Opportunistic Chlamydia and Gonorrhea Screening: Utilizing an Electronic Health Record Prompt in Women 18-24 Years Old

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Abstract

Chlamydia and gonorrhea are the most common sexually transmitted infections that continue to rise in incidence and prevalence in the United States. Although there are effective, low-cost, and safe treatments for both of these infections, many cases go undetected due to a lack of screening. These infections greatly impact women as they have disproportionately higher rates of infection, face reproductive consequences of infection, and pay more in medical treatment for these infections. This project aims to increase screening rates of chlamydia and gonorrhea in women 18 to 24 years old by offering screening at every patient encounter in accordance with national screening guidelines. This quality improvement project was implemented in the women's clinic of a federally qualified health center in the Southwestern United States across six sites. The project intervention included updating a healthcare provider template utilized with every reproductive health-aged visit in the women's clinic to include offering chlamydia and gonorrhea screening to all patients who met national screening guidelines, excluding prenatal visits. Data collected included the chlamydia and gonorrhea screening rate six months pre- and post-template change, positivity rate, and demographic variables. Frequencies were used for statistical analysis along with demographic variables. There was an overall increase in screening rates post-template change of about 11.0% in the six months after the change. Electronic health record prompts can promote screening and evidence-based practice among providers.

Keywords: chlamydia and gonorrhea screening, reproductive-aged women, early detection and treatment

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Chlamydia and gonorrhea are sexually transmitted infections (STIs) that continue to rise in prevalence in sexually active individuals. Although treatments are effective, low-cost, and easy to administer, a delay in screening for these infections can continue the spread and lead to long-term reproductive health consequences. Healthcare providers can increase screening and in turn, detection and treatment, by advocating for opportunistic screening for patients during patient encounters. This is especially vital in reproductive-aged women who not only are affected disproportionately as a population but can suffer severe consequences if left untreated (Kreisel et al., 2021).

Problem Statement

A STI is defined as an infection caused by a pathogen that is transferred through any sexual contact (Workowski et al., 2021). In 2018, one in five people in the United States had a STI at any time (Kreisel et al., 2021). Chlamydia and gonorrhea remain some of the most common infections that are increasing in incidence and prevalence across men and women (Kreisel et al., 2021). However, women are disproportionally affected by both infections; chlamydia is 55% more prevalent and 59% higher incidence, as well as gonorrhea is 74% more prevalent and 54% higher incidence in women (Kreisel et al., 2021). Women are also disproportionately burdened with the medical costs of STIs; representing nearly 75% of all STI treatment costs (Chesson et al., 2021). Long-term reproductive health consequences are a term that encapsulates multiple disorders that occur as a result of an untreated chlamydia or gonorrhea infection (Workowski et al., 2021). These complications include infertility, chronic pelvic pain, and pelvic inflammatory disease (Workowski et al., 2021). Oftentimes, chlamydia and gonorrhea

infections are asymptomatic amongst women until it develops into one of these long-term consequences (Davidson et al., 2021).

Opportunistic screening is defined as a technique of testing in which all sexually active persons are offered screening for STIs at any patient encounter, whether a visit is related to sexual wellness or not (Moore et al., 2021). This type of opportunistic screening is not routinely done in the United States but is adopted across the world, such as in Canada and European countries (Moore et al., 2021).

Purpose and Rationale

Chlamydia and gonorrhea are increasing in rates across the United States and lead to a higher occurrence of severe long-term health consequences for those who are infected. Literature is supportive of opportunistic screening for these infections at any patient visit to increase detection and subsequent treatment (Moore et al., 2021). Opportunistic screening is vital as oftentimes women will not have symptoms of infection until the worsening of the disease.

Background and Significance

Chlamydia and gonorrhea remain among the most common STIs across the United States and are consistently increasing in incidence and prevalence (Workowski et al., 2021). Guidelines for the management of chlamydia and gonorrhea published by the Centers for Disease Control and Prevention (CDC) focus on screening and treatment efforts to halt further spread and lower the occurrence of long-term health consequences (Workowski et al., 2021).

Women At Increased Risk for Chlamydia and Gonorrhea Infection

Chlamydia and gonorrhea are more prevalent in women as a whole population compared to their male counterparts (Davidson et al., 2021; Kriesel et al., 2021; Van Gerwen et al., 2022). The female anatomy is more susceptible to infection compared to the male anatomy due to the

increased exposure of the soft tissue during sexual contact (Van Gerwen et al., 2022). Specifically, the vaginal mucosa is thinner and can be easily infiltrated by the bacteria that cause chlamydia and gonorrhea infections (Van Gerwen et al., 2022). Internally, the cervix provides a pathway for these bacteria to spread up into the upper genital tract including the uterus, fallopian tubes, and ovaries (Van Gerwen et al., 2022).

Chlamydia and gonorrhea do not affect all age groups of women equally; almost two-thirds of all reported chlamydia infections and more than half of new gonorrhea infections were among persons aged 15 to 24 years (Davidson et al., 2021). This major risk predictor of age has prompted the United States Preventative Services Task Force (USPSTF) to recommend screening all sexually active women who are 24 years old or younger (Davidson et al., 2021).

Other factors that would increase a woman's risk of infection include having a new sex partner, more than one sex partner, a sex partner with concurrent partners, inconsistent condom use, or having a previous STI (Davidson et al., 2021). A woman with a history of incarceration or exchanging sex for goods are also at increased risk (Davidson et al., 2021). Both the CDC and USPSTF recommend screening for chlamydia and gonorrhea in all sexually active women who are 25 years or older with these increased risks for infection (Davidson et al., 2021; Workowski et al., 2021).

Screening Modalities for Chlamydia and Gonorrhea Infections

Nucleic acid amplification tests (NAATs), for chlamydia and gonorrhea infection are considered the gold standard for screening due to their high specificity and sensitivity to the infection (Davidson et al., 2021; Rönn et al., 2019). NAATs are approved for testing in various sites on women including vaginally, endocervical, urine, rectally, and pharyngeal depending on the area of sexual infection exposure (Davidson et al., 2021). Systematic reviews have shown

that a specimen obtained from urine is not only at least as sensitive as testing endocervical or vaginal sites but is also preferable for many patients (Davidson et al., 2021; Rönn et al., 2019). A major advantage of testing through urine is that it does not require the individual to get undressed or go through any physical examination for sample collection (Davidson et al., 2021).

Current Screening Recommendations for Chlamydia and Gonorrhea

Both the CDC and USPSTF recommend screening for chlamydia and gonorrhea in all sexually active women who are 24 years or younger and those 25 years or older with increased risk for infection (Davidson et al., 2021; Workowski et al., 2021). A major downfall of this recommendation is the lack of guidance on screening intervals due to the absence of credible study availability (Davidson et al., 2021; Workowski et al., 2021). The consensus is to screen at least annually or when a patient's sexual history changes to include a new risk factor for infection (Davidson et al., 2021; Workowski et al., 2021). This puts the initiative of going into a clinic for sexual transmission testing onto the individual, which becomes difficult when a majority of women do not have any symptoms and may not be aware they should get tested even when there are no symptoms (Davidson et al., 2021; Van Gerwen et al., 2022; Workowski et al., 2021). This is a major advantage of opportunistic screening; another screening technique that is employed in other countries, such as Canada and many European countries, which emphasizes offering screening at every patient encounter (Grennan & Tan, 2021). This strategy of screening has many benefits such as earlier detection of infection, helps to minimize bias from the healthcare provider to only screen those they think may be at higher risk, and helps to normalize conversations regarding sexual wellness (Grennan & Tan, 2021).

Early Detection and Treatment of Chlamydia and Gonorrhea

Chlamydia and gonorrhea are both easily treatable and curable infections if addressed in a timely manner (Van Gerwen et al., 2022). Decreasing the time of diagnosis can greatly impact the likelihood of long-term reproductive consequences from occurring and promote the overall health of the individual and community as a whole (Van Gerwen et al., 2022; Workowski et al., 2021). Both chlamydia and gonorrhea can ascend through the cervix and into the uterus where pelvic inflammatory disease can develop with acute sudden pain (Smolarczyk et al., 2021). Further travel of the bacteria can cause scarring of the tubes leading to tubal factor infertility, increased chances of ectopic pregnancy, and recurrent pregnancy loss (Smolarczyk et al., 2021).

