and exchanging sex for money or drugs” (USPSTF, 2019). In conclusion, healthcare providers within clinical practice should adopt and adhere to evidence-based guidelines to provide patient-centered care.

In relation to the changes in practice due to the pandemic, the CDC (2020a), recommends providing appointments via telehealth to offer STI diagnosis and treatment to symptomatic and exposed individuals. Healthcare providers should be aware of how to assess and treat patients virtually. CDC offers an STI protocol guideline to assist clinicians in providing adequate care to patients via telemedicine (CDC, 2020a).

**Healthcare Policy**

All healthcare settings must observe a set of policies that guide their practice. As a result, care can be delivered safely and adequately to follow proper guidelines and recommendations. For instance, one policy clinicians should comply with is providing education to their patients regarding retest adherence. Advantages to developing a generalized policy regarding bacterial
REMINDERS TO PROMOTE BACTERIAL STI RETEST

STI retest across all medical facilities could offer benefits to both healthcare providers and patients. Healthcare policy plays a fundamental role in the overall effectiveness of patient care and is necessary to implement to promote equal delivery of care.

Quality and Safety

By promoting 3-month retest following initial diagnosis and treatment of bacterial STIs, the spread of infection throughout the general population is reduced. For example, patients who return for retest that have a positive result will be treated again and a second 3-month retest is warranted. Thus, the quality of care and safety of the general population is a priority and reduction of spread serves as a crucial component in healthcare delivery. Additionally, by advocating for retest measures, clinicians can help prevent lifelong harmful health consequences due to untreated infection. Also, education can play a key role in reduction of disease transmission and disease prevention. A primary way healthcare providers can prevent infection is by offering education regarding safe sexual practices to prevent future bacterial STIs. Lastly, high quality healthcare should be given to all individuals regardless of socioeconomic status to provide best practice. Overall, the standard of care should include high quality and safety in order to prevent consequences and enhance healthcare delivery.

Education

Education about safer sexual practices is imperative in order to prevent bacterial STI diagnoses. If patients understand the reasoning for retesting 3 months following their initial diagnosis, the hope is that patients will be more compliant with the recommendation. However, if education is deferred during the visits, then patients may not recognize the importance of returning for retest. Education should include safer sexual practices, signs and symptoms of bacterial STIs, and harmful consequences that can result from untreated infections. Healthcare
providers can teach their patients accurate information obtained from credible sources including CDC, UptoDate, and Mayo Clinic. Additionally, including STI education within middle and high schools should be considered to promote safe sexual practices. As a result, greater awareness will be achieved regarding STIs by adulthood. In general, education is a vital factor in facilitating patient compliance.

**Economic**

In general, the annual healthcare related expenditures associated with bacterial STIs is significant. Therefore, it is crucial for all solutions to be considered to minimize the overall costs. Reduction of costs can be completed by possible solutions such as early detection and treatment, adherence to the 3-month retest, and annual STI screening for high-risk individuals. Implementing interventions such as reminder systems can promote compliance to retest, thus reducing overall expenditure. Furthermore, untreated harmful consequences can also be costly to treat for both the healthcare system and the patient. Another consideration to reduce the cost of STI testing is by possibly utilizing more at home test kits. With proper instruction, home test kits can be both affordable and convenient in providing accurate STI testing. According to Shih et al. (2011), the cost of at home STI testing kits is approximately $25 per test in comparison to a total cost of $111 if testing is performed within the clinic. This at-clinic-based testing does not include other costs such as office visit, transportation to visit, or missed work (Shih et al., 2011). Overall, reduction of STIs can provide positive benefits in regard to decreasing healthcare costs.

**Patient Portal System**

Although phone call reminders and mailed letters were used as the interventions for this project, future studies and procedures at clinical sites may benefit from implementing the patient portal messaging system. However, in order to use this approach, patients must have access to
their patient portal accounts. Multiple benefits arise from having access, such as patients can view their personal health records via a HIPAA compliant web-based resource or application. Additionally, this method promotes communication with healthcare providers. As a result, patients can be active participants in their health. Healthcare clinics and offices should promote patient portal access at each visit in order to encourage patient use. If attempts are not made to advocate for the patient portal system, then patients will not be able to fully utilize all the resources available. Patient portal messaging can be a secure, beneficial method to incorporate into healthcare in order to connect with patients when necessary. Another option to consider along with patient portal systems is integration of telehealth in order to address patient’s concerns. The utilization of telemedicine is the future of primary healthcare. In general, patient portal systems and telemedicine are both virtual platforms that can help guide patient adherence and healthcare promotion.

