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MESSIAH UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DOCTOR OF NURSING PRACTICE (DNP) PROGRAM

Family Nurse Practitioner Track

A DNP PROJECT

Implementing Standardized Chlamydia Screening in a College Health Center

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DATE: August 2020

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MESSIAH UNIVERSITY

SCHOOL OF GRADUATE STUDIES

Implementing Standardized Chlamydia Screening in a College Health Center

A Project Presented to the Faculty of the Department of Nursing

Messiah University

In partial fulfillment of the requirements

For the Degree of Doctor of Nursing Practice

Family Nurse Practitioner Track

By

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Implementing Standardized Chlamydia Screening in a College Health Center

Submitted in Partial Fulfillment of the Requirements

for the Degree of Doctor of Nursing Practice at Messiah University

By

Lacey Ehrenfeuchter

July, 2020

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Abstract

Background*: Chlamydia trachomatis* (CT) is the most common reportable sexually transmitted infection (STI) in the United States. Despite regulatory agencies' recommendations, routine CT screening is not being performed in many high-risk settings. ***Problem:*** The burden of undetected CT infections is substantial to patients and the healthcare system. There is a lack of consensus regarding an effective standardized CT screening strategy and screening rates remain suboptimal. ***Methods:*** A standardized CT screening, testing, and treatment process was implemented in Spring of 2020 and compared to screening rates pre-intervention in Spring 2019. ***Intervention:*** A 3-question sexual health screening questionnaire (SHSQ) was administered to all patients aged 18 - 24 years seeking care at the Millersville University Health Center (MUHS). ***Results:*** There were 1613 visits from Spring 2019 (n=675) and Spring 2020 (n=938) semesters. The final sample of 473 visits included those screened in Spring 2019 (n=65) and Spring 2020 (n=408). The screening rate increased from 9.6% in Spring 2019 to 43.5% in Spring 2020. There was a statistically significant difference in the pre- and post-groups who received a CT test (100% vs.18.4%, respectively, $p = .00$). Among the 140 students tested for CT, there was no statistically significant difference in detection of CT between the 2019 and the 2020 group and all students who tested positive were treated. ***Conclusion:*** This project resulted in an increase of 34 percentage points in CT screening at MUHS. The findings of this project reinforce regulatory agencies' concerns that CT screening rates remain suboptimal as only 34.3% of participants indicated they were tested for CT within the past year (n=140).

Keywords: *Chlamydia screening, chlamydia testing, STI screening, STD screening*, *college,* and *primary care*

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Title of Project

Implementing Standardized Chlamydia Screening in a College Health Center.

Background

Chlamydia trachomatis (CT) is the most common reportable sexually transmitted infection (STI) in the United States with the highest prevalence rates in adolescents and young adult women, causing significant morbidity when left undetected (Centers for Disease Control and Prevention [CDC], 2019). Despite recommendations from the CDC (2015), the U.S. Preventative Services Task Force (USPSTF, 2016), and the National Committee for Quality Assurance (NCQA, 2018) for routine annual CT screening of sexually active women younger than 25 years of age, many high-risk populations are still not being screened. Screening is important for CT detection, as approximately 75% of CT infections in women and 95% of infections in men are asymptomatic (NCQA, 2018).

Problem Statement

The burden of undetected CT infections is substantial to patients and the healthcare system in the United States. Untreated CT infection can result in pelvic inflammatory disease (PID), which is a major cause of infertility, ectopic pregnancy, and chronic pelvic pain (CDC, 2019). Additionally, the USPSTF (2016) estimated that the lifetime direct medical costs for CT were $516.7 million (in 2010 dollars).

Although many regulatory agencies have emphasized the importance of screening sexually active high-risk populations, there is a lack of consensus regarding an effective standardized screening strategy and screening rates remain suboptimal. The purpose of this project was to implement a standardized CT screening, testing, and treatment process for students at a college health center to increase the detection and treatment rate of CT infections on

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a college campus. The population, intervention, comparison, and outcome (PICO) question for the Doctor of Nursing Practice (DNP) project was: In students 18 - 24 years of age seeking clinical services in a college health center (P), does implementation of standardized CT screening (I), as compared to complaint-based CT screening (C), increase the detection and treatment of CT (O)?

Needs Assessment

Many individuals who are at risk are still not being tested for CT, reflecting the lack of awareness among some providers and the limited resources available to support these screenings (CDC, 2019). A fishbone diagram (see Appendix A) was used to investigate the possible causes of low CT screening rates. Common barriers to screening cited by patients include: (a) insurance (or lack thereof), (b) confidentiality, (c) cost, (d) embarrassment, (e) stigma, and (f) perceived lack of risk (Griner et al., 2019; Myers, McCaskill, & VanRavenstein, 2017; Reed et al., 2017; Schneider, FitzGerald, Byczkowski, & Reed, 2016). Providers cited screening barriers such as (a) lack of financial support or reimbursement, (b) comfort level discussing sexual health, (c) time constraints gathering specimens, (d) lack of knowledge regarding public health implications, and (e) lack of training (Myers et al., 2017).

Pre-implementation CT screening at Millersville University Health Services (MUHS) was complaint-based, meaning testing was only completed on symptomatic patients or at the patient's request. A strength, weaknesses, opportunities, and threats (SWOT) analysis (see Appendix B) was used to evaluate the internal and external attributes of the project environment at MUHS. Strengths included confidential CT testing and treatment for a relatively low cost. A primary obstacle was the increased time and effort required by nurses and healthcare providers, which could cause some resistance to implementation. Implementation of CT screening in this

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high-risk population provided the opportunity to increase CT detection and treatment rates, decrease morbidity rates, and thus improve the overall health on the Millersville University campus. External threats to implementation include other sites that offer free testing or accept insurance.

Aims, Objectives, Purpose Statement

This project aimed to determine if implementation of standardized CT screening among students aged 18 - 24 years in a college health center increased the testing, detection, and treatment of CT. The primary objective over the 4-month period was to screen at least 90% of students (aged 18 - 24 years) for CT who presented for a provider visit, using a sexual history screening questionnaire (SHSQ). All patients who screened positive (sexually active and have not been tested for CT in the past 12 months) on the SHSQ during the 4-month screening period were offered CT testing. Another objective was to achieve at least a 10% increase in the proportion of students (aged 18 - 24 years) tested for CT infection over a 4-month period. The purpose of this project was to implement a standardized CT screening, testing, and treatment process for students at a college health center to increase the detection and treatment rate of CT infections on a college campus.

Review of Literature

A literature review was conducted from August 2018 to January 2020 using the keywords: *chlamydia screening, chlamydia testing, STI screening, STD screening*, *college,* and *primary care*. The databases used were CINAHL and PubMed. Limits were set to only include articles written in the English language and date limits were set to the most recent 5 years. Twenty articles were found, and nine articles met inclusion criteria (see PRISMA diagram in Appendix C). Articles were critiqued using the Johns Hopkins Nursing Evidence-Based Practice

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Research Evidence Appraisal Instrument (see evidence matrix in Appendix D; Dang & Dearholt, 2018).

Researchers found statistically significant increases in CT screening in high-risk settings when standardized CT screening was implemented (DiVasta et al., 2016; Karas, Sondike, Fitzgibbon, Redding, & Brown, 2018; Myers et al., 2017; Owusu-Edusei, Hoover, & Gift, 2016; Wood et al., 2019). Additionally, Myers et al. (2017) found an increase in testing and a decrease in the CT infection rate after implementation of a routine CT screening protocol. Similarly, Karas et al. (2018) found 11% of the asymptomatic females for whom alerts were fired were positive for CT and Schneider et al. (2016) found 9.9% of participants were positive for CT. Griner et al. (2019) found that many participants described that the testing should be low cost to students. Furthermore, participants noted self-sampling methods to be straightforward, preferable to collect or drop off on campus without interaction with a provider, and affordable at $20-$30 (Griner et al., 2019).

Theoretical Model

The theory used to guide this project was Betty Neuman's systems model (Appendix E). Neuman's systems model focuses on the response of the patient system to environmental stressors and the use of primary, secondary, and tertiary nursing prevention (Utley, Henry, & Smith, 2018). Neuman's system model guided the project to promote health, using all three categories of prevention, with the goal of decreasing morbidity due to undetected CT infections.

Translation Model

The Johns Hopkins Nursing Evidence-Based Practice model (see Appendix F) was used to translate the evidence into practice (Dang & Dearholt, 2018). Evaluation of outcomes included gathering data pre- and post-intervention to determine CT screening, detection, and treatment

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rates. Adjustments were made throughout the project using the practice question, evidence, translation (PET) process for evidence-based practice, as this involved a continuous loop of learning and practice improvement (Dang & Dearholt, 2018). The results were shared with key stakeholders throughout the project.