Internal Data

A federally qualified health center (FQHC) system with multiple locations in the Southwestern United States was examined and found to be missing potential opportunities for screening for chlamydia and gonorrhea in their women's clinic. The site reported that the target screening rate for organizations who receive Title X funding is 41%. The current screening rate in this organization was 32% in Spring 2023. Following their mission values of providing affordable comprehensive primary care to communities at risk, this organization utilizes government reproductive grants to help patients pay for reproductive healthcare. Currently, there is no protocol for STI screening; causing some healthcare providers to not provide care in accordance to national guidelines.

PICO Question

A review of the literature led to the clinically relevant PICO question: "In reproductive-aged women (P), how does opportunistic screening of chlamydia and gonorrhea (I) compared to current screening guidelines (C) impact earlier detection and treatment (O)?" and led to the following exhaustive search.

Search Strategy

This literature review included a search of the following databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, and Cochrane. These databases were chosen due to their significance to the medical field. All three databases yielded articles of relevance and applicability to answering the PICO question.

Keyword Selection

Keywords chosen included: *reproductive-aged women, women, childbearing aged women, chlamydia* and *gonorrhea screening, urine chlamydia* and *gonorrhea testing, urine STD testing, urine STD screening, STD screening, detection and treatment,* and *early intervention.* The terms *screening* and *testing* were both used synonymously because they did not influence the quality of results.

Initial and Final Search Yields

The initial search of *reproductive-aged women OR women AND gonorrhea and chlamydia screening OR urine STD screening AND detection and treatment OR early intervention* yielded a total of five results on CINAHL, 305 results on PubMed, and 27 results in Cochrane. A revision of the CINAHL search terms was done to include the term *STD screening* which yielded six results. A revision of the PubMed terms was done by adding the term *childbearing age women* to help narrow the results; this yielded 17 results. Cochrane was not revised down from the 27 results. Grey literature from the CDC as well as Maricopa County and Arizona State policies were also searched.

The six results from CINAHL, 17 results from PubMed, and 27 results from Cochrane were reviewed by the abstract and titles of the final yield for relevance to the PICO question. Rapid critical appraisal checklists as well as inclusion and exclusion criteria were used to narrow

down the search to 10 for in depth evaluation. These included four systematic reviews, four prospective or retrospective quality improvement studies, one cost analysis, and one cross sectional study.

Limitations, Inclusion, and Exclusion Criteria

Search limits were set to include only publications from the past five years, research articles, and availability in the English language. Inclusion criteria included articles addressing women of reproductive age who were being screened for gonorrhea, chlamydia, or paired chlamydia and gonorrhea screening. An article regarding medical costs of chlamydia and gonorrhea was included due to the prevalence of the topic. Exclusion criteria included articles being outside of the date range, only studying male patients, and not including chlamydia or gonorrhea in their STI testing.

Critical Appraisal and Synthesis of Evidence

The quality of the ten selected studies were evaluated by applicable rapid critical appraisal tools (Melnyk & Fineout-Overholt, 2019). A combination of seven quantitative (see Appendix A, Table A1) and three qualitative studies (see Appendix A, Table A2) were included in evaluation and synthesis tables to provide evidence surrounding the topic of chlamydia and gonorrhea screening. Four of the studies evaluated were systematic reviews which are the highest level of evidence. The other selected articles included three retrospective analyses, two quality improvement studies, and one cost analysis. Although the quality improvement and cost analysis did not have the highest quality of evidence, they provided meaningful insight into the topic. For example, Chesson et al. (2021), did an evaluation of the cost per case of a STI for an individual to treat and found that women will pay three to five times more for the treatment of chlamydia or gonorrhea compared to a man. This helps demonstrate how this problem will disproportionately

affect women in their lifetime. Qualitative articles explored patients' beliefs and attitudes about screening for STIs. For example, Francisco-Natanauan et al. (2021), found that youths declined screening for chlamydia and gonorrhea because they did not have symptoms and therefore did not have any infection when in fact, a majority of cases of these infections will not cause symptoms in patients.

All except two studies were based in the United States; the other two were based in Canada or worldwide. A majority of the subjects were ages 12-24 and all studies included female subjects. There was homogeneity in the variables and outcomes measured as a majority of the studies evaluated chlamydia and gonorrhea screening by urine sample and outcomes were measured by percentage of individuals screened and positivity rates. Heterogeneity was observed in the size of sample and few studies focused on patient beliefs on screening. Overall, a majority of the studies found that bringing awareness by offering screening of chlamydia and gonorrhea, especially when done by urine sample, increased the rates of individuals screened, and increased the detection of infection then subsequent treatment in those that otherwise would not have been screened.

There is clear and substantial evidence that supports offering chlamydia and gonorrhea screening to all female patients at every patient encounter, especially those of reproductive age, due to the non-invasive use of urine samples for testing and lack of symptoms for those who are infected. Women are disproportionately burdened financially by the cost of chlamydia and gonorrhea infections compared to men and will also face more adverse reproductive consequences from infection. Increasing screening rates by offering testing at every patient encounter can help to identify those with infection to help reduce the severity of reproductive

harm, cost of treatment, and reduce the spread to other individuals. Offering screening at every patient encounter can also affect the attitude and decrease the stigma of screening for STIs.

Theory Framework Application

The Health Belief Model is a health behavior theory that was originally developed for public health use to determine why individuals did not participate in free preventive and detective public health programs for disease (Becker, 1974). The Health Belief Model theorizes that demographic variables and psychological characteristics will influence a person's perceived susceptibility to disease and perception of benefits which will determine their action (see Appendix B, Figure B1). Examples of demographic variables include social class, gender, and age (Butts & Rich, 2018). Psychological characteristics include personality or pressure from a peer group (Butts & Rich, 2018). Many factors will influence a person's perceived susceptibility and benefits including; if they are likely to get the disease, if the condition has serious consequences, the belief that their action would reduce susceptibility, the belief that the costs of taking action outweighed the benefits, exposure to factors that prompt action, and are they confident in their ability to perform the action (Butts & Rich, 2018). This provides an explanation as to why individuals do not choose to get chlamydia and gonorrhea screening as many do not believe they are susceptible to the disease and do not realize the severe consequences it can have on their reproductive health. Many individuals also do not know that there are free or low-cost testing options available and do not know the recommendation of the frequency of screening. This then puts the initiation, offering, and education of chlamydia and gonorrhea screening on the healthcare provider since a patient may not know to ask or believe they are at risk. The healthcare provider can greatly influence a patient's perceived susceptibility,

highlight benefits, and lower perceived barriers simply by offering screening at any patient encounter.

Implementation Framework

The PDSA cycle, also known as Plan-Do-Study-Act, is a commonly used quality improvement model used to identify problems, implement change, and continuously improve processes (Deming, 1950). This quality improvement tool focuses on four steps that can be repeated to continue to improve quality; plan by describing the objective, do by running the test and collecting data, study by analyzing data and summarizing data, and act by making changes to the project then restarting the cycle as many times as needed (see Appendix B, Figure 2). This model allows for change to the intervention after implementation which is why this is appealing for public health initiatives, such as chlamydia and gonorrhea screening, since adjustments to the intervention can be made in response to patient feedback, provider feedback, or unexpected barriers.

Implications for Practice Change

The evidence points to increasing chlamydia and gonorrhea screening by offering testing at every patient encounter since many patients do not know that they are at risk, likely would not have symptoms if infected, and can be tested without an exam. The project will be conducted at a FQHC in the Southwestern United States. The FQHC has six locations which have clinics specialized in women's health staffed in an integrative health model having healthcare providers, medical assistants, behavioral health specialists, and registered dieticians. Key stakeholders include leadership within the women's health department, healthcare providers in the women's health clinics, and medical assistants in the women's health clinic. This additional screening can be offered at no cost to the patient due to the grant funding the FQHC receives. For this FQHC,

implementing a new protocol to promote screening of chlamydia and gonorrhea can not only promote patient wellness but can also secure more grant funding for the organization.