**Sustainability**

Findings from this QI project can lead to sustainable change. One possible outcome from this DNP project could be development of a clinic-based practice guideline on the use of reminder systems that could be applied to patients diagnosed with bacterial STIs at state and national levels. This practice guideline would follow the current CDC guidelines regarding 3-month retest. Although patients are informed to follow-up during their initial visit, the reminder acts as an additional motivator to promote compliance. A practice guideline is essential to establish to ensure all healthcare providers are administering similar care based on evidence-based practices. Policy regulations are necessary to ensure that all healthcare providers are adhering to recommended protocols. The clinic can confirm provider adherence to policies by performing randomized audits. Overall, inclusion of a practice guideline in a clinic-based setting
can provide positive benefits to the clinicians and patients as it can sustain fluidity among multiple outpatient practices.

This project utilized a dual-intervention approach which explored diverse communication methods such as phone calls and mailed letters. Practices should consider using multiple communication approaches to get in contact with patients as one individual may prefer a certain method over another. Additionally, during every patient interaction, the patient's address, phone number, and email should be confirmed for accuracy. As a result, the reminder will be delivered to the correct individual. Although healthcare providers do not have complete control over the actions that their patients take, efforts can still be made to promote compliance. Communication with patients in person is crucial, but utilization of messaging systems is also essential as it reiterates key points highlighted during the visit.

The original project methodology included patient portal messaging. However, the researchers quickly discovered that this would not be possible as many patients declined access. Therefore, the modified study procedure included promotion of the patient portal during the reminder call and in the mailed letter. If this intervention is continued over time, more patients may be compliant with accessing their portals and actively participating in their personal health. As a result, patient portal messaging can be a supplemental communication method that is incorporated when contacting patients regarding follow-up appointments and other urgent reminders.

**Plans for Future Scholarship**

The researchers plan to submit an abstract on the findings from this project to nursing conferences involving STI management and treatment as well as publish the results in a peer reviewed journal. Additionally, the project will be added to the Rutgers DNP repository, which is
a university website that contains a collection of alumni DNP projects. This database is open and available to the general public for viewing. Contact information for the researchers is also available in the repository for any reader questions or comments. Overall, future scholarship involving this project focuses on dissemination of the study findings though publication, conference submission, and repository viewings.

Since this project is a pilot study at an urban clinic-based setting, further evaluation and promotion may be necessary in future legacy projects to ensure validity of the interventions. Several obstacles occurred during the timeline of this project due to unforeseen events, such as the COVID-19 pandemic. Therefore, if this project were to be implemented post-COVID, the results may be altered. The advantages of having a legacy project include further investigation of the interventional method and study findings. If in the future, patients are more adherent to accessing the patient portal system, then a possible legacy project could utilize patient portal messaging as a reminder intervention rather than phone calls and mailed letters.

Conclusion

Healthcare providers must reconsider their approach to promoting bacterial STI retest to ensure best practice. This project discovered that patients may not be compliant with the CDC 3-month retest recommendation for a variety of reasons, but with the implementation of reminders, the guideline was promoted. The endorsement of the 3-month retest guideline can ultimately promote reduction of cost expenditure, prevention of untreated infection consequences, and minimization of infection spread.
REMINDERS TO PROMOTE BACTERIAL STI RETEST

References


Owusu-Edusei, W., Chesson, L., Gift, B., Tao, K., Mahajan, K., Ocfemia, K., & Kent, K. (2013). The estimated direct medical cost of selected sexually transmitted infections in the United
REMINDERS TO PROMOTE BACTERIAL STI RETEST


https://doi.org/10.1097/OLQ.0b013e318285c6d2


Appendix A

Clinical Question: For adult patients (18 years and older) previously treated for chlamydia and/or gonorrhea (P), does the implementation of mailed reminders along with phone call reminders (I) compared to usual care (C) increase the rate of retesting (O)?