Methodology

This quality improvement (QI) project aimed to increase the number of students at MUHS screened for CT through the implementation of a standardized CT screening, testing, and treatment process. The strategy used for CT screening at MUHS followed the age-based screening pathway for asymptomatic females, 24 years and younger (see Appendix G), provided by the Altarum Institute (2016). A 3-question SHSQ was implemented during the rooming process on all individuals who were aged 18 - 24 years. A convenience sample of patients who were administered the 3-question SHSQ in the Spring of 2020 was compared to those who were tested for CT in the Spring of 2019 when only complaint-based screening methods were used.

Participants

Due to the high prevalence in young adults, the CDC recommended screening not just young women, but all individuals aged < 25 years for STIs (Myers et al., 2017). Additionally, the CDC (2015) recommended screening sexually active young men who have sex with men (MSM) or men in clinical settings serving a population with a high prevalence of CT, such as college health centers. Therefore, participants included all students aged 18 - 24 years presenting for an office visit at MUHS. Exclusion criteria included students who were (a) 25 years of age or older, (b) less than 18 years of age, or (b) not sexually active.

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Setting

Millersville University (2019) is a rural public university located in Lancaster, Pennsylvania, with an estimated 7,000 undergraduate students. Free health services are provided to all students who attend the university and are funded in part by student fees paid each semester. MUHS offers confidential CT/gonorrhea (GC) testing and treatment for $15, which the patient can choose to self-pay or have billed as a generic MUHS charge on their student account. MUHS includes (a) six exam rooms; (b) four offices for providers, nursing staff, and the office manager; (c) a laboratory for processing specimens; and (d) a dispensary for medications. The full-time nurse practitioner is the main provider and, occasionally, there is additional provider coverage by a physician. During the school year, additional staff consist of three registered nurses (RNs), an administrative assistant, and the nurse manager.

Tools

Given the lack of a standardized CT screening tool in existence, a 3-question SHSQ (see Appendix H) was developed following CT screening guidelines from the CDC (2015), USPSTF (2016), and NCQA (2018). The SHSQ was administered to all patients aged 18 - 24 years seeking care at MUHS due to the high-risk population and setting. The SHSQ provided a standardized tool for the implementation of the CDC (2015) recommendation for annual CT screening for all sexually active women aged < 25 years and men in high-prevalence settings. Similarly, the USPSTF (2016) recommended annual CT screening in sexually active MSM or males in high prevalence rates. Additionally, the SHSQ is consistent with the Healthcare Effectiveness Data and Information Set (HEDIS) measure analyzing “the percentage of women 16-24 years of age who were identified as sexually active and who had at least one test for CT during the measurement year” (NCQA, 2018, para. 1).

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Intervention

An electronic medical record (EMR)-based prompt alerted the RN to administer the SHSQ upon rooming the patient. If the patient met inclusion criteria and had a positive SHSQ (sexually active, no CT test within the past year, and/or symptomatic), the nurse offered CT/GC testing to the patient and provided the patient with an STI handout that the patient reviewed while waiting for the provider (see Appendix I). The provider (a) reviewed the patient's sexual history; (b) discussed any areas of concern, testing, and treatment options; and (c) provided information on sexual health. A process map of the intervention is included in Appendix J.

Comparison (Pre-Intervention)

Complaint-based screening was the only screening method being used prior to the project intervention. Therefore, only students who requested CT testing or who presented with symptoms that could be attributed to a STI were offered or tested for CT in Spring 2019. It is known that most cases of CT are asymptomatic and symptoms, when present, are vague (Altarum Institute, 2016). Therefore, without assessing for symptoms or risk factors, especially in high risk populations, such as a college health center, many CT infections may go undetected and continue to spread among the population.

Data Collection

The project was implemented during the Spring 2020 semester (1/21/2020 – 3/12/2020). Demographic data (gender, ethnicity, and age) were collected in the EMR to evaluated for differences. Outcomes were measured by gathering data from the EMR, including the number of students screened, tested, and treated for CT. Data collected during the implementation period was compared to pre-intervention data from the Spring 2019 semester (1/21/2019 – 3/12/2019) to evaluate the relationship of the intervention to CT screening, testing, and treatment rates.

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Cost Analysis

There were a few direct costs considered in the implementation of this project (see Appendix K). The highest direct cost was a $175 fee to call Point and Click, the company that manages the EMR system, to add the SHSQ prompt into the EMR. The use of MUHS printer and ink, which were already in place, to make handouts was estimated at $20 for MUHS over the duration of the project. Otherwise, this DNP project was created to be without financial cost utilizing available MUHS resources. The total cost of this project to MUHS was $195.

Timeline

The timeline for the actualization of this project is illustrated through a Gantt chart attached in Appendix L. Proposal approval was obtained in May 2019. A meeting was held with the staff at MUHS in October 2019 and an in-service was held just before implementation in January 2020. Data collection and review occurred throughout the implementation in January 2020 to March 2020. Although the intention was to implement the project for the entire Spring 2020 semester, due to the coronavirus pandemic data collection was cut short when students were sent home at spring break for the remainder of the semester. Therefore, data was collected from January 21, 2020 to March 12, 2020. Data analysis and interpretation of outcomes occurred post-intervention from May 2020 to July 2020. The final report of the findings was completed in August 2020.

Ethics and Human Subject Protection

Messiah University and Millersville University Institutional Review Board (IRB) approval was obtained before initiating the DNP Project (see Appendix M). All participants were protected by the Health Insurance Portability and Accountability Act of 1996 (HIPAA), which protects the privacy and security of the individuals' health information (Modifications to the

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HIPAA Privacy, Security, Enforcement, and Breach Notification Rules, 2013). Informed consent was obtained through implicit consent for medical treatment. The Millersville University and Messiah University IRBs waived written informed consent. It is important to note that participants could decline to answer any questions, therefore withdrawing or discontinuing their participation in the project at any point in time.

There were no risks in participating in this research beyond those experienced in everyday life. The identity of the participants was protected using a password-protected EMR system to obtain and store answers to the SHSQ. Similarly, deidentified data were stored in a password-protected computer and file, accessed only by the researchers involved in the project. This project used aggregate data; therefore, personal identifiers were not linked to the data used in the project.

Results: Data Analysis and Evaluation

Data were maintained and analyzed with IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp, 2019). To evaluate differences between the 2020 intervention group and the 2019 comparison group for demographics (gender and ethnicity), a Pearson's chi-square test or Fisher's exact test was used as appropriate; differences in age between the two groups were evaluated using an independent samples *t*-test. The outcome variables (tested, result, and treatment) were examined to assess assumptions for nonparametric testing. Statistical significance was established as $p < .05$.

Sample Characteristics

There were 1613 visits from Spring 2019 (n=675) and Spring 2020 (n=938) semesters. Of these, 473 patient visits (408 in 2020 intervention group, 65 in 2019 comparison group), met inclusion criteria and were included in the final sample (see appendix N). The final sample had a

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mean age of 20.29 years of age (SD 1.53), the majority of subjects were female (73.6%, n = 348), and were White (68.1%, n = 322). There were no statistically significant differences in the original potential sample or the final sample for age [t (1611) = -.82, p = .41], gender [$x^2(1)$ = 2.46, p = .12], or ethnicity [$x^2(3)$ = 3.79, p = .28].

Additionally, there were no statistically significant differences between the intervention group and the comparison group for age [t (471) = 1.52, p = .84]. However, there were statistically significant differences in the intervention group and the comparison group for gender [$x^2(1)$ = 7.14, p = .008] and ethnicity [$x^2(3)$ = 17.09, p = .001]. While it is important to recognize that these are potential confounders, considering the lack of true CT screening in the 2019 comparison group and the amount of missing data, a correction calculation was not felt to be necessary, nor would it have affected the findings.

Findings

Implementation of a standardized CT screening protocol at MUHS resulted in an increase in screening rates of individuals age 18-24 years of age. The screening rate increased from 65/675 (9.6%) in Spring 2019 to 408/938 (43.5%) in Spring 2020. Thus, a 34 percentage point increase in CT screening from the pre-to post-intervention group was noted.

Of the 408 participants in the 2020 (3-question SHSQ) group, 92.6% (n = 378) stated they were sexually active (see Appendix O). However, only 34.3% stated they were tested for CT within the past year (n = 140). As such, 58.4% (n = 237) had a positive screen, meaning they were sexually active but did not have a CT test in the past year and/or they had symptoms. All patients who had a positive screen were offered CT testing, therefore meeting one of the primary objectives of this QI project.