Offering chlamydia and gonorrhea screening at every patient encounter can increase rates of screening, allow for earlier detection of infection, promote treatment, and reduce the further spread of infection in the community.

Methods

Ethical Considerations

Three ethical principles will guide this project: respect for persons, beneficence, and justice. Respect for persons states that humans hold intrinsic, unconditional moral worth and should always be treated as such (Fowler, 2015). The project will adhere to this principle by ensuring that patients are freely autonomous with the right and capacity to consent (Fowler, 2015). Since this project will be a universal practice change, no consent is necessary for implementation. Healthcare providers at the patient encounter will offer chlamydia and gonorrhea screening to all eligible patients. Patients will then choose to accept or decline screening. Beneficence is the obligation to do good for others and prevent harm (Fowler, 2015). The project will adhere to this principle by performing a risk-benefit assessment before implementation (Fowler, 2015). In this project, a risk assessment will evaluate the benefits and risks to the patient and be reviewed by the key stakeholders and an Institutional Review Board (IRB) before implementation. Justice is the final principle and is the idea that there is fairness in the distribution of social burdens and benefits (Fowler, 2015). Since this intervention is a universal practice change, this project will adhere to this principle because no recruitment is necessary. Faculty mentors and the IRB at Arizona State University reviewed the project and deemed the project IRB except on August 23, 2023.

Description of Setting and Population

The project was implemented at a FQHC in the Southwestern United States. The organization has six locations with women's health clinics; all six locations implemented the project intervention. This organization serves a diverse ethnic population of patients primarily uninsured or utilizing Medicaid and has many programs for low or no-cost care through federal grants. The mission of this organization is to provide affordable, comprehensive primary care to these at-risk communities. In the women's clinic, patient care is provided by healthcare providers including medical doctors and nurse practitioners working closely with their respective medical assistants. The project population includes patients seen in the women's clinic from ages 18 to 24 years old, excluding patients who are seen for prenatal visits.

Project Description and Planning Timeline

The universal practice change is an opportunistic approach to chlamydia and gonorrhea screening using an electronic health record (EHR) prompt. This is done by modifying an already utilized template within the EHR to include a screening question based on the patient's age; if the patient is 24 years old or younger, they will be offered chlamydia and gonorrhea screening to which the patient can accept or decline (see Appendix C, Figure C1). This prompt comes from recommendations from the CDC and USPSTF to screen all women 24 years old or younger at least annually (Davidson et al., 2021; Workowski et al., 2021).

Development of an intervention to promote chlamydia and gonorrhea screening was made with the project site's leadership team. The project's initial assessment and development timeline ran from March 2023 to June 2023. Initially, to implement the practice change intervention, changes were made in the EHR template utilized by healthcare providers during patient visits. During monthly staff meetings, the women's health providers and medical

assistants were notified of the new practice changes. Project intervention implementation ran July 2023 to January 2024. The project data was analyzed from January 2024 to March 2024. After data analysis, project findings were shared with the project site. The timeline for identifying changes for the future ran from March 2024 to May 2024.

Data Collection and Analysis

Two measurable outcomes from this project are the screening rate and positivity rate of chlamydia and gonorrhea infections. An outline of the outcomes as result of the intervention are available to view (see Appendix B, Figure B3). Data provided included the total number of chlamydia and gonorrhea screening tests ordered and the number of positive tests during the six months before the template change and then six months after the template change. This information was obtained by a member of the informatics team in the project site and was de-identified. Additional demographic data included the following information: age, organization location, visit date, insurance type, sex, gender, level of English proficiency, ethnicity, chlamydia results, and gonorrhea results. All data was de-identified and contained no patient identifiers. Data was presented in aggregate form.

Budget and Funding

The project site facility is an established FQHC that has grant funding to cover the cost of chlamydia and gonorrhea screening and treatment for uninsured individuals under 25 years old.

Results

Outcomes

Project data was imported into the statistical software, Intellectus Statistics™, for analysis. Descriptive statistics were performed with the patient demographics. The most common patient demographics include female gender, being 21 years old, having public

insurance coverage, identifying as the white race, and having Hispanic or Latino ethnicity both pre- and post-intervention (see Appendix D, Figure D1). Data was then analyzed six months pre- and six months after post-implementation. The screening rate of chlamydia and gonorrhea pre-intervention was 34.6% across the six locations on average over the six months and post-intervention was 45.4% across the six locations on average over the six months (see Appendix D, Figure D2). The positivity rate of chlamydia pre-intervention was 9.4% and post-intervention was 9.0% (see Appendix D, Figure D3). The positivity rate of gonorrhea pre-intervention was 0.7% and post-intervention was 4.3% (see Appendix D, Figure D3).

Clinical Significance

Clinical significance is important to consider when evaluating a quality improvement project to understand the impact the project had on patient care. After the project implementation, the screening rate of chlamydia and gonorrhea within the organization increased by 11.0%. This is an incredibility reassuring result and supports the idea that incorporating a template prompt for healthcare providers can increase screening rates which allows for earlier detection of infection, promote treatment, and reduces the further spread of infection in the community. It also demonstrates a rise in healthcare providers following the national screening guidelines. The change in positivity rates, either increasing or decreasing, is not an indicator of the effectiveness of the screening itself. Instead, it reflects the health of the community and can be helpful for population-focused health promotion.

Impact of Project

This project has lasting impacts on the patient, provider, organization system, and policy as a whole. With the increase in screening, the patients benefit from earlier detection and treatment of infection, reducing the chances of long-term health consequences. The 11% increase

in screening is an 11% increase of real individuals who were able to know more insight about their health status. This project has impacted healthcare providers by maintaining a standard of care that is in line with national screening guidelines and supports practicing evidence-based care. The organization has been impacted by having consistency in their visits to offer consistent screening across their six women's clinics and by improving their chlamydia and gonorrhea screening rate. Lastly, policy has been impacted by supporting the need and utilization of Title X, or reproductive healthcare funding, for reproductive healthcare.

Project Sustainability

An important factor for any quality improvement project is the element of sustainability after the introduction of the project. The changes to the healthcare provider template and standard of offering chlamydia and gonorrhea screening to all female patients under 24 years old has been adopted into the project site's universal protocol. With the shown increase in chlamydia and gonorrhea screening and adoption into the project site's standard of care, it is hopeful that the project will continue to increase screening rates.

Discussion

Summary of Findings

The project has found that EHR prompts can increase screening rates of chlamydia and gonorrhea. These EHR modifications helped to promote consistency in the patient visits and across providers at six locations and promote screening at all appropriate visits. This has resulted in healthcare providers and the organization as a whole adhering to national screening guidelines and providing more consistent evidence-based care.

Limitations and Barriers

One limitation of this quality improvement project was that there was no direct data to know if the template change was filled out completely or utilized by healthcare providers. Another limitation was that the healthcare provider template did not automatically order the screening test. This was not evaluated in this project but does create a potential situation of the patient accepting the screening only for the healthcare provider to not order the test. Lastly, there was no area to document why the screening was declined. This could lead to situations where patients are declining screening since they were screened within the last year, but would look like a missed opportunity since the only option to report that would be by declining screening.

Relating Findings to Literature

As mentioned in the evidence synthesis, the evidence supports offering chlamydia and gonorrhea screening to all female patients 24 years old and younger at every patient encounter. This project supports the idea that offering screening at every patient encounter can increase screening rates within an organization as evidenced by the 11% screening increase over the six months after implementation and increase in screening at each individual location (Davidson et al., 2021; Van Gerwen et al., 2022; Workowski et al., 2021).

Recommendations for Future Research

From this quality improvement project, future research could be inspired to explore how EHR prompts and template changes could promote screening of other STIs or other screenings in general in a wide variety of settings. For example, this could be utilized in primary care and women's health to promote pap smear or mammogram screenings. Another opportunity for future research would be to explore the possibility of offering self-swabbing for specimen collection instead of urine. This promotes patient autonomy and can be helpful if the patient cannot urinate at the time of the visit.