<table>
<thead>
<tr>
<th>Article</th>
<th>Author, Date</th>
<th>Evidence Type</th>
<th>Sample, Sample Size, Setting</th>
<th>Study Findings</th>
<th>Limitations</th>
<th>Evidence Level &amp; Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Centers for Disease Control and Prevention (CDC, 2015)</td>
<td>Clinical Guideline</td>
<td>Guidelines created for healthcare providers who provide care to various income level patients to screen, treat and manage chlamydia.</td>
<td>The recommendations mandated by the CDC (2016) include chlamydia retest three months following initial diagnosis and medication completion regardless of partner treatment. In relation to this recommendation, it is essential for healthcare providers to stress the need for a follow-up at the three-month interval to ensure that the bacterial infection has been eradicated. Due to the course of the asymptomatic infection, many patients may delay seeking health care needed to prevent spread and further complications.</td>
<td>N/A</td>
<td>Non-Research Level IV, A, High quality</td>
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</tbody>
</table>
Other educational considerations should also be taught to patients post-treatment such as abstaining from sexual activity 7 days post-treatment and promoting the use of sexual barriers such as condoms.

Due to the nature of this DNP project, participants will be receiving reminders at the 3-month interval for retest along with education explaining the importance of retest in order to prevent spread and further complications.

|   | Cohen, A. C., Zimmerman, F., Prelip, M., and Glik, D. (2017) | Retrospective Cohort Study | N= 917 male clients who tested positive and received treatment for chlamydia, gonorrhea, or syphilis between January 1, 2014, and December 31, 2015. n= 424 positive patients prior to implementation of Healthvana and 493 positive patients after implementation of Healthvana | Smartphone applications, such as Healthvana, can be effective mechanisms to immediately notify patients regarding STI results. There are several applications that address other health concerns such as weight management and physical activity, but there seems | Only patients who were successfully notified and returned for treatment were incorporated in the evaluation. Data regarding risky sexual behavior was not analyzed but | Research Level II, B, Good quality |
### Setting
8 Aids Healthcare Foundation (AHF) centers from California and Florida

- to be a lack of evaluation regarding how STIs can be managed by utilizing modern day technology.
  - Healthyvana demonstrated a significant reduction in number of days between initial testing and treatment.
  - Findings from this study indicate that implementation of electronic messaging systems can be beneficial to STI management.

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**Qualitative Study**

A total of 634 participants were tested for Gonorrhea/Chlamydia between May & June 2018. 50% of the patients were randomly selected for the survey regarding evaluation of electronic messaging services for STD care

- N = 317 randomly selected from total Gonorrhea/Chlamydia tested patients
- n = 113 opted-in for follow-up survey

99% of patients that completed the survey stated that the utilization of text message or email would be reasonable.

- 92.9% of the participants believed that this intervention would be easy to apply.

Based on the findings of this particular study, integration of electronic messaging systems could produce better patient satisfaction.

- The older population may not be technologically adept. As a result, text message reminders may not be effective for this age group.

Patient information, such as phone number and email address, needs to be accurate in the EMR.

**Research Level:** III, A, High quality
<table>
<thead>
<tr>
<th>Setting: Durham, North Carolina</th>
<th>outcomes due to satisfaction of electronic messaging services.</th>
<th>system in order to ensure the intervention is being transmitted to the correct individual.</th>
</tr>
</thead>
</table>

| 4 | Desai, M., Woodhall, S. C., Nardone, A., Burns, F., Mercey, D., & Gilson, R. (2015) | Systematic Review | An analysis of various active recall strategies to promote STI and HIV retesting was performed. Some examples of recall methods that were examined include SMS, phone call reminders, and home sampling kits. N= 17 full-text articles met the inclusion criteria. n= Of the 14 comparative studies, all but one displayed higher retesting rates. **Setting:** Geographic location varied for each reviewed article. Overall, use of active recall increased reattendance for retest of STIs. However, since the three methods that were analyzed demonstrate similarities, it is difficult to determine which method is the most effective. In regard to cost effectiveness, further studies need to be performed to understand which intervention is sufficient from a financial and compliance standpoint. | The inclusion criteria was broad in order to examine as many articles as possible. However, with the inclusion of various settings and guidelines, follow-up times and retesting strategies varied among different populations. Participants included in the studies which utilized active recall reminders were not blinded to the study intervention. Thus, bias must be considered as a Research Level III, A, High quality |

Controlled Observational Study

16 to 25 years old heterosexuals who tested both negative and positive (total sample size 1072) were sent invitations to retest via a home-collection Chlamydia test kit 3 to 20 months after initial test. If participants were unresponsive, then SMS reminder was sent.