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There was a statistically significant difference in the proportion of students who received a CT test between groups (see Appendix P), with 100% (n = 65) of the students in the 2019 (complaint-based screening) group being tested compared to 18.4% (n = 75) of students in the 2020 (3-question SHSQ) group [x^2 (1) = 179.23, p = .00]. Note that only the students tested in 2019 were included in the complaint-based screening group, however, all students given the 3-question SHSQ were included in the intervention group. Additionally, it is important to note, that significantly more students in the 2019 sample compared to 2020 sample reported symptoms (55.4% vs. 33.3%, $x^2(1) = 6.88$, p = .009). This is a potential confounder for detection, results, and treatment.

Among the 140 students who were tested for CT, there was no statistically significant difference in detection of CT between the 2019 (complaint-based screening) group vs the 2020 (3-question SHSQ) group [24.6% vs. 16%, $x^2(1) = 1.61$, p = .200]. As such, the objective to achieve at least a 10% increase in the proportion of students tested for CT during the implementation period was not met. Of the 140 CT tests done, 30.7% (n = 43) were positive and all of these students were treated. An additional 13.4% (n = 15) of students who tested negative were also treated, but these were treated presumptively based on symptoms.

Discussion

Strengths

This QI project provides a guideline for implementing an evidence-based standardized CT screening protocol in a college health center. The complaint-based screening method that was being used previously at MUHS occurred only when students complained of symptoms. Students were not specifically asked if they were having any symptoms or evaluated for risk factors. By not asking about symptoms or risk factors, it is likely that many CT infections were going

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undetected. Through implementation of a standardized CT screening protocol, a 34 percentage point increase in screening was noted.

Among students who were screened in 2020 with the 3 question SHSQ (n = 75), 33.3% (n = 25) reported symptoms of chlamydia, and of these approximately half scored positive on the screening questions (48%, n = 12). Among students who did not report symptoms (n = 50), the majority had a positive screen (70%, n = 35). Although there was no statistically significant difference ($x^2(1) = 3.45$, $p = .06$), a greater proportion of students who did not report symptoms screened positive (74.5%, n = 35) compared to those who screened negative (53.6%, n = 15), indicating that the 3-question SHSQ in addition to symptom screening may identify greater risk for CT infection.

Limitations

There are several limitations of this project. This QI project was conducted in a rural college health center. Participants were aged 18-24 years and in a high-risk setting. As such, generalizing to other settings and populations is limited.

Additionally, during the data collection period, a worldwide pandemic of the COVID-19 virus occurred. Social distancing measures were implemented in the beginning of March. As such, Millersville University conducted the remainder of the Spring 2020 semester after spring break online, thus significantly reducing the number of students who utilized MUHS. A major implication of the pandemic on this DNP project was the abbreviated data collection timeframe. Thus, shortening the implementation period from the intended 4 months to less than 2 months.

It is also important to note two major confounders in this QI project. The first of which is that significantly more students in 2019 compared to 2020 reported symptoms (55.4% vs. 33.3%, $x^2(1) = 6.88$, $p = .009$). This is a potential confounder for detection, results, and treatment.

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Second, there was a significant about of missing data in the 2020 group (56.5%), meaning the students were not asked all or part of the 3-question SHSQ. As such, the primary objective to screen at least 90% of students for CT who presented for a provider visit, using the SHSQ, was not met.

Recommendations

Given the limitations of this QI project related to a large amount of missing data for screening questions in the 2020 group, significantly greater positive symptoms in the 2019 groups, and the potential for other confounders, a change in practice is not recommended based on this data. Considering a future QI project, a priori power analysis for sample size was conducted with G*Power with an effect size of 0.6, alpha = .05, and power of .80 indicating a total sample size of 22 students would be required. However, with the project limitations, a smaller effect size of 0.2 for the calculation is recommended, which results in a sample size of 197. The recommendation would be to round up to 200 for future project sample size and perform an interim analysis at 100 participants to determine if any issues are noted.

Additionally, a future QI project with better control for confounders by asking all students if they have symptoms of CT would provide greater insight into identifying those at risk and increase testing to improve detection and treatment. Given the significant amount of missing data, relying on the nurses to collect the data at each visit proved to be ineffective. One recommendation would be to have the students complete the questionnaire on the secure computer system prior to their visit, perhaps upon checking in for their appointment. The questionnaire could list specific symptoms and risk factors for STIs that the student could review in the time waiting to be evaluated. The nurses could then review the questionnaire responses and clarify any missing data. This type of system could also flag the provider of any risk factors.

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This would allow for a more complete screening process and would be cognizant of the nurses and provider's time.

Conclusion

The burden of undetected CT infections is substantial to patients and the healthcare system in the United States. Many regulatory agencies have emphasized the importance of screening sexually active high-risk populations, yet screening rates remain suboptimal (CDC, 2019; NCQA, 2018; USPTF, 2016). The findings of this project reinforce regulatory agencies' concerns that CT screening rates remain poor as only 34.3% of participants indicated they were tested for CT within the past year (n=140).

Researchers found that standardized CT screening in high-risk settings increased screening rates, detection, and treatment (DiVasta et al., 2016; Karas et al., 2018; Myers et al., 2017; Owusu-Edusei et al., 2016; Wood et al., 2019). MUHS provided access to a high-risk population, where standardized CT screening was implemented with little to no additional burden or cost, with the goal of increasing the detection and treatment of CT infection, thus decreasing the morbidity rates in the campus community and preventing future sequela due to the untreated CT infection. By implementing a standardized CT screening process, a 34 percentage point increase in CT screening rate was noted.

This QI project adds to the body of literature regarding sexual health habits of high-risk populations and provides a starting point for implementing standardized CT screening processes. Improvements could include electronic integration of standardized screening questions prior to the office visit, detailing symptoms and risk factors for CT and other STIs. Further research is needed to explore sexual health habits and risk factors in high-risk settings, such as college

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health centers, and the effects of standardized CT screening process on detection and treatment rates.

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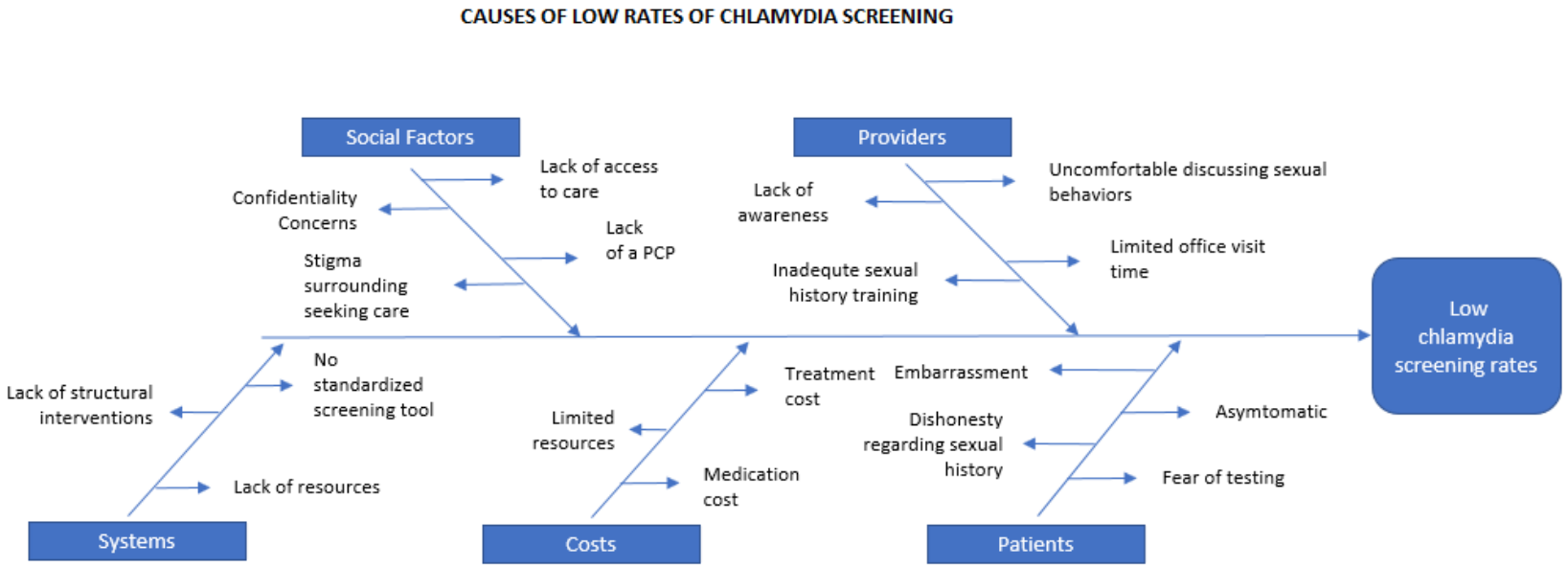
Appendix A