Conclusions

With chlamydia and gonorrhea being the most common reportable STIs that are often asymptomatic in nature, evidence supports offering chlamydia and gonorrhea screening to all female patients at every patient encounter. The project has found that EHR prompts can increase screening rates of chlamydia and gonorrhea. These EHR modifications helped to promote consistency in patient visits across healthcare providers at six locations and promoted screening at all appropriate visits. EHR prompts to promote opportunistic screening can make significant and lasting impacts on an organization, especially with screening.

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Appendix A

Evaluation and Synthesis Tables

Table A1

Evaluation Table for Quantitative Studies

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Dang et al. (2021), Paired testing of sexually transmitted infections with urine pregnancy tests in incarcerated women. **Country**: United States **Funding**: Office of Medical Student Research at UT Southwestern Medical Center **Bias**: None disclosed	Health Belief Model	**Design:** Prospective Quality Improvement Study **Purpose:** To compare if pairing screening of GC and CT with UPT influences screening, detection, and treatment rates of gonorrhea and chlamydia.	**N=** GC tests= 1171 CT tests = 1177 **Demographics:** Women entering county jail Ages 18+ included Majority ages 18-40 **Setting:** Dallas County Jail **Exclusion:** Opting out of study **Attrition:** 6 CT tests did not want GC included	**IV1:** Paired UPT with GC/CT testing **DV1:** Screening rate of GC and CT **DV2:** GC and CT positivity rate **DV3:** Time to treatment of GC and CT **Definitions:** Paired testing-testing for GC and CT with the same	**Tools:** Retrospective chart review to establish age, gender, race, GC/CT results, and date of GC/CT results **Validity/ Reliability:** Author does not establish who went through chart or specific process	**Statistical Tests Used:** Demographic characteristics were summarized by frequency	**DV1:** Screening rates of GC/CT increased 4.7-fold **DV2:** GC positivity increased 3.7-fold CT positivity increased 4.6-fold **DV3:** GC time to results was 5.8 days CT time to results 1.8 days	**Level of Evidence**: II **Strengths**: Convenient testing, increase in screening, detection, and treatment of GC/CT, low cost **Weakness**: No established protocol for chart review **Feasibility**: Recommended for practice to combine GC/CT testing with UPT with patient consent. **Application**: Regularly offer

Key: **GC** Gonorrhea, **CT** Chlamydia, **DV** Dependent Variable, **IV** Independent Variable, **NAATs** Nucleic Acid Amplification Tests, **STIs** Sexually Transmitted Infections, **UPT** Urine Pregnancy Test, **QI** Quality Improvement

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
				sample as the UPT				GC/CT testing with UPT in practice.
Wood et al. (2019), Effectiveness of a quality improvement intervention to improve rates of routine chlamydia trachomatis screening in female adolescents seeking primary preventive care. **Country**: United States **Funding**: National Institute of Mental Health and the Children's Hospital of Philadelphia Research Institute K23	Institutional improvement framework derived from Lean Six Sigma methodology	**Design:** Multiphase QI Study **Purpose:** To determine the impact of a multicomponent QI intervention on CT screening for young women in primary care and to increase CT screening rates for young women by offering CT at well-person visits.	**N=** 1,500 well **Demographics:** 15- to 19-year-old female adolescents attending primary care visits, majority of participants have Medicaid and are African American **Setting:** Urban, pediatric, and adolescent primary care clinic located in West Philadelphia **Exclusion:** Opting out of study & not coming to clinic for well-person visit **Attrition:** About 70% of patients were tested	**IV1:** CT testing at primary care visits **DV1:** Screening rate of CT **DV2:** CT positivity rate **DV3:** Visit Length Change with Intervention	**Tools:** Retrospective chart review to establish age, gender, race, and CT results with visits with an ICD-10 code of well-visit encounter pre and post intervention period **Validity/ Reliability:** Author does not establish who went through chart or specific process	**Statistical Tests Used:** Descriptive statistics were used to summarize demographic Pre and post intervention screening rates assessed with the Pearson x2 test Time of visit pre and post intervention were found using the Wilcoxon rank sum testing	**DV1:** Screening rates of CT increased 21% **DV2:** CT positivity increased from 10.7% to 11.1% **DV3:** Visit length increased by 1 minute with intervention	**Level of Evidence**: V **Strengths**: Increased screening rates of CT without significant impact to visit time, no cost to patient **Weakness**: Only tested for CT, no GC screening **Feasibility**: Recommended for practice to offer screening to adolescents at patient encounters. **Application**: Regularly offer CT testing in practice to adolescents as well as adults.

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Readiness Award **Bias**: None disclosed								
Rönn et al. (2019), Evaluation of the performance of NAATs in detection of CT and GC infection in vaginal specimens relative to patient infection status: a systematic review **Country**: United States & United Kingdom **Funding**: Wellcome Trust, MRC Population Health Scientist Fellowship, National Institute of Health Research	Health Belief Model	**Design:** Systematic Review **Method:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses Guidelines **Purpose:** To evaluate the performance of NAATs using vaginal specimens in comparison to specimens from the cervix or urine in their ability to detect CT and GC infection in women based on patient infection status (PIS).	**N=** 9 studies **Demographics:** Studies that tested sample from vagina and urine and/ cervix with 2 NAATs for CT and 2 NAATs and/or 1 NAATS and 1 culture for GC in post pubertal women **Setting:** Databases searched include EMBASE, Ovid MEDLINE, and OvidSP **Exclusion:** Did not test for GC or CT as described or did not test post pubertal women	**IV1:** CT vaginal performance rates **IV2:** GC vaginal performance rates **DV1:** cervical CT performance rate **DV2:** cervical GC performance rate **DV3:** urine CT performance rate **DV4:** urine GC performance rate	**Tools:** Systematic review to find performance of CT and GC NAATs on various anatomical sites. Risk of bias was assessed using modified QUADAS-2. **Validity/ Reliability:** Author does not establish who went through chart or specific process	**Statistical Tests Used:** Average of performance estimates from studies being analyzed	**IV1:** CT vaginal performance rates 65-100% **IV2:** GC vaginal performance rates 64-100% **DV1:** cervical CT performance rate 59-97% **DV2:** cervical GC performance rate 85-100% **DV3:** urine CT performance rate 57-100% **DV4:** urine GC performance rate 67-94%	**Level of Evidence: I** **Strengths:** Found that cervical, urine, and vaginal swabs all had similar performance. **Weakness:** Did not exclude studies by date **Feasibility:** Urine NAATs can be used as alternatives for vaginal or cervical NAATs for GC and CT testing. **Application:** Offer patient choice of location for testing.

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Biomedical research Center **Bias**: None disclosed			**Attrition:** None, only included those with criteria					
Chesson et al. (2021), The estimated direct lifetime medical costs of sexually transmitted infections acquired in the United States in 2018. **Country**: United States **Funding**: Centers for Disease Control and Prevention, Fonds de recherche du Québec – Santé Research Scholars award, Foundation scheme grant from the Canadian Institutes of	Health Belief Model	**Design:** Cost Analysis **Purpose:** To estimate the lifetime medical costs attributable to STIs for men and women.	**N=** 8 STIs estimated **Demographics:** 8 STIs include: CT, GC, trichomoniasis, syphilis, genital herpes, human papilloma virus, hepatitis B, and HIV. **Setting:** United States incident in 2018 **Exclusion:** None **Attrition:** None	**IV1:** Incidence of STI **DV1:** Lifetime medical cost of each STI to individual **DV2:** Overall cost of STI across all age groups	**Tools:** Incidence of each STI and cost estimates per case of infection was obtained from the Centers from Disease Control **Validity/ Reliability:** Author does not establish who went through chart or specific process	**Statistical Tests Used:** 10,000 Monte Carlo simulations of lifetime medical cost	**DV1:** **CT:** $46/man, $262/woman **GC:** $78/man, $254/woman **Trichomoniasis:** $5/man, $36/woman **Syphilis:** $1,190/ man or woman **Genital herpes:** $156/man, $169/woman **Human Papillomavirus:** undetermined due to association with cancer	**Level of Evidence: V** **Strengths:** Estimated burden of medical costs of STIs. **Weakness:** Unable to know exact number of infections, so estimates were included. **Feasibility:** Prevention and early treatment can lower health care burden of cost. **Application:** Promote early testing and treatment of STIs.

