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Reducing Delays in Sexually Transmitted Infections(STI) Treatment: A Quality Improvement Project to Improve Timely Communication Among Providers and Patients

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Abstract

Purpose: To use a nurse-communication intervention for timely provider notification of abnormal chlamydia, gonorrhea and syphilis infections, to reduce delays in treatment at a large Northeastern United States hospital.

Methods*:* The hospital's communicable disease report was reviewed daily, and treatment of all patients who were seen in the Infectious Disease clinic and diagnosed with chlamydia, gonorrhea and syphilis infections was monitored. Emails were sent to inform treating providers whenever a patient was not treated within 72 hours after diagnosis. Data from patients in the three months preceding was compared with data during the three months of nurse-communication intervention and medical records were reviewed for reasons for delayed treatments. This was followed by a survey of providers who received the reminder emails.

Results: Eighty-three percent of patients were treated within 72 hours of diagnosis in the last month of the nurse-communication intervention compared to a high of 78% in the preceding three months. Survey results showed that 100% of providers agreed or strongly agreed that the nurse-communication intervention would benefit the clinic, and 80% strongly agreed that the intervention improved patient notification. Both patient and provider factors were equally responsible for treatment delays with $p < .001$.

Conclusion: These data suggest that nurse-communication intervention can improve timely communication and treatment of chlamydia, gonorrhea and syphilis. The department has adopted the nurse-communication intervention as the standard for communicating chlamydia, gonorrhea and syphilis results with providers and patients.

Keywords: *Sexually Transmitted Disease treatment, STD notification and delays.*

Introduction

Delayed communication of abnormal or critical test results is a patient safety issue which may result in delayed diagnoses, delayed treatment and loss to follow-up, as well as medical and legal implications for both health services and health care providers (Callen et al., 2015; Joint Commission (JNC), 2016). Collins et al. (2015) also wrote that existing evidence suggests that there is often a lapse in communication or follow up of abnormal and critical results, resulting in subsequent delays in treatment. The researchers cited a study in which more than 20% of 1,117 elderly trauma patients had incidental findings of lesions during an abdominal or pelvic ultrasound, but less than 20% of affected patients were notified of their results (Collins et al., 2015).

This lapse in communication of abnormal laboratory tests poses a threat to patient safety and has led to institution-based performance improvement/quality improvement projects, national recommendations for policies that outline inter-professional communication of abnormal laboratory results, and re-evaluation of current practices. Examples of such policies are the Food and Drug Administration's (FDA) policy on the communication of mammography results to patients and the Joint Commission's (JNC) Patient Safety Goal #2, which mandates timely communication of abnormal laboratory results. In fact, the problem is so severe that the JNC continue to rank improved staff communication, especially the reporting of abnormal test reporting among its top priorities for patient safety (FDA, 2015; JNC, 2016).

Lam, Ajzner, Campbell and Young (2016) found that the lack of uniformity in designating common terminology or defining of critical laboratory results, and the communication of abnormal test results across the health care spectrum internationally

and within same countries, is a major barrier to quality care and remains in the forefront of advocacy by patient safety advocates. Research about best practices for timely notification of abnormal test results include application of advanced technologies with or without a nurse navigator, and quality improvement projects using a nurse navigator (Litchfield et al., 2015; Snow et al., 2013). Lam et al. (2016) also wrote that advances in technologies would lead to international harmonization of the definition of abnormal test results and best practices, and subsequently improve patient safety.

Background

On average, there were approximately 20 chlamydia, 10 gonorrhea, and seven new syphilis infections or reinfections reported at a large hospital in Northeastern United States from January through July 2017. According to the Preventive Medicine department's daily communicable disease (COMDIS) tracking log, up to 35% of patients are not treated within 72 hours and at least 15% of patients are treated after seven days.

The disease tracking data also shows that at least 60% percent of patients diagnosed with chlamydia, gonorrhea and syphilis each month are homosexual males who receive care in the Infectious Disease clinic, the population that is being focused on in this project. This group of individuals also account for up to 60% of patients who receive delayed treatment, including patients who are not treated after two weeks after diagnosis.