Fishbone Analysis



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Appendix B

SWOT Analysis

	Helpful to achieving the objective	**Harmful** to achieving the objective
Internal origin (attributes of the system)	*Strengths* • Convenient access to care • Free office visits & low-cost testing • Confidential testing as insurance is not used • Efficient system in place for chlamydia testing • EHR can be tailored to incorporate screening questions • Positive staff collaboration and rapport • Knowledgeable and experienced nursing staff	*Weaknesses* • Provider resistance • Additional workload for nursing staff • Low motivation for provider compliance • Limited staff • May increase visit time • Limited hours of operation (no nights or weekends) • Cost (self-pay) • Funding limitations • Inexperienced in grant application
External origin (attributes of the environment)	*Opportunities* • Access to high risk population • Improve health outcomes • Decrease morbidity • Offer self-collected specimens • Eligible for federal Title X grants • Chlamydia screening recommendations by the USPTF, NCQA, & CDC	*Threats* • Can use insurance to cover costs at other facilities • Free testing at Title X Family Planning Clinics • EMR is not connected to other health systems

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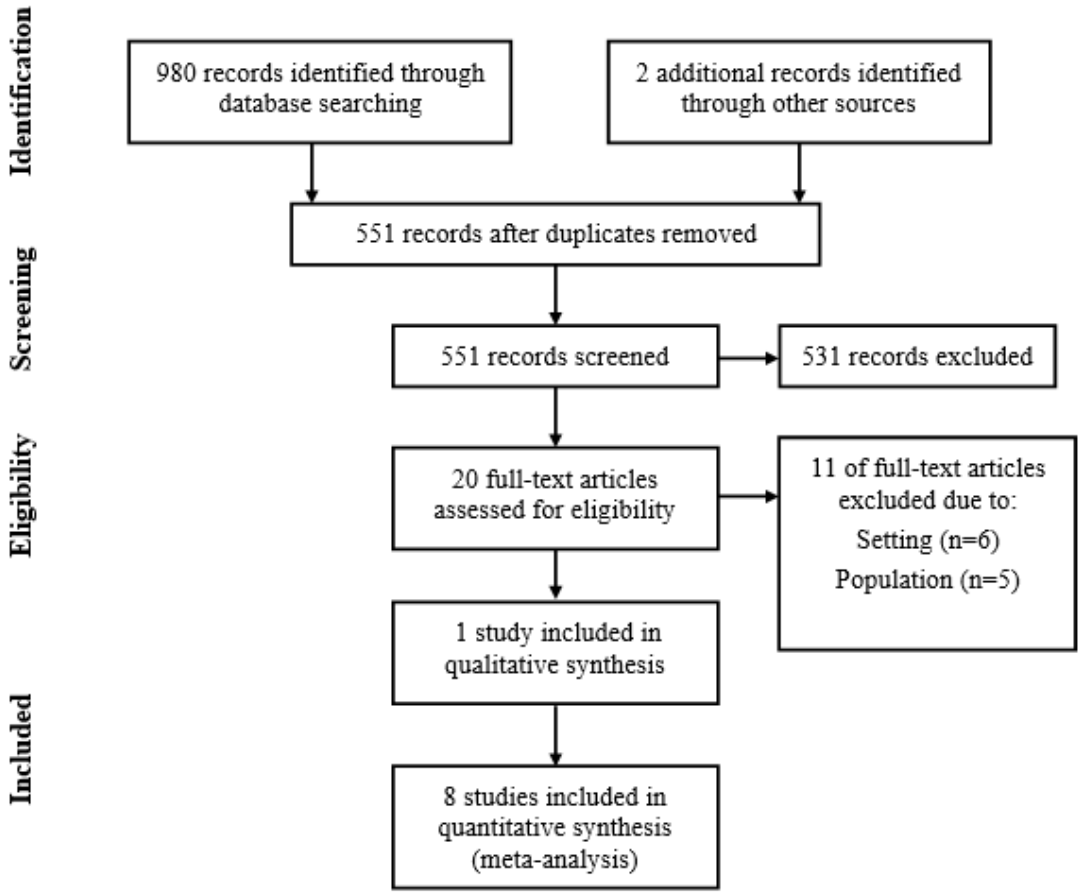
Appendix C

PRISMA Diagram



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Appendix D

Evidence Matrix

Article #	Author, Publication Source, & Date of Publication	Evidence Type and Purpose	Sample Type, Size, Setting	Study Findings	Limitations	Evidence Level	Quality Rating
1	DiVasta, Pediatrics, 2016.	Quality Improvement Intervention Purpose: To increase Chlamydia screening in at-risk young women using a practice-based quality improvement collaborative.	A convenience sample of 85 Boston Children's Hospital affiliated pediatric primary care practices.	Results: LC participants demonstrated statistically significant increases in recommended Chlamydia screening (LC1:52.8% preintervention to 66.7% postintervention; LC2: 57.8% preintervention to 69.3% postintervention). Additionally, increased documentation of sexual activity status in the record (LC1: 61.2% preintervention to 91.2% postintervention; LC2: 43.3% preintervention to 61.2% postintervention).	(see Limitations): (pg. e7 & e10) -Transferability: Population consisted of self-selected pediatric primary care offices and participants had a high level of screening at baseline, therefore unable to transfer findings to other settings or populations.	V	A
2	Griner, Sexually Transmitted Disease, 2019	Nonexperimental, Basic Qualitative Descriptive Design Purpose: The purpose of this study was to explore intervention characteristics influencing the decision to adopt self-sampling methods (SSMs) among college women.	Purposive sampling, (n=12 women screened for chlamydia or gonorrhea in the past 12 months & n=12 women nonscreened for chlamydia or gonorrhea in the past 12 months), on a large, public university in the southeast via campus e-	The mean age was 19.5 years, and those who were screened was significantly older than those who were not screened. Participants felt the SSM kit would be easy to use and straightforward. Participants identified their preference for picking up and dropping off the kit somewhere on campus rather than using the mail system.	(See Limitations) (pg.766) - Transferability: The participants were recruited from a convenience sample of sexually active college women willing to participate who may have been generally more comfortable discussing STI screening than other young adults	III	B

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			mail, listservs, flyers, and contacting student organizations.	Participants were concerned about parent's perceptions and the desire to keep their sexual behaviors from their parents. The main benefit of SSM identified by participants was not interacting with a health care provider. Participants emphasized that the product should be low cost to students.			
3	Karas, Clinical Pediatrics, 2018.	Quantitative, Nonexperimental Purpose: The primary objective of this study was to identify the impact of a CDS tool on the screening rates for CT among female patients ages 13 to 21 years presenting for preventive care.	A convenience sample of Akron Children's Hospital Pediatrics network of 27 pediatric primary care offices in urban, suburban, and rural areas across Northeast Ohio.	The odds of an adolescent female being screened were 2.143 times higher after the intervention. -11% of the asymptomatic females for whom alerts fired were positive for either GC or CT.	(See Limitations): (pg. 1641) -Reliability The researchers did not discuss the psychometrics of the CDS tools, therefore unable to assess reliability.	III	B
4	Myers, Journal of Community Health, 2017.	Quality Improvement Intervention Purpose: To determine if implementing routine screening for gonorrhea and chlamydia among young adults 25 years of age and younger on a private residential university	A consecutive sample of college students (n=364), who were seen in the health center and were sexually active on a private residential university campus in the southeastern US.	Results: The screening percentage increased from 2 to 65.85%. The testing percentage increased during the post-intervention phase to 17.86%. The chlamydia infection rate decreased from 9.38% pre-intervention to 6.15% post-intervention.	(see Limitations): (p. 1253) - Transferability: Due to the nature of the study, using a sample of students from one university, there is limited generalizability to a larger population. -Auditability: The pre- and post-intervention phases were held at different timeframes	V	B