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Health Research **Bias**: None disclosed							**Hepatitis B:** $5,530/ man or woman **HIV:** $420,285/ man or woman **DV2:** $15.9 billion	
Francisco-Natanauan et al. (2021), Chlamydia and gonorrhea prevalence and treatment in detained youths: Strategies for improvement. **Country**: United States **Funding**: Department of Health, State of Hawaii **Bias**: None disclosed	Health Belief Model	**Design:** Retrospective analysis **Method:** Retrospective chart review **Purpose:** The purpose of this study was to document the prevalence of CT and GC infections in detained youth in Hawai'i and to determine the proportion who were treated before discharge to assess the effectiveness of the existing policy and whether different	**N=** 461 males, 372 females **Demographics:** Youths aged 12-17 detained in the state of Hawaii from January 2014 to June 2017. **Setting:** Juvenile detention facility in Hawaii **Exclusion:** Not consenting to testing **Attrition:** 1,375 youths, 2,208 youths were offered and only	**IV1:** Offering GC/CT screening for all youths **DV1:** Number of youths who elected screening **DV2:** STI Positivity rate **DV3:** Agreed to presumptive treatment	**Tools:** Retrospective chart review to establish age, gender, if they consented to testing, GC/CT results, and if presumptive treatment was given. **Validity/ Reliability:** Author does not establish who went through chart or specific process	**Statistical Tests Used:** Descriptive statistics were used to summarize age demographic and test results.	**DV1:** 67.4% of females elected to be screened, 27.8% of males elected to be screened **DV2:** 23.7% of females, 9.5% of males **DV3:** 8.8% of males, 22.8% of females	**Level of Evidence: III** **Strengths:** Documented that many youths refused the screening because they did not have symptoms. Showed that youths in juvenile detection are at increased risk and prevalence of GC/CT. **Weakness:** Specific population, many youths declined testing. **Feasibility:** GC/CT could be offered to all youths.

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
		strategies, including presumptive treatment, are warranted.	833 agreed to testing					**Application:** Review with youth patients that GC/CT may not have symptoms, so testing is important.
Kaufman et al. (2020), Chlamydia and gonorrhea: Shifting age-based positivity among young females, 2010–2017 **Country**: United States **Funding**: Quest Diagnostics **Bias**: None disclosed	Health Belief Model	**Design:** Retrospective analysis **Method:** Examined de-identified test results from Quest Diagnostics performed from 2010-2017 **Purpose:** This study aims to determine if and how the age distribution of Chlamydia trachomatis and Neisseria gonorrhoeae infections in women evolved from 2010 to 2017, given changes in sexual practices over this time.	**N=** 17,794,680 specimens **Demographics:** Females aged 12-30 who had CT/GC testing at Quest Diagnostics from 2010-2017. **Setting:** Quest Diagnostics in the U.S. **Exclusion:** Test results with outcomes that were not positive or negative **Attrition:** 1,186 specimens	**IV1:** GC/CT screening **DV1:** Specimen location **DV2:** STI testing versus average per age group **DV3:** GC/CT positivity rates in 2010 & 2017 **DV4:** Age shift in positivity rates	**Tools:** Retrospective chart review to establish age, gender, and GC/CT results. **Validity/ Reliability:** All authors were involved with all aspects of study design. Used validated statistical tools.	**Statistical Tests Used:** Descriptive statistics were used to summarize age and test results. Chi-square tests used to analyze age groups. Cochran-Armitage test was used for positivity trends. SAS Studio was used to was used for analysis.	**DV1:** 99.8% of specimens were vaginal, cervical, or urine **DV2:** 32.9% increase versus average in ages 12-17, 32.5% increase in ages 18-24, 34.5% increase in those 25-30 **DV3: CT-**4.9% in 2010 & 5.8% in 2017 (18% ↑) **GC-** 0.7% in 2010 & 0.9% in 2017 (33%↑) **DV4:** 7-year age shift	**Level of Evidence: III** **Strengths:** Large sample size and over 7 years. **Weakness:** Only received data from one lab company, only analyzed women 12-30. **Feasibility:** Although not feasible to change CDC screening guidelines, providers can engage with all patients about screening. **Application:** Providers should ask all patients about GC/CT screening at visits regardless of age.

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Douglas et al. (2021), Gonorrhea and chlamydia rates among 12-24 year old patients in an urban health system. **Country**: United States **Funding**: National Institute of Health **Bias**: None disclosed	None noted	**Design:** Retrospective study **Method:** Analyzed electronic health record data from 2017 to 2019 in a large system of federally qualified health centers in Denver, CO. **Purpose:** The aim was to evaluate CT and GC testing and prevalence among 12- to 24-year-old patients in an urban federally qualified health center system.	**N**= 44,021 patients **Demographics:** Aged 12-24 years old, majority White race, Hispanic ethnicity, public insurance **Setting:** A large system of federally qualified health centers in Denver, CO. **Exclusion:** Patients who did not visit the primary care center **Attrition:** None, all studies that met criteria were analyzed	**IV1:** GC/CT screening **DV1:** Percentage tested **DV2:** GC/CT positivity rates **DV3:** Patient documented as sexually active & subsequent testing **DV4:** Specimen type	**Tools:** Retrospective chart review included demographics, sexual activity, sexual orientation, and laboratory results. **Validity/ Reliability:** All authors were involved with all aspects of study design. Used validated statistical tools.	**Statistical Tests Used:** $\chi 2$ Tests were used to evaluate differences between groups.	**DV1:** 37.6% of patients were tested for CT/GC ≥1 time **DV2:** 15% were positive for CT ≥1 time, 3.4% were positive for GC ≥1 time. Positive results were more likely to be female **DV3:** 40.7% were documented as sexually active. Of patients documented as sexually active, 77.3% screened. Some positive results came from those who marked not sexually active **DV4:** Urine	**Level of Evidence: III** **Strengths:** Large sample size, explored pediatrics and young adults. **Weakness:** Specific population in Colorado. **Feasibility:** GC/CT could be offered to all youths. **Application:** Providers should ask all patients about GC/CT screening at visits regardless of age.

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Table A2

Evaluation Table for Qualitative Studies

Citation	**Theory/ Conceptual Framework**	**Design/ Method/ Sampling**	**Sample/ Setting**	**Major Themes Studied/ Definitions**	**Measurement/ Instrumentation**	**Data Analysis**	**Findings/ Themes**	**Level/ Quality of Evidence; Decision for/ Application to practice; Generalization**
Pillay et al. (2021), Screening for chlamydia and/or gonorrhea in primary health care: Systematic reviews on effectiveness and patient preferences. **Country**: Canada **Funding**: Public Health Agency of Canada **Bias**: None disclosed	Health Belief Model	**Design:** Systematic review **Method:** Searched 5 databases, trial registries, conferences proceedings, and references for English and French literature published since 1996. **Purpose:** To examine evidence on the benefits and harms of screening GC/CT while investigating patient preferences.	**N=** 41 studies **Demographics:** 28 studies on benefits and harms of screening 14 studies on patient preferences **Setting:** English and French literature published since 1996 **Exclusion:** Study did not answer one of the key questions and/ or focused on pregnant women **Attrition: 0**	1.What is the effectiveness of screening for CT/GC in non-pregnant sexually active individuals? 2. What is the comparative effectiveness of different screening approaches for CT/GC in non-pregnant sexually active individuals? 3.What is the relative importance that people place on the potential outcomes from screening for CT/GC? **Definitions:**	**Data Collection:** Collected by research librarian on Ovid, Cochrane, CINAHL, PsycINFO for articles that answered one or more of the research questions **Data Dependability:** One reviewer extracted data, and another verified all data for accuracy and completeness Detailed methodology available	GRADE assessments	(1) Effectiveness of screening for GC/CT: low certainty of the known benefits and risks, primarily theoretical (2) Different screening approaches effectiveness: testing more than annually may be beneficial, little evidence (3) Patient preference on screening: patients felt benefits outweighed harms	**Level of Evidence: I** **Strengths:** Broad systematic review, valued patient's preference, showed that patients and providers agree that there is more benefit than harm for screening **Weakness:** Only included English and French published literature **Feasibility:** Recommend testing at every patient encounter **Application:** Regularly offer GC/CT testing