N = 1072 individuals invited to retest
n = 206 participants retested

Setting: STI clinics of the Limburg Public Health System, Geleen, the Netherlands

Female patients were more likely to return the home test kits in a timely manner of about 2 weeks.

Patients older than age 22 were more compliant with the intervention.

If patients were unable to return the home test kits in a timely manner text messages were sent as reminders to send the kit back with the sample.

After receiving the lab results a total of 21 participants were positive for chlamydia and out of these 21 patients, 15 of received a text message to send the kit back to the facility.

Based on the study findings, one can identify that using home test kits and text message reminders are effective approaches in promoting

All positive retests in patients that report failure to use sexual barriers (condoms) were categorized as reinfections. However, incidents of treatment failure in the MSM population may have been classified incorrectly in patients who reported always using condoms. Rectal chlamydia is not considered in this scenario.

NAAT utilized in this study did not identify low copy number chlamydial DNA. Therefore an infection at alternative clinical site may have

Research Level III, A, High quality

**Prospective Cohort Study**

- **Population**: Pregnant and nonpregnant women diagnosed with chlamydia
  - Exclusion criteria includes females under age 18, patients who already received treatment for the current infection, allergy to macrolide antibiotics, or if they were diagnosed with Myasthenia Gravis
  - n = 72 total participants (36 pregnant and 36 nonpregnant)

**Setting**: A single academic medical center obstetrics and gynecology clinic in Charleston, South Carolina, United States

- In order to obtain a negative NAAT, pregnant women averaged 8 days while nonpregnant women averaged 7 days.
- After administering single dose chlamydia treatment, both pregnant and nonpregnant women should be retested at the 30-day mark.
- Pregnant women should not be evaluated for test-of-cure before one month has passed.
- In relation to reducing reinfection rates, women should refrain from unprotected sexual activity for at least 30 days following treatment.

- Even though this study was effective in the southeast, one limitation is that this intervention may not be feasible in another region of the United States or other countries.
- Some participants failed to comply with the intervention because they received prenatal care at another healthcare facility. Thus, the sample size was decreased.
- Daily NAATs would have benefited the results of the research.

**Research Level**: II, A, High quality
<p>| 7 | de Lima, I. C. V., Galvão, M. T. G., de Oliveira Alexandre, H., Lima, F. E. T., and de Araújo T. L. (2016). | Systematic Review | Sample consisted of nine randomized clinical trials based on the use of information and communication technologies for adherence to antiretroviral treatment in adults with HIV/AIDS. Total of 2,517 were identified prior to selecting the article based on inclusion and exclusion criteria. | In this study involving HIV/AIDS patients, the most helpful information technology communication tool was phones. This method allowed patients to receive notifications along with reminders about medication adherence. Improvements involving compliance were evident. | The study did not include a randomized control group who received standard care which indicates that the sample was convenient. The researchers could not confirm that the dual intervention of... | Research Level III, B, Good quality |</p>
<table>
<thead>
<tr>
<th></th>
<th>Exclusion criteria included repeat publications, studies that did not answer the research question, case reports, experience reports, theoretical/qualitative/cross-sectional studies, review papers, clinical trial protocols, along with clinical trials that have addressed the use of information and communication technologies in HIV prevention and rapid testing.</th>
<th>among groups exposed to the intervention (smartphones/web-enable handheld devices). By incorporating the use of information and communication technologies, there can be growth in care accessibility and establishment of a strong relationship between patients and the health center they visit.</th>
<th>using home test kits and text message reminders were effective or if their data was influenced by study sample. Without patient knowledge, participants were automatically given two home tests for themselves and their partner. If this method was approached in a different manner, then it is possible that more partners would have been willing to participate which would have resulted in a larger sample size.</th>
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</thead>
<tbody>
<tr>
<td>8</td>
<td>Rose, S. B., Garrett, S. M., Stanley, J., Retrospective Cohort Study</td>
<td>All individuals tested for chlamydia and/or gonorrhea within the timeframe of July 1, 2012 – December 31, 2014</td>
<td>The results indicated that 29.4% of the study participants returned for chlamydia reevaluation in Some individuals could have moved to another residential location.</td>
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</tbody>
</table>
and Pullon, S. (2017)

were included in the data collection. Exclusion criteria included children aged 0-9 years old and those tested without identification of gender.

N = 6,530 total participants
n = 1,919 patients retested 3-months post-treatment

Setting: Primary care and sexual health clinics in Wellington, New Zealand

a timely manner. 18% of those individuals were re-infected with chlamydia.