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		campus in the southeast would increase testing, diagnosis, and treatment rates of gonorrhea and chlamydia.			throughout the academic year.		
5	Oswalt, Journal of American College Health, 2017.	Secondary data analysis of the American College Health Association Annual Pap and STI Survey years 2010-2014. Purpose: To examine college student health centers practices related to sexually transmitted disease screening and treatment over a 5-year period.	A convenience sample of college student health centers (n=150-180) that completed the ACHA Pap and STI survey between 2010 and 2014.	Results: About 90%of the SHCs routinely screened sexually active women under 26 for CT infection. There was a significant increase in the number of SHCs that included pharyngeal and rectal screenings for MSM. The use of cervical swabs dropped from over half to less than one-third during the 5 years. For males, a 7% decrease in the use of urethral swabs and 8% increase in the use of urine testing was noted.	(See Limitations): (pp. 545-546) -Selection bias: Self-reported data and self-selected respondents. -Attrition bias: The data was deidentified which did not allow for tracking changes in the same schools across all 5 years.	III	B
6	Owusu-Edusei Jr., American Journal of Preventive Medicine, 2016	Financial Evaluation Purpose: To determine the cost and effectiveness of the proposed Opt-Out Testing strategy when compared with the existing Risk-Based Screening approach for young women aged 15-24 years from a societal perspective.	Convenience sample of all young women aged 15-24 years unless their record is flagged at check-in as having had a negative test within the past 12 months, or they decline to be tested.	Results: Total chlamydia prevalence without any screening was 5.2%, reducing to 2.7% when the Risk-Based Screening strategy was introduced. When the Risk-Based Strategy was replaced with the Opt-Out Testing Strategy, the total prevalence decreased further from 2.7% to 1.2%.	(See Limitations): (pg. 221) -Auditability: The transmission model is an oversimplification of real-world events. -Transferability: The model was driven by female parameters and there was a lack of data on same-sex sexual behavior and transmission. -Transferability: Considering this was a	V	B

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					computer-generated model, it is unclear if this could be translated to other settings in real life.		
7	Reed, Annals of Emergency Medicine, 2017.	Nonexperimental, Basic Qualitative Descriptive Design Purpose: To explore adolescent and parent or guardian attitudes about benefits and barriers of offering gonorrhea and chlamydia screening to all adolescents in the pediatric ED, as well as the modality of testing; specifically, the acceptability of using a tablet to collect confidential information about risk factors and agreement to screening	Purposive sampling, (n=40 adolescents & n=40 parents), 2 pediatric EDs, one was an urban, tertiary care ED and the second was a satellite pediatric ED, located in a northern suburb.	Almost all adolescents and parents or guardians supported offering ED gonorrhea and chlamydia screening to all teens in the pediatric ED. Both adolescents and parents or guardians cited that the benefits of gonorrhea and chlamydia screening included earlier diagnosis and treatment, convenience of testing in the pediatric ED, and prevention of transmission of infection. Both adolescents and parents or guardians identified the ability to maintain confidentiality and patient cost of gonorrhea and chlamydia screening as barriers.	(See Limitations): (pg791) -Credibility: Adolescent patients often present to the ED without their parent, making it difficult to obtain parental permission for all adolescents approached for enrollment. This requirement may have biased the sample because adolescents who do not require parental permission may be more willing to participate than those of whom parental permission is required. - Transferability This study is limited in that participants included only adolescents and parents or guardians who visited an urban or suburban pediatric ED, and it was unclear whether these patients resided in the surrounding urban community or were from other settings, including rural areas.	III	B

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8	Schneider, Sexually Transmitted Diseases, 2016	Cross-sectional Non-experimental Design Purpose: To determine the proportions of Gonorrhea and Chlamydia infections in asymptomatic adolescents in an academic urban PED and determine patient-related predictors of screening refusals.	A convenience sample (n=719) of adolescents, 14-21 years of age, who presented to the PED of a children's hospital with a non-STI-related chief complaint.	Results: 68% of those approached participated in the study. Those who agreed to STI screening were more likely to be nonwhite (61.4% vs 38.6%) and publicly insured (63.3%) versus privately insured (29.3%) or no insurance (7.58%). 56% of participants provided urine samples and of those, 9.9% were positive for an STI. Controlling for other demographics, race was a significant predictor, which the odds of testing positive for nonwhite participants 5.90 times that of white participants.	(See Limitations) (pg. 213) -Selection bias: This was a convenience sample consisting largely of adolescent patients, who would require parental permission to enroll in the study. This requirement may bias the sample as adolescents who do not require parental permission may be more forthcoming with information and be more willing to participate. -Internal validity The questionnaire was not validated and survey data were obtained through patient report which may limit the interpretation of the results, as parents presence during completion of survey may have affected responses. Additionally, survey data were not linked to the STI testing results, which limited the ability to analyze screening barriers in connection with results.	III	A

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					-External validity Due to the nature of the study, using a sample of students from one PED in an urban environment, there is limited generalizability to a larger population.		
9	Wood, Journal of Pediatric Adolescent Gynecology, 2019.	Quality Improvement Intervention, Observational cohort analysis Purpose: To increase chlamydia screening rates for young women receiving well-adolescent care in a high chlamydia prevalence region. Secondary goals included identifying the effect of the intervention on chlamydia test positivity rates and identifying the effect of the intervention on visit length.	A consecutive sample (n=1550) of 15-19-year-old female adolescents attending annual primary care visits during the study period of January 2016 to April 2018.	Results: This practice-based QI intervention to improve chlamydia screening in adolescent young women resulted in a statistically significant 21% relative increase in routine chlamydia screening in a high chlamydia prevalence clinic. Additionally, there was no statistically significant difference in registration time or visit length before and after intervention.	(see Limitations): (p. 37) -Transferability: The intervention site was a combined primary care and FP clinic with Title X funding, which allowed for confidential service delivery. Clinical sites without integrated sexual health services might face more extensive challenges to confidentiality management. -Auditability: The data did not allow the researchers to determine whether individual patients were sexually active and instead used an ecologic approach using background rates of sexual activity in the local population.	V	A

* From: Dang, D., & Dearholt, S. L. (2018). *Johns Hopkins evidence-based practice: Model and guidelines* (3rd ed.). Indianapolis, IN: Sigma Theta Tau.

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Appendix E

The Neuman Systems Model

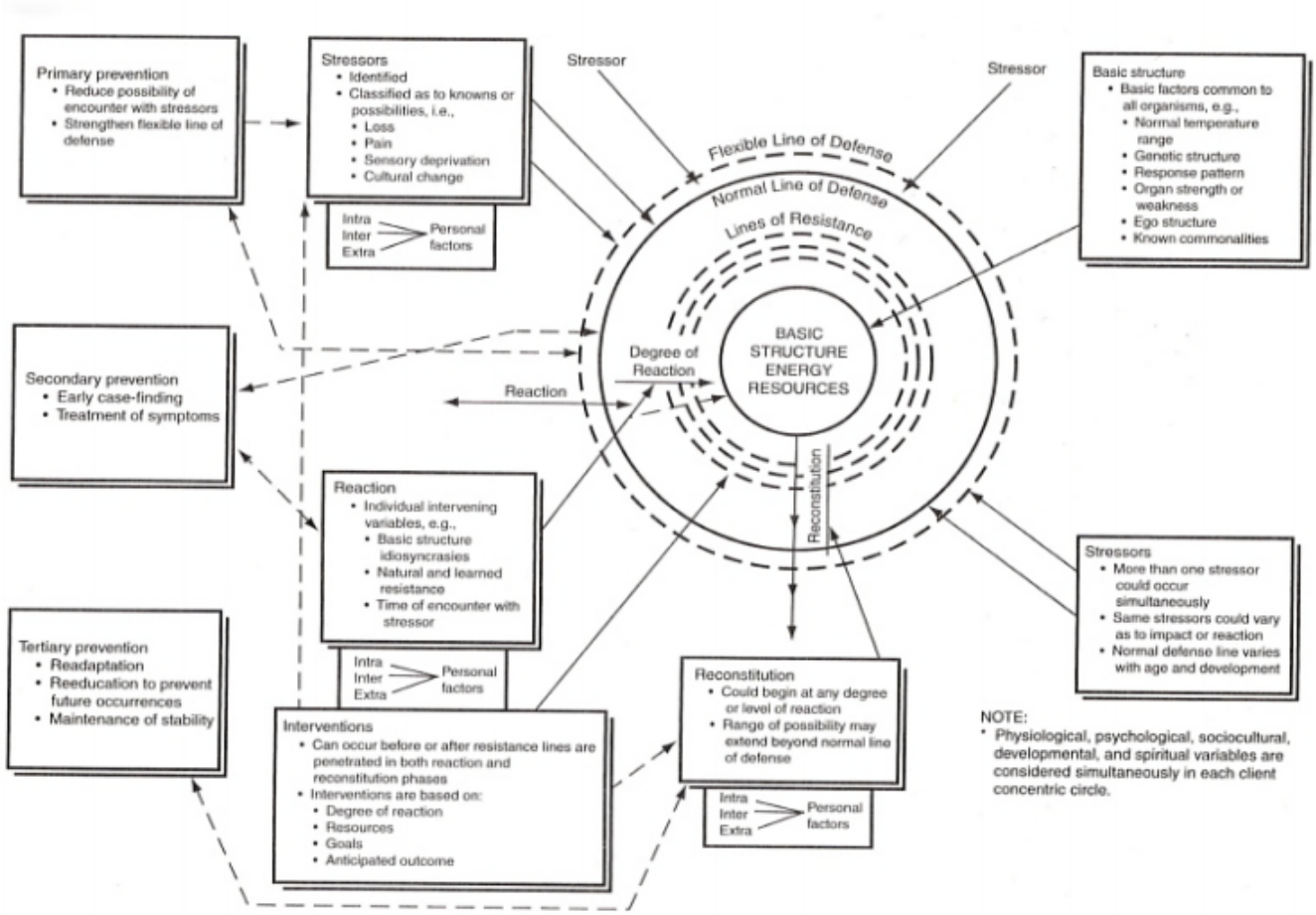

FIGURE 1-3. The Neuman Systems Model. *(Original diagram copyright © 1970 by Betty Neuman.)*