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Citation	Theory/ Conceptual Framework	Design/ Method/ Sampling	Sample/ Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level/ Quality of Evidence; Decision for/ Application to practice; Generalization
				Effectiveness-impact of screening on benefits and harm Relevant importance people place-patient preferences				
Olaleye et al. (2020), Sexually transmitted infections in pregnancy – An update on chlamydia trachomatis and neisseria gonorrhoeae. **Country**: International **Funding**: None **Bias**: None disclosed	None noted	**Design:** Systematic review **Method:** Literature review search in PubMed, HINARI, and Cochrane CENTRAL databases from Jan 2000 to April 2020 **Purpose:** This review provides an update on the epidemiology, diagnosis and treatment of CT and NG in pregnancy. They also evaluate the effect of these	**N=** 67 studies **Demographics:** Studies from Jan 2000 to April 2020 that related to CT and/or GC prevalence on pregnancy **Setting:** PubMed, HINARI, and Cochrane CENTRAL databases **Exclusion:** Not available in English and not	1. Prevalence of GC/CT in pregnancy 2. Risk factors for GC/CT 3. GC/CT pregnancy outcome 4. GC/CT symptoms 5. GC/CT treatment	**Data Collection:** Systematic review of studies searched in PubMed, HINARI, and Cochrane CENTRAL databases from Jan 2000 to April 2020. **Data Dependability:** Two authors involved in data search and extraction; all authors approved manuscript.	PRISMA guidelines for eligibility criteria. STROBE checklists for observational study extraction. CONSORT checklists for experimental study extraction. Summarized in a narrative synthesis.	**1.** Up to 36.8% CT & 14.2% GC prevalence in pregnancy worldwide **2.** Younger age, low education, poverty **3.** Miscarriage, premature rupture of membranes, preterm labor,	**Level of Evidence: I** **Strengths:** Broad systematic review, international inclusion **Weakness:** Only included literature available in English **Feasibility:** GC/CT screening methods are affordable and can be done from multiple sites.

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Citation	Theory/ Conceptual Framework	Design/ Method/ Sampling	Sample/ Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level/ Quality of Evidence; Decision for/ Application to practice; Generalization
		infections on pregnancy outcome.	relating to CT or GC in pregnancy **Attrition:** None, all studies that met criteria were analyzed				increased fetal outcomes **4.** 71.6% of cases were asymptomatic, symptoms were not a good indicator of infection **5.** Single dose therapy for therapy is preferred	**Application:** Routine prenatal care should include early and multiple GC/CT testing to promote early detection, treatment, and lessen adverse outcomes in pregnancy.
Tuddenham et al. (2022), Diagnosis and treatment of sexually transmitted infections: A review. **Country**: United States **Funding**: National Institute of	None noted	**Design:** Systematic review **Method:** Literature review search in PubMed and Cochrane databases studies from Oct 2010 to Oct 2021. **Purpose:** This review provides an update on the epidemiology, diagnosis, and treatment of	**N=** 81 studies **Demographics:** Studies from Oct 2010 to Oct 2021 relating to the epidemiology, diagnosis, and treatment of gonorrhea, chlamydia, syphilis, *Mycoplasma genitalium*, trichomoniasis, and genital herpes.	1.Epidemiology GC/CT 2. Clinical presentations for GC/CT 3. GC/CT testing and screening 4. GC/CT treatment	**Data Collection:** Systematic review of studies searched in PubMed and Cochrane databases from Oct 2010 to Oct 2021. **Data Dependability:** Two authors involved in data search, extraction, and synthesis.	Initially searched on databases for articles of relevancy. Manually searched for references of selected articles for additional references.	**1.GC-** 616,392 new cases in 2019 in the US, rate increased by 43.6% in women, highest among people who were Black and ages 20-24 **CT**- 1,808,703 new cases in 2019 in the	**Level of Evidence: I** **Strengths:** Broad systematic review, great resource for providers. **Weakness:** Only included literature available in English and not all aspects of STIs covered. **Feasibility:** GC/CT reference is helpful for providers and easily assessable.

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Citation	Theory/ Conceptual Framework	Design/ Method/ Sampling	Sample/ Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level/ Quality of Evidence; Decision for/ Application to practice; Generalization
Allergy and Infectious Diseases. **Bias**: Dr. Tuddenham reported serving as a consultant for Luca Biologics, Roche Molecular Diagnostics, and Biofire; receiving royalties from UpToDate, and receiving speaker honoraria from Roche Molecular Diagnostics and Medscape. Dr.'s Ghanem and Hamill reported receiving royalties from UpToDate.		gonorrhea, chlamydia, syphilis, *Mycoplasma genitalium*, trichomoniasis, and genital herpes.	**Setting:** PubMed and Cochrane databases **Exclusion:** Not available in English and not relating described diseases **Attrition:** None, all studies that met criteria were analyzed				US, rated increased by 10% in women, highest among people who were Black and ages 20-24 **2. GC & CT-** usually asymptomatic, possible vaginal discharge or itching **3. GC & CT-** NAATs by either vaginal swab, urine, or endocervical **4. GC-** Ceftriaxone **CT-** doxycycline best,	**Application:** GC/CT testing is essential for lessening adverse outcomes for disease with low-cost of testing and easy, affordable treatments.

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Citation	Theory/ Conceptual Framework	Design/ Method/ Sampling	Sample/ Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level/ Quality of Evidence; Decision for/ Application to practice; Generalization
							azithromycin alternative	

Key: **GC** Gonorrhea, **CT** Chlamydia, **DV** Dependent Variable, **IV** Independent Variable, **NAATs** Nucleic Acid Amplification Tests, **STIs** Sexually Transmitted Infections, **UPT** Urine Pregnancy Test, **QI** Quality Improvement

Table A3

Synthesis Table

Study (Author, year)	(Dang et al., 2021)	(Wood et al., 2019)	(Rönn et al., 2019)	(Chesson et al., 2021)	(Kaufman et al., 2020)	(Francisco-Natanauan et al., 2021)	(Douglas et al., 2021)	(Pillay et al., 2021)	(Olaleye et al., 2020)	(Tuddenham et al., 2022)
Design **LOE** **Type**	QI II Quantitative	QI V Quantitative	SR I Quantitative	Cost Analysis V Quantitative	RA III Quantitative	RA III Quantitative	RA III Quantitative	SR I Qualitative	SR I Qualitative	SR I Qualitative
Sample										
n subjects/ studies	1,177	1,500	9	8	17,794,680	461 F, 372 M	44,021	41	67	81
Age	18+	15-19			12-30	12-17	12-24			-
Sex	F	F	F	F&M	F	F&M	F&M	F&M	F	F&M
Country	US	US	US & UK	US	US	US	US	Canada	Worldwide	US
Interventions										
GC Screening	X		X		X	X	X	X		X
CT Screening	X	X	X		X	X	X	X		X
Urine Screening	X		X		X	X	X			X
Outcomes/ Themes										
GC Screening Rates	↑		↑		↑	↑	↑			X
GC Positivity Rate	↑		↑		↑	↑	↑		X	↑
CT Screening Rates	↑	↑	↑		↑	↑	↑			X
CT Positivity Rate	↑	↑	↑		↑	↑	↑		X	↑
Effects of GC/CT on Pregnancy									X	
Lifetime Cost of STIs				X						
Patients Preferences on Screening								X		
Patient Symptoms		X							X	X
Treatment Time	X					X				X