The occurrence of these three most common sexually transmitted infections and the population mostly affected at the hospital reflect the national trend, even though actual rates may differ. According to the Centers for Disease Control and Prevention's 2015 report on sexually transmitted infections, there were 1,526,658 cases of chlamydia

(479 per 100,000 persons), 395,216 gonorrhea (124 per 1000,000 persons), and 23,872 syphilis (7.8 per 100,000 persons) infections (CDC, 2015). The state of Maryland Department of Health also reported a high rate of chlamydia (459.3 per 100,000 persons), gonorrhea (114.8 per 100,000 persons), and syphilis (7.8 per 100,000) in 2015. The 2016 sexually transmitted disease report for Montgomery County Maryland also showed a similar trend in chlamydia (3,428 per 100,000 persons), gonorrhea (563 per 100,000 persons) and syphilis (33 per 100,000 persons).

This similarity may be due to the fact that patients seen at this hospital come from different parts of the United States, and are therefore representative of the population. National data from the Centers for Disease Control and Prevention and local data from the state of Maryland and Montgomery County also showed that men who have sex with other men (MSM) account for the highest rates of chlamydia, gonorrhea, and syphilis including more than 90% percent of primary and secondary syphilis (CDC, 2017), like their counterparts at this hospital.

The poor reporting of abnormal lab results causes a delay in treatment and patients lost to follow-up. These gaps in patient care services have also been reported in other areas of diagnostic testing in the United States. Among 1,117 patients who underwent abdominal CT scans as part of a trauma protocol at a hospital in central Massachusetts, less than 20% of the 239 patients were notified of incidental findings of lesions in their kidneys, pancreas, liver, adrenal glands or ovaries (Collins et al., 2015).

Patients in developing countries, who bear the heaviest disease burden of diseases such as HIV and tuberculosis, are also at risk for delayed treatment (MacPherson, Houben, Glynn, Corbett, and Kranzer, 2014; Philip et al., 2015). Philip et al. (2015) also

reported that out of the 2.9 million missed cases of tuberculosis worldwide, nearly one million missed cases were from India.

The reasons for untimely treatment or loss to follow up can be multifaceted; fear of the diagnosis, lack of access to care, lack of phone/email access, and poverty are some patient factors (Akilimali et al. 2017; Ojwang et al., 2016; Wolf et al. 2014). Also cited were physician factors including mobility or schedule change, high patient workload, poor interdisciplinary collaboration, and lack of adequate knowledge about the specific diagnosis.

Disclosure of patients' positive sexually transmitted infections status is one such factor that can hinder their return for treatment in some cases (Akilimali et al., 2017). The researchers reported that 12% of HIV infected individuals in Goma of the Democratic Republic of Congo were lost to follow up due mainly to fear of disclosure and follow up. Wolf et al. (2017) also reported a 57% lost to follow up on HIV positive youths in Nyaza, Kenya. Ojwang et al. (2016) reported similar problems among that population in a different part in Kenya. While this study was done in a region with very high rates of infections and poor knowledge about communicable diseases, some individuals in this hospital out patient clinic target population have also expressed fear that their STI status might be disclosed to their military commands.

Problem Statement

The current delay in the treatment of more than 30% of patients diagnosed with chlamydia, gonorrhea, and syphilis in the Infectious Disease clinic of this large military hospital is a patient safety concern. Communication between health care providers about timely treatment of sexually transmitted infections is required for patients' safety and

outcomes.

Organizational "Gap" Analysis of Project Site

The hospital that is the target site of this nurse-communication intervention is a large medical facility that provides health care services to active duty soldiers, retirees, and their respective dependents. United States service members and their dependents stationed overseas as well as the diplomatic corps, are among individuals who seek health care services at this well-established military medical facility. The need to follow up on test results of previous patients, in addition to the heavy volume of patient can lead to untimely notification and treatment of patients with abnormal laboratory reports.