Note. Adapted from *The Neuman Systems Model of Nursing [Overview of the Neuman Systems Model]*, by B. Neuman, 2005, https://www.neumansystemsmodel.org/neuman-fawcett-2011

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Appendix F

John Hopkins Nursing Evidence-Based Practice Model

PRACTICE QUESTION

Step 1: Recruit interprofessional team.
Step 2: Define the problem.
Step 3: Develop and refine the EBP question.
Step 4: Identify stakeholders.
Step 5: Determine responsibility for project leadership.
Step 6: Schedule team meetings.

EVIDENCE

Step 7: Conduct internal and external search for evidence.
Step 8: Appraise the level and quality of each piece of evidence.
Step 9: Summarize the individual evidence.
Step 10: Synthesize overall strength and quality of evidence.
Step 11: Develop recommendations for change based on evidence synthesis.

- Strong, compelling evidence, consistent results.
- Good evidence, consistent results.
- Good evidence, conflicting results.
- Insufficient or absent evidence.

TRANSLATION

Step 12: Determine fit, feasibility, and appropriateness of recommendation(s) for translation path.
Step 13: Create action plan.
Step 14: Secure support and resources to implement action plan.
Step 15: Implement action plan.
Step 16: Evaluate outcomes.
Step 17: Report outcomes to stakeholders.
Step 18: Identify next steps.
Step 19: Disseminate findings.

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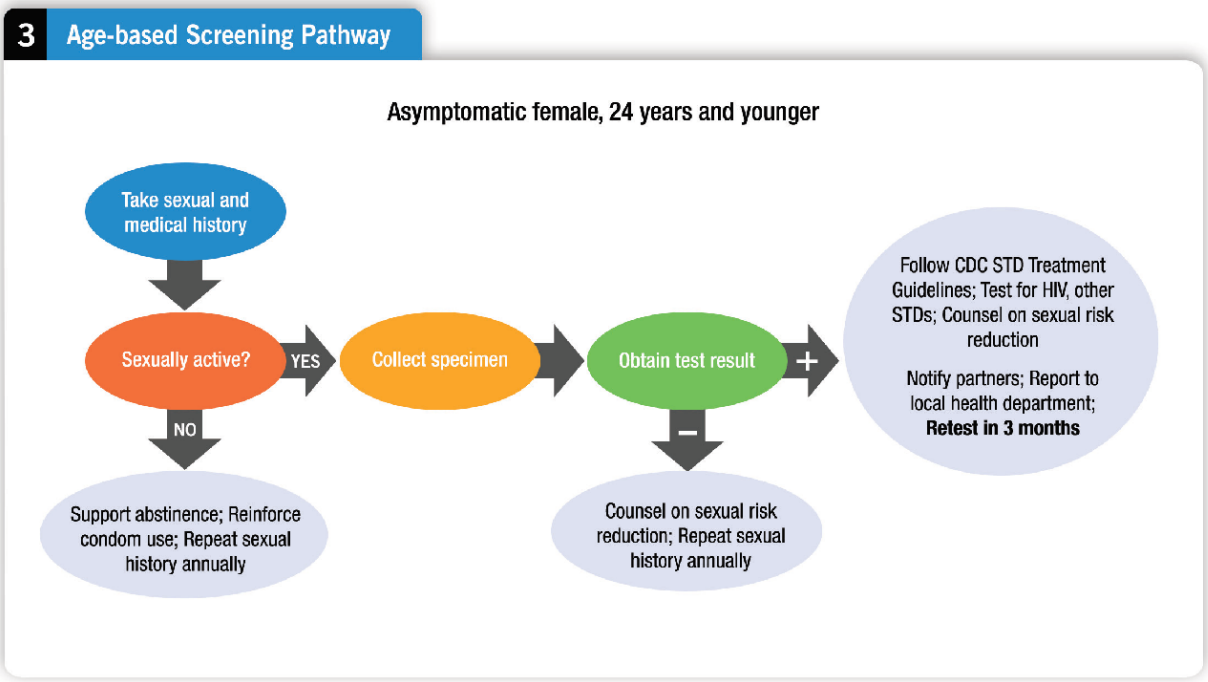
Appendix G

Age-Based Screening Pathway



Note. Age-based screening pathway for asymptomatic females, 24 years and younger. Adapted from *Why Screen for Chlamydia? A How-to Implementation Guide for Healthcare Providers* (3rd ed.), by the Altarum Institute, 2016, http://chlamydiacoalition.org/for-healthcare-providers/why-screen-for-chlamydia/. Copyright 2006 by the Altarum Institute.

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Appendix H

Sexual History Screening Questionnaire

1) Are you currently or have you ever been sexually active?
2) Have you been tested for chlamydia in the past 12 months?
3) Have you been tested for any STIs in the past 12 months?

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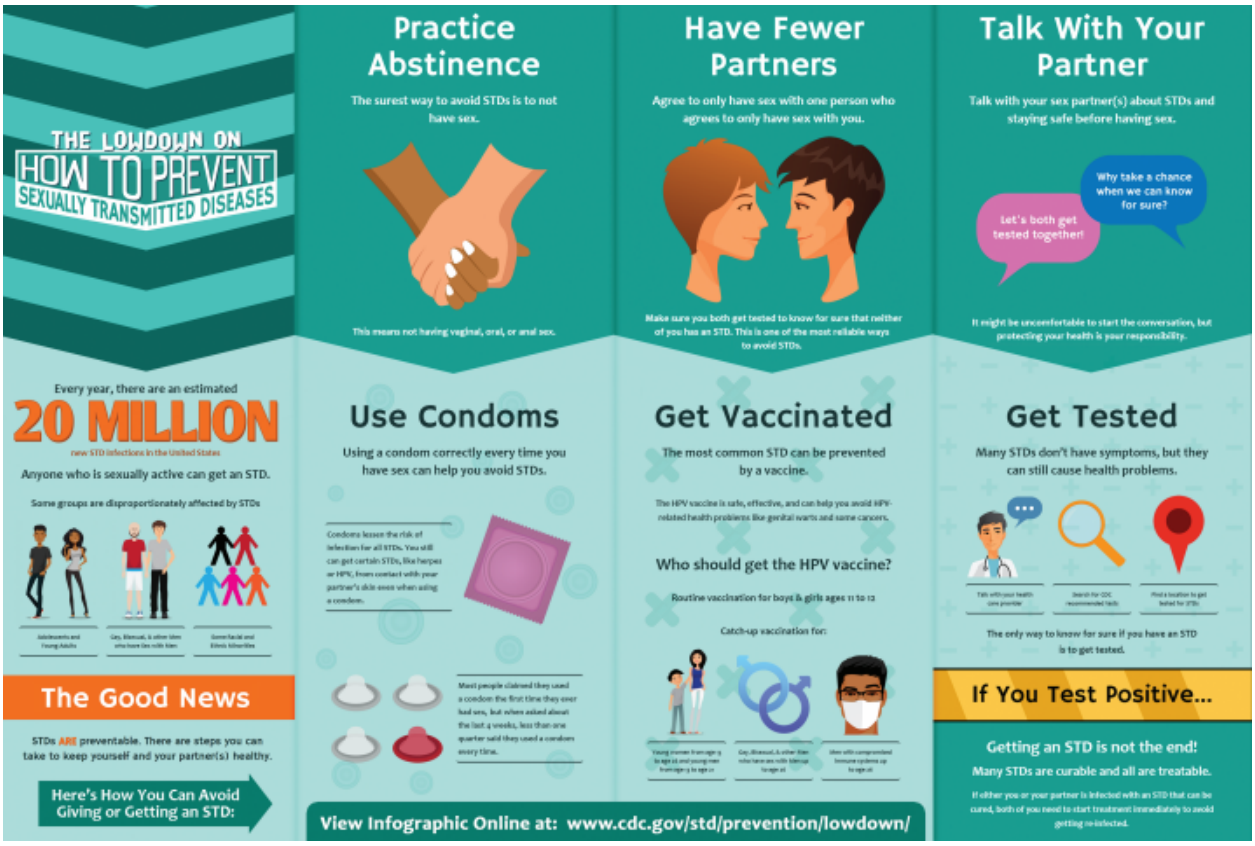
Appendix I