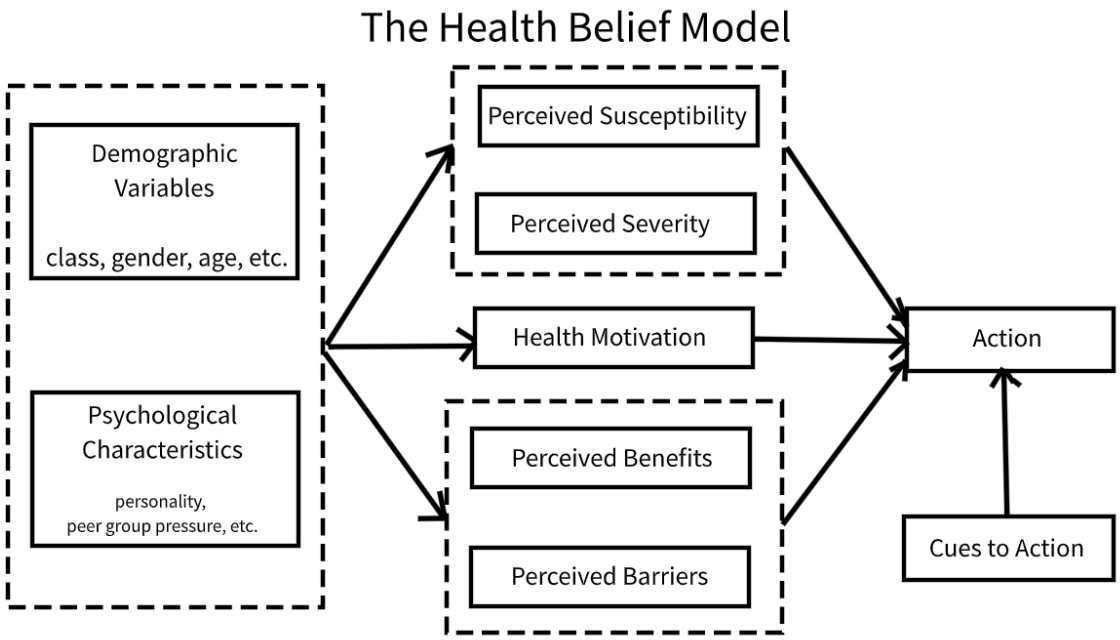
Key): **CT** Chlamydia, **ED** Education, **F** Female, **GC Gonorrhea, LOE** Level of Evidence, **M** Male, **QI** Quality Improvement, **RA** Retrospective Analysis, **SR** Systematic review, **STIs** Sexually Transmitted Infections, **UK** United Kingdom, **US** United States

Appendix B

Models and Frameworks

Figure B1

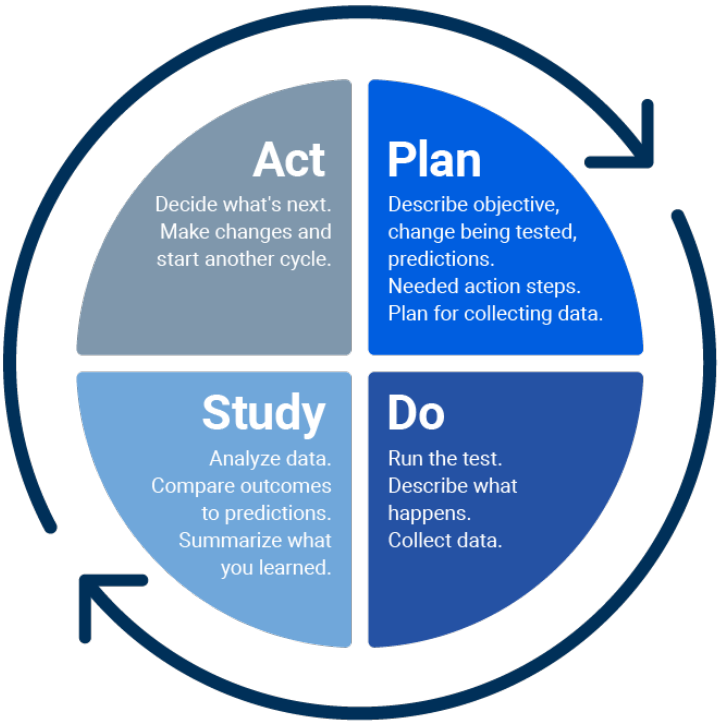
The Health Belief Model



(Butts & Rich, 2018)

Figure B2

Plan-Do-Study- Act (PDSA) Cycle

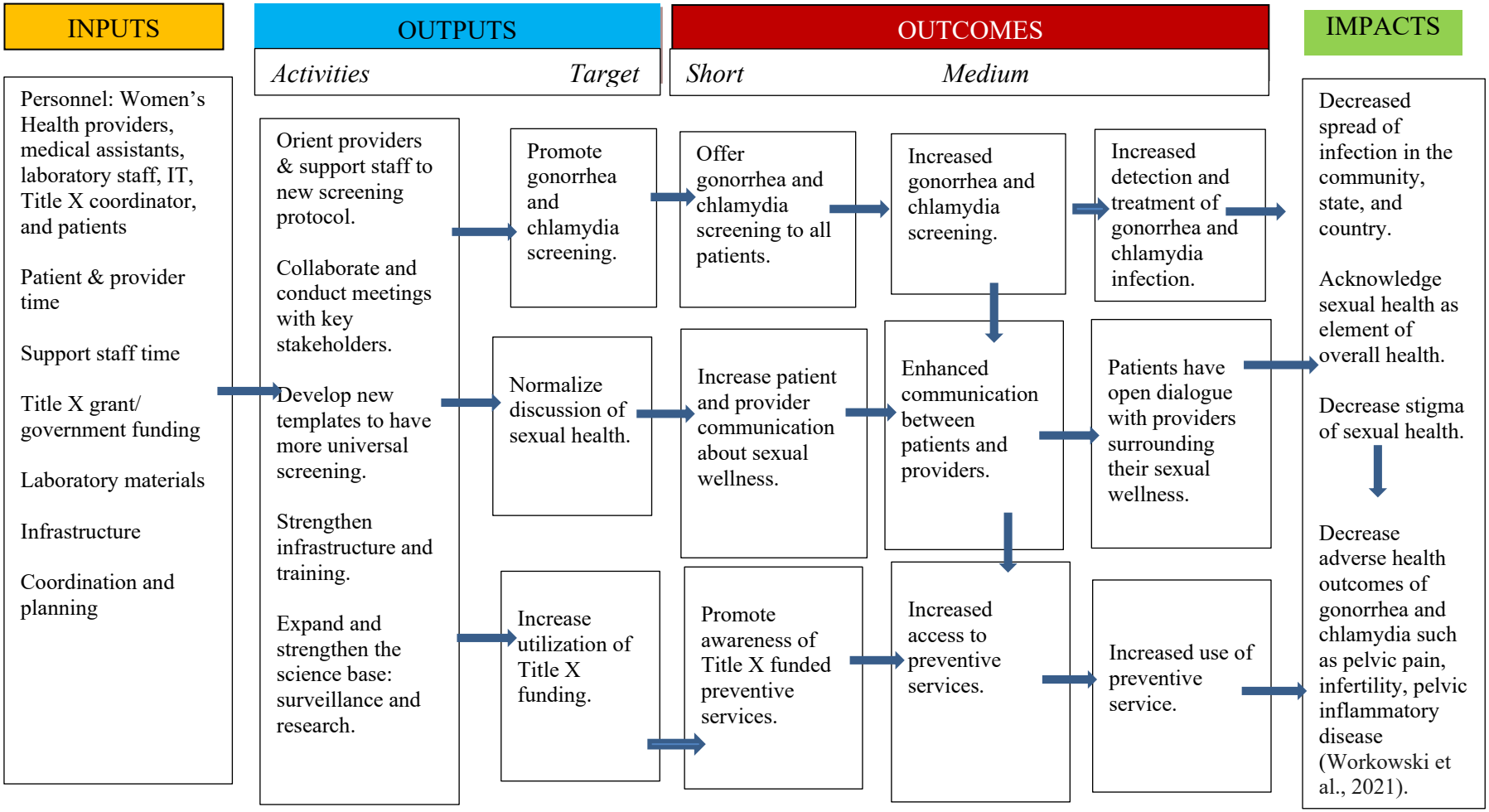


(Deming, 1950)

Figure B3

Opportunistic Chlamydia and Gonorrhea Screening Logic Model

Goals: The purpose of this evidence-based pilot project is to offer chlamydia and gonorrhea screening at every patient encounter to help increase rates of screening, allow for earlier detection of infection, promote treatment, and reduce the further spread of infection in the community.