The Infectious Disease clinic served as the target site for this quality improvement project with 19 different providers working in June and July 2017 seeing more than 300 patients per month. The clinic's nurse coordinator confirmed a total clinic population of 593 that changes frequently based on self-referrals, PrEP enrollment, new infections, and relocation of patients.

According to reports from the microbiology and serology laboratory's specimen tracking also, in June 2017, there were 354 specimens each for chlamydia and gonorrhea, 117 for syphilis, and 17 Treponema pallidum processed for the Infectious Disease clinic. The majority of patients are HIV positive individuals who are on antiretroviral therapy that require careful monitoring. Some patients have compliance issues, and a few have co-morbidities including very complex mental health disorders.

The clinic also provides care for patients seeking HIV prevention treatment with Pre-Exposure Prophylaxis (PrEP), and for diagnosis of chlamydia, gonorrhea and syphilis after a known exposure. The workload of the clinics' providers is further increased by

their roles as preceptors to rotating medical interns and as consultants for inpatient communicable disease patients. The volume of patients seen daily in the infectious Disease clinic, the volume of abnormal laboratory results, combined with administrative duties makes timely follow up of abnormal test results a challenge for providers. A cross-sectional survey by Singh, Spitzmueller, Petersen, Sawhney, and Sittig (2013) of Veteran's Administration providers also showed that organizational characteristics and individual provider behaviors contribute to delays in the follow-up of patients with abnormal test results.

Clinics at this hospital are mostly staffed with both military providers including physicians, nurse practitioners and medical interns from the United States Uniformed Services University and civilian providers. While some providers are stationed in specific clinics, there is constant mobility or turnaround of providers to accommodate the needs of the military. This movement while common for military service has proved to have a negative impact on the continuity of care for all patients, but especially for those who are diagnosed with communicable diseases such as chlamydia, gonorrhea and syphilis.

Another organizational gap is that patients most frequently do not get their lab results on the date of their encounter with their provider. Therefore, local patients who are asymptomatic may need to return to the hospital for treatment. Patients who travel from out of state often need to be notified about their abnormal test results, and referred to seek treatment locally. However, problems often arise when patients are unreachable on their listed telephone numbers or email addresses on file.

Review of the Literature

The following databases and search engines were used for this search of the literature: PubMed, CINAHL Plus, EMBASE, Up-to-date, Medline, Google Scholar and the Joanna Briggs Institute. Also reviewed were reference lists and accessed databases of citations, abstracts, and full text research articles on the life sciences, and topics focusing on inter-professional communication, patient safety and outcomes. Search terms used include *delayed treatment of sexually transmitted infections, missed follow up after abnormal test result, lost to follow up, quality improvement, patient safety, interdisciplinary collaboration provider-patient communication, effect of interdisciplinary communication on patient outcomes, nurse-led interdisciplinary communication, effect of nurse-physician communication, physician behavior change and evidence-based protocol on sexually transmitted infection notification*.

Articles that addressed patient safety concerns, quality improvement, physician-physician communication, or interventions to improve patient notification of abnormal test result were included. Only research articles with level III evidence rating and above were included in this review. Journal articles and organizational papers that did not meet the stated criteria were excluded. While there is adequate data on nurse-physician communication, the majority of the research reviewed on nurse-led intervention focuses on the role of the nurse as the program navigator or facilitator for patients who were already in care, but lost to follow-up.

A total of 81 journal articles, 16 organizational reports and five papers were reviewed, but only 28 Journal articles and, 8 organizational reports, and two books met the inclusion for this review. Studies included in this paper were completed using

systematic reviews and meta-analysis, randomized interventional quality improvement projects, surveys and questionnaires administered to health care providers who use electronic medical records, and data from multiple cohort studies. Evaluation methods of most studies conducted were through pretest-posttest survey questionnaires completed by physicians and nurses, through patient self–reports, staff input, and by direct audit of provider participation in automated alerts in electronic medical record (EMR).