STI Handout



(front)

Figure I1. The lowdown on how to prevent STDs. Adapted from *STD prevention infographics,* by Centers for Disease Control and Prevention, 2020, https://www.cdc.gov/std/products/infographics.htm

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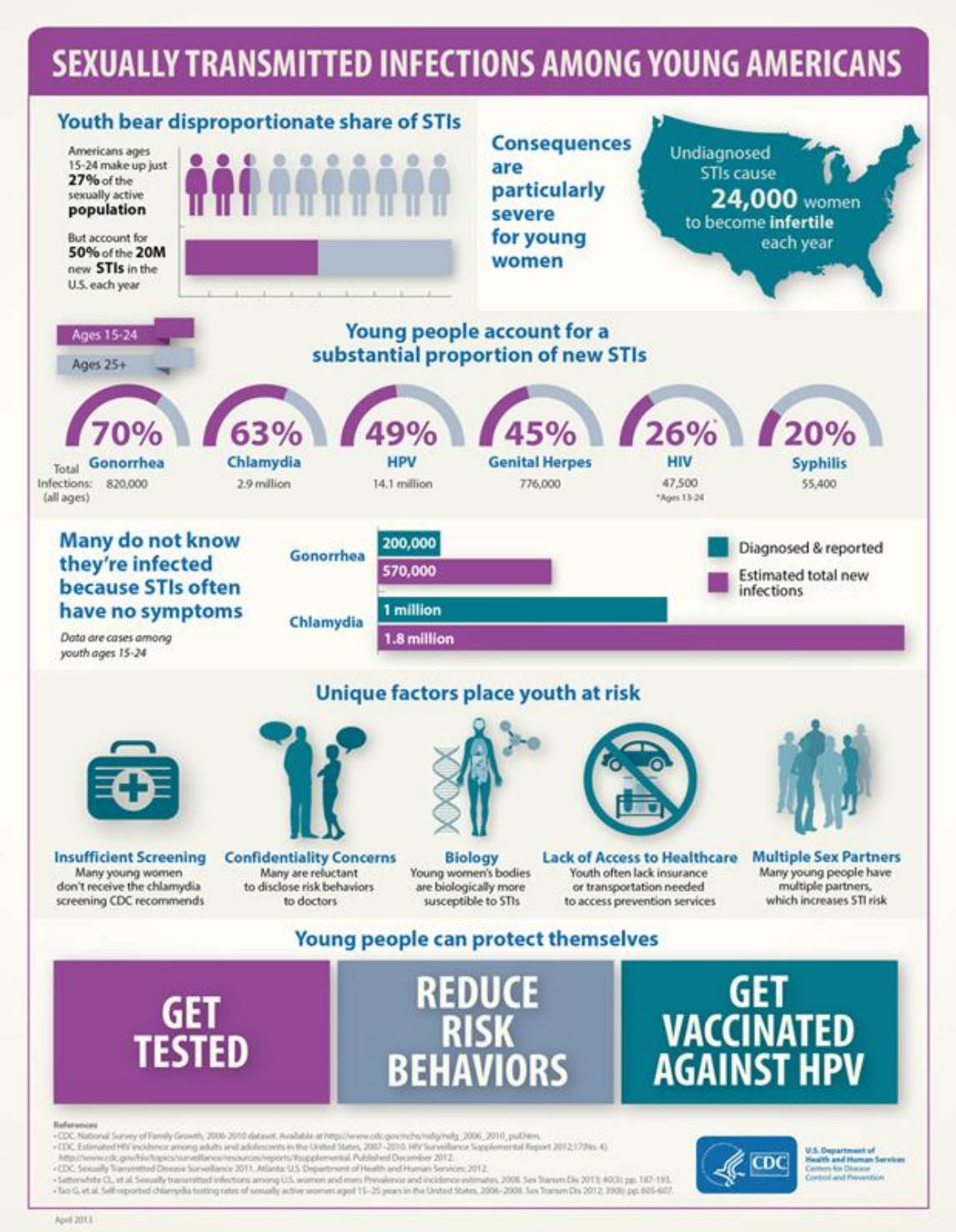

(back)

Figure I2. STIs among young Americans. Adapted from *STD prevention infographics,* Centers for Disease Control and Prevention, 2020, https://www.cdc.gov/std/products/infographics.htm

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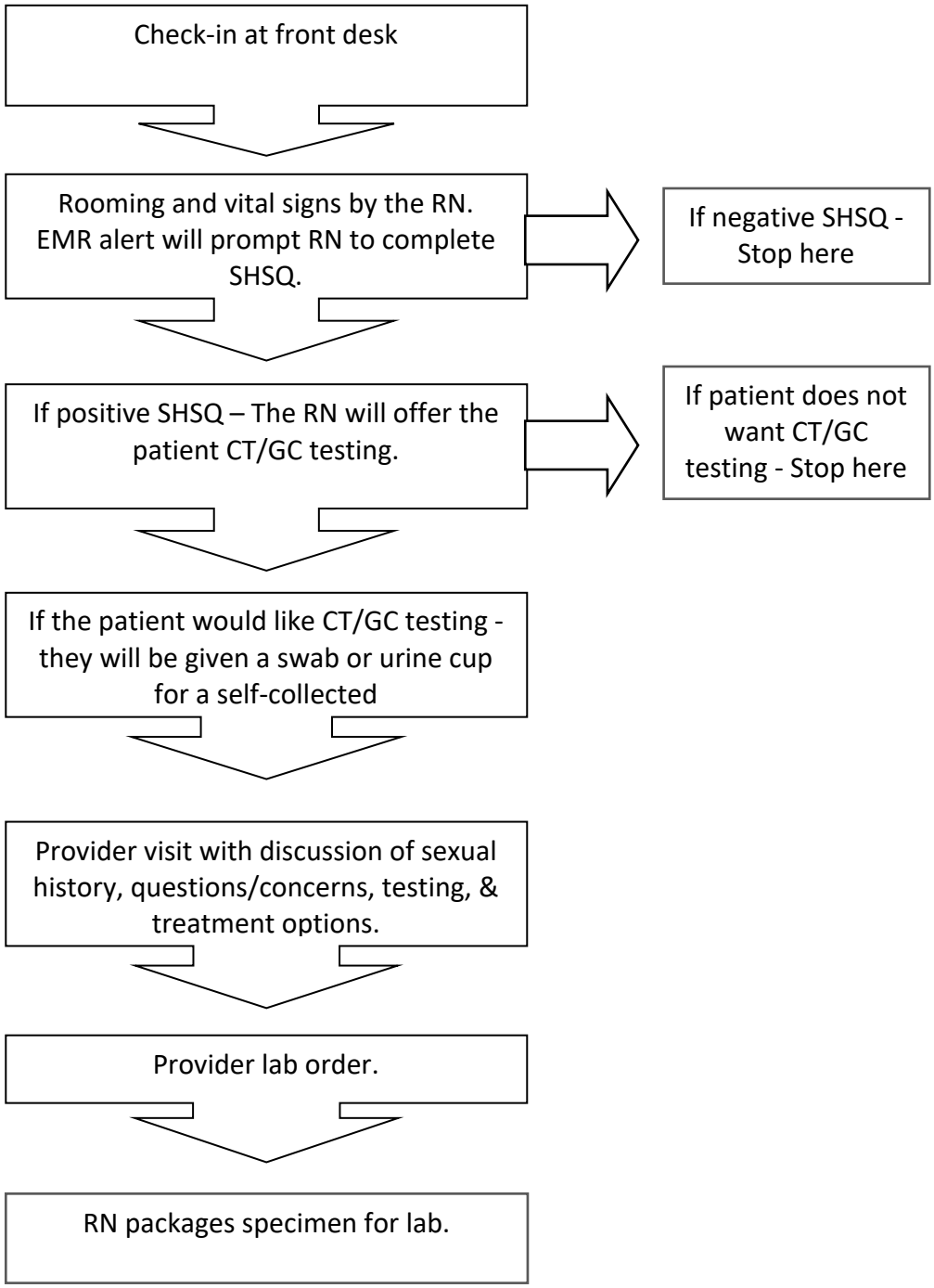
Appendix J