Since there is a substantial lack of awareness and knowledge about chlamydia retest, clinicians must stress the importance of the recommended retest guidelines to decrease spread of the disease and frequency of repeat infections.

By providing education verbally and through alternative approaches, clinicians can reiterate retest recommendations and other actions to avoid post-treatment.

location during the time period of retest, resulting in inability to obtain retest data for these patients.

Patients could have visited other facilities for retest, rather than returning to the health center where they were originally diagnosed.

Researchers were unable to determine if clinicians were providing education about retest during the initial visit.

Researchers were unable to obtain data about sexual partners and behavioral practices within
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>REMINDERS TO PROMOTE BACTERIAL STI RETEST</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>All participants had confirmed chlamydia infection and were administered 1 g azithromycin. N= 600 participants (200 each of women, heterosexual men, and MSM) n= 290 participants retested at one to four months (26 classed as reinfection and 9 as treatment failures)</td>
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<tr>
<td></td>
<td></td>
<td>Setting: Two metropolitan public sexual health clinics in Australia</td>
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<tr>
<td></td>
<td></td>
<td>High positive retest rates, especially among the MSM population, emphasize the significance of retesting at the recommended 3-month period following treatment. Treatment failure is more common in MSM who are diagnosed with rectal chlamydia. As a result, single-dose therapy may not be the most effective option for this group. Chlamydia reinfection is common after treatment completion. Thus, retest is crucial to prevent transmission and development of consequences.</td>
<td>Only patients who were successfully notified and returned for treatment were incorporated in the evaluation. Data regarding risky sexual behavior was not analyzed but could have enhanced the investigation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MEDLINE was used as the search engine to systematically review studies of interventions to improve STI screening or rescreening in clinic-based settings. The STIs that were included in the Patient reminders for screening or rescreening via text, telephone, and postcards were primarily categorized as highly effective or moderately effective. This</td>
<td>The search did not incorporate abstracts, meeting proceedings, or unpublished studies that</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Research Level I, B, Good quality</td>
</tr>
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</table>
### REMINDERS TO PROMOTE BACTERIAL STI RETEST

<table>
<thead>
<tr>
<th>Investigation were chlamydia, gonorrhea, or syphilis.</th>
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<tbody>
<tr>
<td>The selected articles were published between January 2000 and January 2014.</td>
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<tr>
<td>N= 38 articles analyzed n= 11 RCTs included in analysis</td>
</tr>
<tr>
<td>Of the 4,566 references reviewed, 38 articles involving a total of 42 interventions met the inclusion criteria.</td>
</tr>
<tr>
<td>Of the 42 interventions, 38.1% were considered as highly effective while 33.3% were identified as moderately effective.</td>
</tr>
</tbody>
</table>

**Setting:** Geographic location varied for each reviewed article, but a clinic-based setting was necessary in order to be included in the review.

Intervention also demonstrated low or moderate cost (less than $1001–10,000). Programming retest/rescreening reminders into patient portals may be done with limited supplementary cost to the clinic. These reminders can be easily modified to meet the needs of the patient population visiting the clinics.

Interventions involving dedicated clinic employees that worked to advance STI screening were highly effective or moderately effective in improving STI screening. However, high-cost ($10,001–$100,000) is a factor to consider when budgeting.

Conveyed negative results.

The outcomes of the interventions that were reviewed may be different in other clinical settings. Additionally, not all clinic-based health centers are similar. Patient population plays a significant role in the effectiveness of an intervention.

Baseline screening performance was not considered when analyzing changes. Therefore, sites with low baseline screenings had more opportunity to increase screening compared to centers where baseline

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<table>
<thead>
<tr>
<th>REMINDERS TO PROMOTE BACTERIAL STI RETEST</th>
<th>61</th>
</tr>
</thead>
</table>
### United States Preventative Service Task Force (USPSTF)

| 11 | United States Preventative Service Task Force (USPSTF) | Clinical Guideline | Guidelines created for healthcare providers who provide care to various income level patients to screen, treat and manage chlamydia. | “The USPSTF recommends screening for chlamydia in sexually active women age 24 years and younger and in older women who are at increased risk for infection” (USPSTF, 2019). | “Pregnant women diagnosed with a chlamydial or gonococcal infection in the first trimester should be retested 3 months after treatment” (USPSTF, 2019). | “Because of a high likelihood of reinfection, the CDC also recommends retesting all patients diagnosed with screenings were already elevated. The cost portion of the results is estimated because only 5 of the 38 articles mentioned exact expenditure. | Non-Research Level IV, A, High quality |
chlamydial or gonococcal infection 3 months after treatment, regardless of whether they believe their partners have been treated” (USPSTF, 2019).