Lost to Follow Up

Callen et al. (2015) wrote about physicians' lack of specific expertise to explain test results, the pressures of their workload, and fear or inciting anxiety in patients as the reasons for lack of follow-up with patients after positive test results. The researchers stated that although test results can be missed in hospitalized patients, up to 75% of tests done in emergency rooms are lost to follow up. Tien, Chiu, and Liu (2016) also reported that the rate of lost to follow-up was up to 35% among patients with rheumatic disease at a large medical center in Taiwan

Delayed or untreated chlamydia and gonorrhea infections can lead to the development of pelvic inflammatory disease (PID), and infertility, and untreated syphilis may result in cardiac and central nervous system complications, and possibly death. Persistent sexually transmitted infections can also increase an individual's risk of contracting HIV (CDC, 2017).

Automated Alert Systems

The use of automated alert features in the electronic medical record system is one approach that large healthcare institutions including Veterans Affairs Medical Centers and the target hospital currently utilize to optimize timely provider notification of

abnormal or critical laboratory results. This feature is meant to trigger an immediate action by providers, but can actually cause alarm fatigue, which leads providers to overlook important notifications (Cook, Enders, Caraballo, Nishimura, and Lloyd, 2015; Litchfield et al., 2015; Singh et al., 2013). The system, which can only be turned off by the ordering or treating provider, is a way of ensuring that patients are notified and treated for abnormal test results in a timely manner.

Sittig and Singh (2012) also warned against health care organizations' total reliance on technology stating that technological failures and lack of adequate staff training can compromise patient safety. The researchers cited a malfunctioning of the computer system at some hospitals in Rhode Island in 2010 that led to the cancellation of vital services, including elective surgeries as an example. They therefore recommend an alternate plan of action for technology failures and human incompetence.

Providers across the Veteran's Hospital system and its outpatient primary care satellite settings have attributed their failure to respond to alerts to information overload, redundant test results that are not recognized by the automated system, distraction from patient care, and lack of knowledge (Singh et al., 2010). Providers in private clinics in England also reported similar reasons for ignoring automated alerts, even though they worked in different electronic medical record systems (Litchfield et al., 2015).

Litchfield et al. conducted a survey of providers at a single hospital in England where respondents stated that providers depended on patients to follow-up about abnormal test results by calling in, and the majority (80%) surveyed did not have abnormal test alert technology in place at their practices. Singh et al.2010), used audit trails of computerized test result notification alerts and provider actions to document the

significance of the problem at a large multispecialty Veterans Affairs Medical Center (MEDVAMC) and its five satellite clinics using reports over a six-month period of time. The researchers found that acknowledgement of alerts about abnormal test result did not result in timely follow-up by providers. The volume of high priority alerts and redundancy of alerts were cited as the reasons for provider overlook, poor documentation or lack of follow-up of automated alerts in the medical record system.

Text Messaging

Direct patient notification of abnormal laboratory results using text messaging or phone calls were also reported in the literature as an effective means of timely notification to prevent delays in treatment (Huppert et al., 2012; Reed et al., 2014). However, Huppert et al. (2012) wrote that adolescents who are most often the population with the highest rates of chlamydia, gonorrhea, and syphilis, frequently ignore their phone calls and may have limited texting due to financial constrains. Healthcare providers in the studies reviewed were also unlikely to follow-up with patients whose telephone numbers were wrongly transcribed, or those who did not receive a card on which to write their telephone number during their visit. Both studies were interventional quality improvement projects that were conducted in the same pediatric emergency room in Ohio, using similar sample characteristics (14-21 year old), and at two separate times.

Nursing Communication

Nurse-led nurse-provider communication has proved to be effective in the management of both acute medical conditions such as sexually transmitted infections, and chronic disease management (Massimi, et al., 2017; Snow et al, 2013; Wade et al.2015;). In the experimental study by Snow et al., HIV testing increased among men

after a sexual health nurse was introduced into a clinic. The study also reported that more Spanish- speaking men returned for testing because there was a Spanish-speaking nurse added to the clinic. The clinic with the highest testing rate also did not require any payment for HIV testing. However, the researchers cautioned that one or both factors might have contributed to the increase in the testing rate.