Assumptions: The providers and support staff are open to and accept change. The provider will ask and offer all applicable patients about gonorrhea and chlamydia testing. The patient will agree to gonorrhea and chlamydia testing. The provider will order the correct screening test.

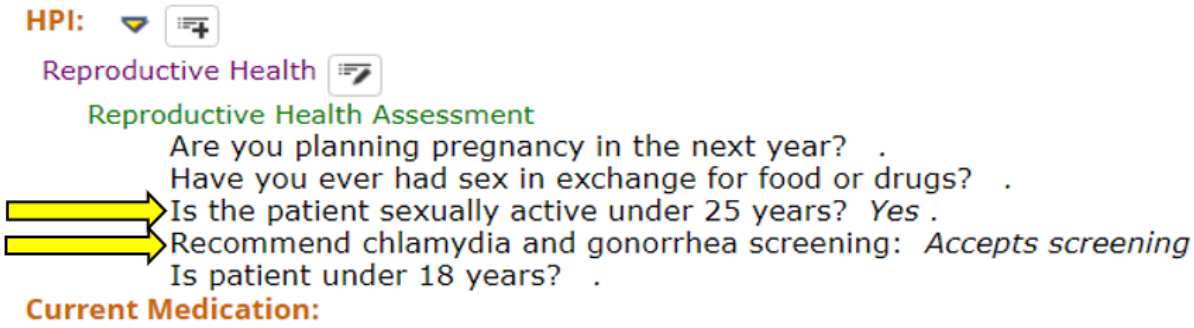
Appendix C

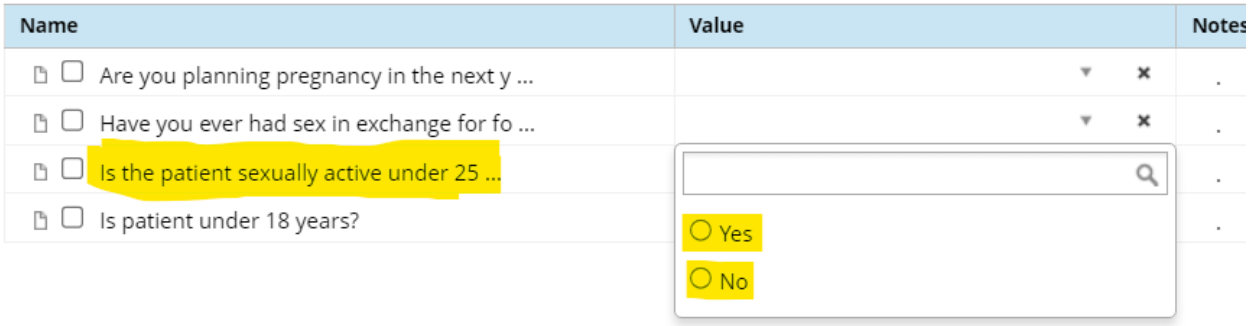
Project Intervention

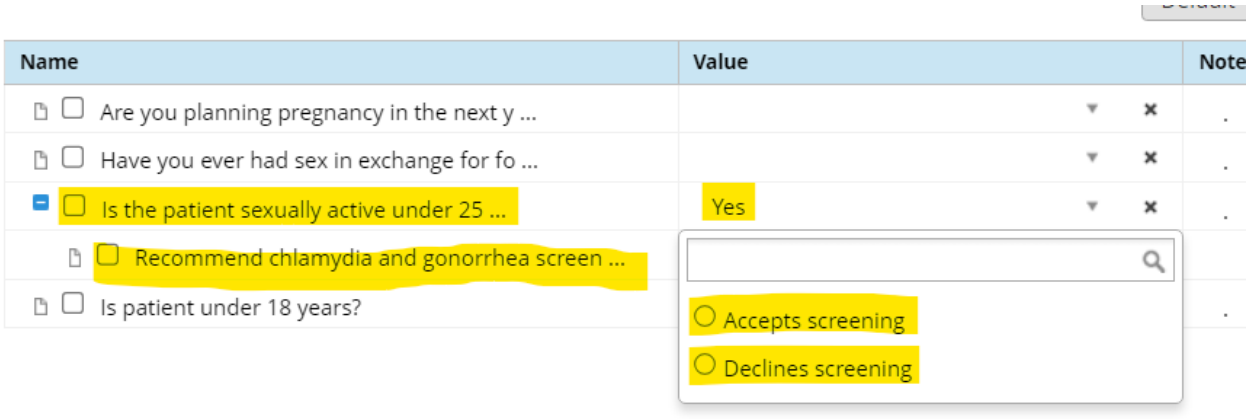
Figure C1

Screenshots from EHR template of Project Intervention

Changes to the EHR template are highlighted in yellow.







Appendix D

Project Data

Figure D1

Patient Demographic Data

Patient Demographic Data

Age	**Pre-Intervention**	**Post-Intervention**
18	8.9%	7.5%
19	10.9%	13%
20	12%	13.4%
21	18.8%	19.3%
22	16.3%	12.7%
23	18.4%	19%
24	14.7%	15.1%
Gender		
Female	100%	100%
Male	0%	0%
Race		
White	48%	47.5%
Black or African American	11%	9.8%
Asian	0.4%	0.3%
American Indian or Alaskan Native	0.2%	1.2%
Native Hawaiian or Other Pacific	0.2%	0.3%
Not Reported	40.2%	40.9%
Ethnicity		
Hispanic/Latino	74%	74.9%
Not Hispanic/ Latino	16.5%	15.4%
Not Reported	9.9%	9.7%
Insurance Type		
Private	15.3%	16.8%
Public	63.6%	54.6%
None	21.1%	28.6%

Figure D2

Screening Rates Across Project Locations Pre-Intervention

Dates	Location #1	Location #2	Location #3	Location #4	Location #5	Location #6	All Sites Average
02/15/23-02/28/23	28.9%	16.9%	28.6%	23.8%	34.8%	N/A	24.3%
March 2023	28.4%	21.5%	50%	36.6%	40.8%	N/A	30.4%
April 2023	23.4%	33.9%	0%	28.9%	33.9%	N/A	30.3%
May 2023	32.9%	21%	44.4%	28%	38.1%	N/A	28.6%
June 2023	29.2%	24.5%	50%	32.1%	29.5%	N/A	29%
July 2023	28.3%	19.6%	36.4%	48.3%	29.4%	N/A	28.2%
08/01/23-08/15/23	13.6%	42.9%	42.9%	35%	44%	42.9%	36.6%
Average Across Six Months	30.8%	30.1%	42.1%	38.8%	41.8%	42.9%	34.6%

Screening Rates Across Project Locations Post-Intervention

Dates	Location #1	Location #2	Location #3	Location #4	Location #5	Location #6	All Sites Average
08/16/23-08/31/23	36.8%	40.7%	42.9%	52%	36.4%	45%	41.8%
September 2023	36.8%	36.9%	70%	48.6%	35.5%	44.4%	40.7%
October 2023	32.8%	33.3%	33.3%	61.5%	40.6%	15.4%	36.4%
November 2023	35.5%	33.3%	50%	46.4%	52.1%	33.3%	39.7%
December 2023	34.1%	43.3%	41.2%	46.4%	37.2%	33.3%	39.3%
January 2024	34%	26.2%	47.3%	35.5%	36.1%	51.7%	34.8%
02/01/24-02/15/24	35.6%	32.4%	11.1%	83.3%	33.3%	55%	39.6%
Average Across Six Months	40.9%	41%	49.3%	62.3%	45.2%	47.3%	45.4%

Figure D3

Chlamydia and Gonorrhea Positivity Rates

	Six Months Pre-Intervention ***N= 510 total tests***		**Six Months Post-Intervention** ***N= 634 total tests***	
Infection Type	**Positive Cases**	**Positivity Rate**	**Positive Cases**	**Positivity Rate**
Chlamydia	48	9.4%	4	0.7%
Gonorrhea	57	9.0%	27	4.3%