These guidelines relate to the proposed clinical question and encourage retest at 3-months.

| 12 | Wijers, J., van Liere, G., Hoebe, C., Cals, J., Wolffs, P., and Dukers-Muijrers, N. (2018) | Retrospective Cohort Study | Laboratory data of 48 Dutch General Practitioners (GP) practices between January 2011 and July 2016 were analyzed. N= 622 total diagnosed chlamydia initially and 73 diagnosed with gonorrhea n= 24 positive at test-of-cure (TOC) within 3 months (19 at test location and 5 at another STI clinic) Setting: All chlamydia and gonorrhea laboratory tests of patients 16 and older were acquired from the database of the regional medical microbiology laboratory of The baseline number of patients that tested positive for chlamydia is 622. 19.6% of these patients had a TOC completed within 3 months. Of the patients that returned for TOC, 15.6% tested positive which indicates that a total of 19 were either re-infected or never cured. 23.8% of patients diagnosed with chlamydia were retested within 2-3 months. Of this sum, 12.2% tested positive at retest. The study findings imply that retest is essential to Information regarding patients’ sexual behaviors and reason for seeking treatment were not identified. Patients may not be compliant with retesting at the GP practices in comparison to STI clinics due to cost. Many GPs require health insurance which encompasses a copayment, while STI clinics can provide testing free of charge for high risk groups, such as Research Level III, C, Low quality |
| 13 | Wong, W. C. W., Tsz Hei Lau, S., Pui Hang Choi, E., Tucker, J. D., Fairley, C. K., and Saunders, J. M. (2019) | Systematic Review | The socioecological model was integrated in the review to analyze interventions that could promote chlamydia retest. The levels included policy, community, organizational, interpersonal, and individual.  
N= 24 full-text articles evaluated for eligibility  
n= 19 systematic reviews were included in the qualitative synthesis  
**Setting**: Geographic location varied for each reviewed article. | In regard to the organization level of the socioecological model, using electronic health records facilitated testing, as long as additional cost was not involved.  
Age plays an important role in chlamydia screening.  
Techniques to minimize reinfection such as partner notification, treatment provision to partners, and reminders for retest need to be implemented to decrease the spread of chlamydial infection. | Systematic reviews that were analyzed varied considerably in regard to intervention strategies, target populations, locations, and study results.  
Thus, comparing effectiveness of the interventions was challenging.  
Information about treatment, partner notification, and retesting were often absent.  
Circumstances such as, cultural attitudes, government policies, and disparities in health care systems could have influenced the study findings. | Research Level III, A, High quality |
Appendix B

Figure 1. Knowledge to action framework model.
Appendix C

Mailed Letter Message Template

Date:

You are due for a follow up visit to see if the treatment was successful.

Why is this important?
- To confirm the infection is gone
- To stop spread of infection
- To avoid long-term pain from infection

What will happen during my visit?
- A healthcare provider will ask you questions about your last visit and if you still have any symptoms
- Another test will be taken to confirm if the infection is gone

How can I prevent this infection?
- Use of condoms
- Yearly testing for sexual transmitted infections
- Telling your partner(s) of positive test results

Please call the community-based health center at (###) ### – #### to make an appointment.

Important Tips:
- This community-based health center has a patient portal system where you can see your medical records through the web with a safe login.
- The system can also be easily used through a smartphone app.
- The patient portal system allows you to send safe messages to your doctor and review lab results.
- Ask an employee on how to get started at your next visit.
Appendix D

Utilization of Reminders to Promote Bacterial STI Retest:
A Quality Improvement Project
Data Abstraction Tool