Massimi et al. (2017) also wrote that nurses need more training for the roles that they undertake and that Advanced Practice Nurses are more prepared for this type of role. The Institute of Medicine of The National Academies (2010) also recommended that nurses acquire higher levels of education and training and form full partnerships with other healthcare professionals, for the advance of healthcare services.

Interprofessional collaboration led by nurses to facilitate behavioral change using process enhancement strategies can be a successful strategy (Kotecha, et al. 2015; Wojciechowski, 2016). By involving patients with chronic disease who required frequent surveillance, a nurse-led communication was effective in improving timely physician notification of crucial laboratory test results, for the reduction of cost and loss to follow up, resulting in improved adherence and overall quality of care (Wade et al.2015).

Inter-professional communication between nurses and physicians is an effective approach for patient safety and improved outcomes. Improving nurse-physician relationships is important as they are often strained by lack of timely responsiveness to nursing inquiries, demeaning attitudes of physicians towards nurses, and the hurried nature of physicians in acute care settings (Tjai et al., 2009).

While advances in technology have paved the way for faster notification of abnormal test results, patient and provider factors, and institutional factors can influence timely notification of abnormal laboratory results leading to delayed treatment and lost to follow up (Litchfield et al., 2015;Singh et al., 2013). Behavioral change interventions to facilitate nurse-physician and patient-physician communication can be achieved with the right approaches including structured training in communication skills, continued medical education, audit feedback, environmental restructuring, cultural competence and incentives (Chauhan et al., 2017; Michie, van Stralen & West 2011; Wojciechowski et al. 2016).

It is well documented in the research literature that was reviewed for this project that nurses have been successful in leading interdisciplinary communication to facilitate behavioral change in the areas of chronic disease management, disease surveillance, in improved timely physician notification of crucial laboratory test results, for reduction of recruitment cost, patient adherence, reduction in lost to follow up, and improved overall quality of care (Donovan, J. L. 2015; Wade et al., 2015.)

Summary of Literature Review

Quality improvement interventions implemented in health care settings can help to bridge the gap in systemic and organizational functions, help to build teams with mutually beneficial relationships (providers, providers and patients), reduce process-related barriers that impede patient care, and improve overall patient outcomes (Kotecha et al, 2015; World Health Organization, 2016). This approach was chosen because it is well documented that using a nurse navigator can facilitate timely

communication between patients and providers, reduce lost to follow up, and subsequently prevent treatment delays (Paskett et al., 2016).

Technological approaches have proven to be an effective means of abnormal lab notification through automated alerts. However, results from large systematic reviews showed that the volume of daily alerts overburdened providers (Hysong et al., 2011; Singh et al., 2013; Singh et al., 2010). The researchers therefore recommended that an administrative review and follow-up is required to ensure that patients with actual abnormal results are not lost to follow-up.

Theoretical Framework

Kurt Lewin's Change theory was used for this process-driven quality improvement project. The theory focuses on positive forces to counter restraining forces or the status quo that impede progress, thereby paving the way for change to occur (Shirey, 2013; Wojciechowski, Murphy, Pearsall, and French, 2016). Major strengths of Lewin's Change theory are that it has been widely used, validated by different disciplines, and the theory's three-step model of Unfreeze, Freeze, and Refreeze is easily adaptable (Shirey, 2013).

The undeviating three-step model was cited by Shirey (2013) as a limitation for its use in certain change situations, due to the complexity of the constantly evolving health care environment. However, Wojciechowski et al. (2016), wrote that combining the supportive Lean Systems Approach to Kurt Lewin's linear theory yields success because the Lean Model focuses on staff empowerment, increase efficiency and process flow, patient safety, identification of underlying problems, and utilization of data.

Kurt Lewin's unfreeze stage includes awareness of the status quo and increasing the driving forces that will help to overcome the restraining forces, and direct behavior towards the new behavior. The change agent will need to provide a convincing explanation that the change is relevant and stakeholders will also need to identify factors that are for and against the change, have the willingness to see a need for change, and agree and with the change terms.