Chlamydia Screening Intervention Process Map



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Appendix K

Cost-Benefit Analysis

Project Expenses		
Salaries/Wages		
	Monthly	Total
Practitioner	$9,244	$36,976
Registered Nurse	$5,833	$23,332
Project Manager	$8,195	$32,780
Total Salary Costs	$93,088 *($0 for this project)	
Startup Costs		
	Monthly	Total
Education Handouts	$5	$20
EMR Consult	$0	$175
Total Startup Costs	$195	
Total Project Expenses	$93,283 *($195 for this project)	
Revenue Generated		
Revenue Generated	$0	
Total Revenue Generated	$0	
Program Benefit/Loss		
Total Revenue		$0
Less Expenses		-$93,283 *(-$195 for this project)
Total Program Benefit/Loss		-$93,283 *(-$195 for this project)

**Note*. For this project Total Salary Costs were $0, as MUHS staff were already in place and time was donated by DNP student.

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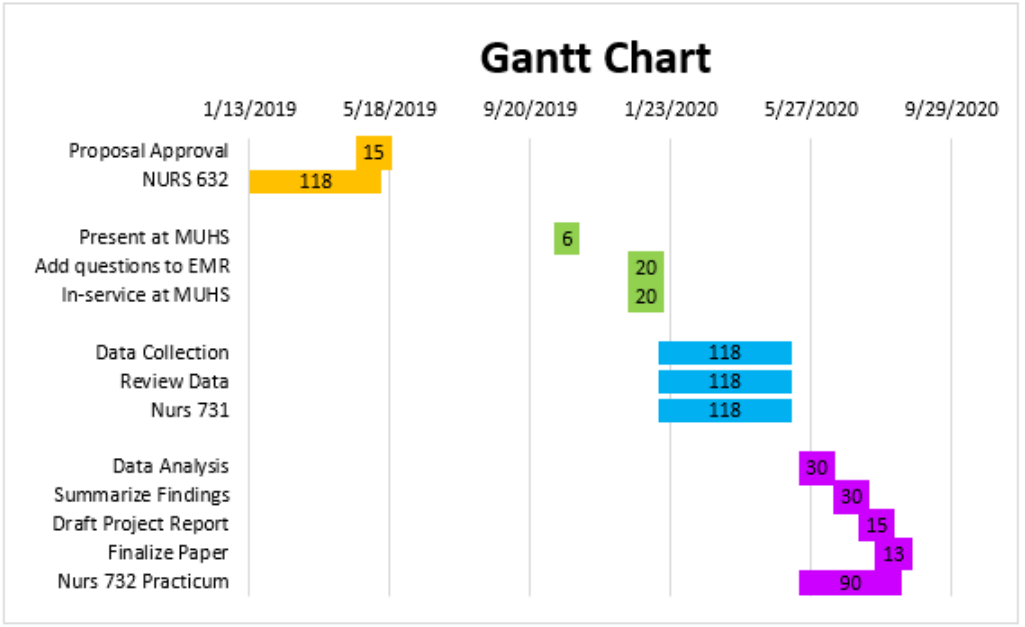
Appendix L

Gantt Chart

Gantt Chart			
Task	Starting Date	Duration	Ending Date
Proposal Approval	4/26/2019	15	5/11/2019
NURS 632	1/13/2019	118	5/11/2019
Present at MUHS	10/20/2019	6	10/26/2019
Add questions to EMR	12/22/2019	20	1/11/2020
In-service at MUHS	12/22/2019	20	1/11/2020
Data Collection	1/12/2020	118	5/9/2020
Review Data	1/12/2020	118	5/9/2020
Nurs 731	1/12/2020	118	5/9/2020
Data Analysis	5/17/2020	30	6/16/2020
Summarize Findings	6/17/2020	30	7/17/2020
Draft Project Report	7/17/2020	15	8/1/2020
Finalize Paper	8/2/2020	13	8/15/2020
Nurs 732 Practicum	5/17/2020	90	8/15/2020



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Appendix M

IRB Approval Letters

Millersville University
SEIZE THE OPPORTUNITY

P.O. Box 1002
Millersville, PA 17551-0302

Sponsored Programs and Research Administration
www.millersville.edu/spra
Phone: 717-871-4457

Thursday, October 24, 2019

RE: IRB Protocol no. 539251344, "Implementing Standardized Chlamydia Screening in a College Health Center"

Ms. Ehrenfeuchter,

The above referenced protocol has been reviewed by the Millersville Institutional Review Board and found to be minimal risk. Your protocol received expedited review. Your approval extends one year from the date of this letter. If you need additional time to complete the proposed project or if you need to modify the study, please contact Rene Munoz by phone or email.

We understand that as a doctoral student at an institution other than Millersville University, your home institution will have IRB oversight of this project.

Sincerely,

Dr. Rene Munoz
Director, Sponsored Programs
Millersville University Pennsylvania

rene.munoz@millersville.edu
717.871.4457

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---------- Forwarded message ---------
From: **IRB Administrator** <noreply@axiommentor.com>
Date: Wed, Jan 8, 2020 at 9:10 AM
Subject: Full Board Approved - Revisions Complete - IRB ID: 2019-025
To: <lh1234@messiah.edu>

Messiah College IRB *Approval Notification*

To: Lacey Ehrenfeuchter
From: Michael Shin, IRB Chair
Subject: Protocol #2019-025
Date: 01/08/2020

The protocol **#2019-025, Implementing Standardized Chlamydia Screening in a College Health Center** has been approved by the Institutional Review Board on **12/04/2019**.

The approval of your study is valid through 12/03/2020, by which time you must submit an annual report either closing the protocol or requesting permission to continue the protocol for another year. Please submit your report by **11/05/2020** so that the IRB has time to review and approve your report if you wish to continue it for another year.

If you have any questions, feel free to contact me.

Michael Shin,
IRB Chair
mshin@messiah.edu

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Appendix N

Sample Characteristics

	Potential Sample* (N = 1613)	**Final Sample* (N=473)**	**2019 (n=65)**	**2020 (n=408)**
Age				
Mean (SD)	20.16 (1.49)	20.29 (1.53)	20.55 (1.54)	20.25 (1.52)
Ethnicity				
White	71% (n=1145)	68.1% (n=322)	46.2% (n=30)	71.6% (n=292)
Black	11.5% (n=185)	16.5% (n=78)	27.7% (n=18)	14.7% (n=60)
Hispanic	11.1% (n=179)	10.8% (n=51)	16.9% (n=11)	9.8% (n=40)
Other	6.4% (n=104)	4.7% (n=22)	9.2% (n=6)	3.9% (n=16)
Gender				
Male	33% (n=532)	26.4% (n=125)	40% (n=26)	24.3% (n=99)
Female	67% (n=1081)	73.6% (n=348)	60% (n=39)	75.7% (n=309)

*No statistically significant differences between groups ($p > .05$)

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Appendix O

Sexual Health Screening Questionnaire (SHSQ) Responses
Spring 2020

	Intervention (n=408)	**Total Visits (n=938)**
Sexually active		
Yes	92.6% (n=378)	43.7% (n=410)
No	7.4% (n=30)	9.4% (n=88)
Not assessed	-	46.9% (n=440)
Tested for CT past 12 months		
Yes	34.3% (n=140)	17.2% (n=161)
No	65.2% (n=266)	28.5% (n=257)
Not assessed	0.5% (n=2)	54.4% (n=510)
Tested for STI past 12 months		
Yes	31.9% (n=130)	14% (n=131)
No	58.3% (n=238)	25.5% (n=239)
Not assessed	9.8% (n=40)	60.6% (n=568)

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Appendix P

Outcomes of Complaint Based CT Screening vs Standardized CT Screening

	Pre-intervention (n=65)	**Post-intervention (n=408)**
Tested		
Yes	100% (n=65)	18.4% (n=75)
No	-	81.6% (n=333)
Detected (CT Results)		
Positive	24.6% (n=16)	16% (n=12)
Negative	75.4% (n=49)	84% (n=63)
Treated*		
Yes	26	17
No	39	58

*All patients with positive results were treated, plus an additional 13.4% (n=15) of students who tested negative were also treated presumptively based on symptoms.

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