Patient Identification Number: __________________

### Information From Chart Before Intervention

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<tr>
<th>Gender</th>
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<th>Female</th>
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</thead>
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<tr>
<td>Age</td>
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<td>Marital Status</td>
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<td>Primary Dx and Date of Dx</td>
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<td>Symptoms with Dx</td>
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<tr>
<td>Treatment of Dx</td>
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<td>Doxycycline</td>
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<td>Previous GC and/or CT History</td>
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<td>Other Concurrent STI Diagnoses</td>
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<tr>
<td>Patient Portal Access</td>
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<td>No</td>
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### Information Post Intervention

| Date of Mailed Letter Sent | MM/DD/YYYY |
| Date of First Phone Call Reminder | MM/DD/YYYY |
| Date of Second Phone Call Reminder | MM/DD/YYYY |
| Date of Third Phone Call Reminder | MM/DD/YYYY |
| Appointment Scheduled? | Yes | No |
| Kept Appointment? | Yes | No |
| **For Those Who Attend Appointment, Any Symptoms? If so, which ones?** | Yes | No |
| **For Those Who Attend Appointment, Retested?** | Yes | No |
| **If Retested, Results with Dx?** | Positive Dx: | Negative |
Appendix E

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*Figure 2. Project timeline.*
Appendix F

Table 1

*Characteristics of Sample*

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<th>Variable</th>
<th>Total (n=22)</th>
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<td></td>
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<td>30 – 39</td>
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<td><strong>Gender</strong></td>
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</tr>
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</tr>
<tr>
<td>Declined</td>
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Appendix G

Table 2

Pre-Intervention Data

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<tr>
<td>Gonorrhea</td>
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<tr>
<td>Chlamydia &amp; Gonorrhea</td>
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</tr>
<tr>
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</tr>
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<td>May 2020</td>
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<td>June 2020</td>
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</tr>
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<td>July 2020</td>
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<tr>
<td>August 2020</td>
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</tr>
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<td>September 2020</td>
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<tr>
<td><strong>Symptoms with Diagnosis</strong></td>
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<tr>
<td>Dysuria</td>
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<tr>
<td>Vaginal Discharge</td>
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</tr>
<tr>
<td>Rectal Pain/Bleeding</td>
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</tr>
<tr>
<td>Rectal Discharge</td>
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</tr>
<tr>
<td>Eye Irritation/Discharge</td>
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<td>Abdominal Cramping</td>
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<td><strong>Treatment of Diagnosis</strong></td>
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<tr>
<td>Yes – CT</td>
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<td>Both</td>
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<td>Syphilis</td>
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</table>

Note. a – multiple symptoms occurred for some patients, thus total is > n=22 and percentile was not calculated as it would not equate to 100%.

Note. b – multiple concurrent STIs occurred for some patients, thus total is > n=22 and percentile was not calculated as it would not equate to 100%.
## Appendix H

### Table 3

**Post-Intervention Data**

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</tr>
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<td>10/28/2020</td>
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<tr>
<td>11/11/2020</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>12/04/2020</td>
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<td>-</td>
</tr>
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<td>12/18/2020</td>
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<td>-</td>
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<td><strong>Date of 1st Phone Call</strong></td>
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</tr>
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<td>11/13/2020</td>
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<td>12/09/2020</td>
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<td>4.5</td>
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<td></td>
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<td>12/14/2020</td>
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<td>13.6</td>
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<td>31.9</td>
</tr>
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<td>Retested</td>
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<td>9.0</td>
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<tr>
<td><strong>Date of 3rd Phone Call</strong></td>
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<td></td>
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<td>11/23/2020</td>
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<td>40.9</td>
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<tr>
<td>12/21/2020</td>
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<td>13.6</td>
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<tr>
<td>Not Applicable b</td>
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<td>31.9</td>
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<td>13.6</td>
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<td><strong>Appointment Scheduled</strong></td>
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<td>13.6</td>
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<tr>
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<tr>
<td>Not Applicable c</td>
<td>19</td>
<td>86.4</td>
</tr>
</tbody>
</table>

Note. a – two sets of letters sent to each participant, which equates to 44 total letters mailed.

Note. b – participants retested prior to implementation phase or intervention successful to promote appointment adherence.

Note. c – incompliant with recommended 3 month retest intervention.
Figure 3. Retest Results.
Appendix J

Figure 4. Phone Call Reminder Results.
Appendix K

Table 4

*Retest Rate Analysis*

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Retested</th>
<th>Total</th>
<th>Retest Rate&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailing</td>
<td>1</td>
<td>44</td>
<td>2.3%</td>
</tr>
<tr>
<td>Phone Calls</td>
<td>2</td>
<td>39</td>
<td>5.1%</td>
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</tbody>
</table>

*Note.* <sup>a</sup>Retest Rate = Number of Retested / Total Number Mail Sent or Phone Called