The freezing or transitional stage is the most difficult stage of this linear model because change is often resisted especially when people are accustomed to the status quo with the belief that it works well (Jenkins, 2005; Shirey, 2013.). Restraining forces in this stage can include fear of learning, lack of adequate training, or lack of adequate information about the new process. The change agent can abate stakeholders' fears by being a subject matter expert on the specific change being requested, by providing education and by mentoring to overcome fears (Shirey, 2013).

The last and final or refreezing stage constantly engaging participants in the fragile change stage to prevent reversion to the old ways. In refreezing the change agent will continue to emphasize the driving forces that facilitate the change, and also try to thwart any restraining forces from getting in the way of change. Refreezing produces a new stability which then becomes the norm that will oppose further change (Shirey, 2013; Wojciechowski et al., 2016).

The health care community where this proposed quality improvement project was implemented has existing bureaucracies that guide policy decisions. The plan was to use ongoing rates of chlamydia, gonorrhea and syphilis infections and reinfections, and data from prior treatment records to show that a change is required for patient safety. The

DNP student also used her role as a nurse specialist to provide expert coaching, education and mentoring for the new nurse-provider communication that is aimed at ensuring timely notification of abnormal sexually transmitted infection test results.

Methods

This quality improvement project goal was to improve the process of notification of providers at a large military hospital of abnormal chlamydia, gonorrhea, and syphilis test results, thereby reducing the time from diagnosis to treatment of affected patients. The intervention developed a standard operating procedure (SOP) that will serve as a guideline, for timely notification and follow up on sexually transmitted diseases in the Infectious Disease clinic.

The purpose of this communication-driven quality improvement project was to facilitate timely treatment of chlamydia, gonorrhea, and syphilis in a large military facility. By tracking new reported infections on a daily basis over a two month period the DNP student worked with providers to provide timely notification of positive results and initiation of treatment, The success of this project was determined by comparing days from diagnosis to treatment pre-intervention versus during the intervention.

Project Site and Sample

The quality improvement project was implemented using data from the Infectious Disease Clinic at a large military hospital. A preventive medicine physician, a nursing Chief, a nurse practitioner, two public health nurse (PHN) specialists, an administrative staff member, and three trained hospital health care technicians staff the clinic were involved. There was adequate staff for the implementation of this proposed quality improvement project and scheduled meetings were held with the Infectious Disease clinic

staff during which any untreated sexually transmitted infections past 72 hours of diagnosis were discussed.

The site of this DNP project provides health care services to active duty soldiers, retirees and their Tricare-eligible dependents. United States service members and their dependents stationed overseas, NATO and military allies, White House staff, Congress, and the Diplomatic community are also among individuals who seek health care services at this facility. Patients who seek health care services at the facility provide a wide representation of the United States' population because they come from different states.

The majority of patients that are seen in the Infectious Disease clinic are young adult to middle-aged men as well as older patients also seek ongoing care for communicable diseases. Patients are mostly seen for enrollment or management post enrollment in HIV pre-exposure prophylaxis (PrEP), for management of new and existing HIV infections and are either scheduled for care, self-referred, or are referred by their primary care providers for treatment after a confirmed HIV or other sexually transmitted infection diagnosis. Homosexual males account for the majority of patients seen in the Infectious Disease clinic and that population also accounts for over 60% of the daily positive sexually transmitted infection test results.

The department's monthly communicable disease tracking log also exhibits an increase in the number of sexually transmitted infection diagnoses among asymptomatic patients who present for routine screening for PrEP, because of required rectal and pharyngeal swabs that are done to rule out chlamydia and gonorrhea prior to enrollment.

All patients 19 years and older who received care in the Infectious Disease clinic and who tested positive for chlamydia, gonorrhea and syphilis were included in this

quality improvement project. Patients were not excluded based on pre-existing HIV status, recurrent infections, age, or sexual orientation. The quality improvement was aimed at reducing treatment delays through timely nurse-provider communication intervention. Every new infection or re-infection that was diagnosed during the same visit was counted as one occurrence.

Major stakeholders for this quality improvement project are the public health service, patients and the general community who stand to benefit from the timely treatment, which will help to prevent the spread of chlamydia, gonorrhea, and syphilis. Other stakeholders include providers of the Infectious Disease clinic who would have the assurance of an active daily administrative check system in place that will prevent them from missing abnormal or crucial test results.

Implementation Procedures

The daily logs of positive chlamydia, gonorrhea and syphilis test results were reviewed that were reported from the hospital's laboratories on patients that received care throughout the hospital. Treatment of patients with positive chlamydia, gonorrhea, and syphilis was tracked using a password protected excel spreadsheet that contained columns to record patients names, identification numbers, type of infection, date of diagnosis and treatment, and comments (see Appendix D).

While the diagnosis and treatment dates provided information about delays, the "originating clinic" column helped track quantitative data from the target clinic. Updates about reasons for delays or loss to follow up was recorded both in the "comments" section of the excel spreadsheet, and also in the patient's electronic medical record.

An email notification was sent to providers whose patients were not treated within 72 hours of a positive test result (see Appendix E). The chief of the Infectious Disease clinic was notified via email if no response from the provider within one working day. Local residents who were not treated within 72 hours were called and invited to come to the clinic to be treated by a health care provider and the director of the clinic was notified. Patients who could not be reached after three separate attempts within two weeks of diagnosis were considered lost to follow up. The same procedure was followed for out-of-state residents with the addition of an email sent to the public health nurse at the patient's local military base for follow-up.

Communicable disease reports and treatment records of past patients, especially those who were treated within the last three months preceding the implementation of the quality improvement project was used as baseline data. The timeline for the intervention phase of this project that was originally planned for two months, but was extended to three months to enable the collection of adequate data that is both comparable to the pre-intervention preceding months and sufficient to measure the effect of the nurse-led communication intervention.

Provider Survey

At the end of the quality improvement intervention a survey was administered to providers in the target clinic who were contacted about test results during the quality improvement project in order to obtain data about the effectiveness of nurse-provider email communication (see Appendix C). The survey focused on the provider's experiences with regards to the email communication from the DNP student, and

information about the provider's interest in building a working relationship to improve patient safety and outcomes.

The survey required providers to rate the following statements:

1. The QI project was beneficial to my department;
2. I like the email communication about abnormal lab results;
3. The emails from the nurse helped me to get in touch with patients faster;
4. The email communication helped me to view the nurse as part of my team;
5. I do not feel like the email communication was helpful.

Response options ranged from: N/A or Not applicable,

1. Strongly disagree,
2. Disagree,
3. Neither agrees nor disagrees,
4. Agree
5. Strongly agree.

The survey also had three open-ended questions that were designed to elicit information about providers' perception of the best aspect of the nurse-communication intervention. The questions included: 1. What were the best features of the QI process or nurse-provider communication? 2. What didn't you like or how might the intervention be changed? 3. How could the nursing communication improve?

Human Subjects Protection

The Hospital's Institutional Review Board (IRB) approved the project and none of the anticipated barriers affected the approval of the project proposal because it was determined to be a non-research and minimal risk project.

The names of all patients with positive chlamydia, gonorrhea, and syphilis test results whom providers in the Infectious Disease clinic cared for were uploaded daily in a password protected Excel spreadsheet that was kept on a password protected computer and could be accessed only by the public health nurse (see Appendix D). The printed list of positive patients was disposed in a secure shredder at the end of each day. The list was updated daily, Monday through Friday, to reflect new abnormal tests, treatment, and outcome of nurse-provider or nurse-patient communication. The spreadsheet was updated to reflect dates of treatment, loss to follow-up, and reasons for no treatment.

Patient data was protected throughout the duration of this quality improvement project. Only those involved with the project had access to the password-protected spreadsheet. The clinic staff receives mandatory annual HIPPA training, and they have the privilege to access patient information. The public health nurse met with the enlisted staff daily to answer questions and make clarifications and logged the names of all new infections in a password protected excel spreadsheet that were used for tracking treatments. The enlisted staff did not have any direct contact with patients or providers to avoid dissemination of conflicting information.

Data Analysis

The student in consultation with the hospital's biostatistician decided that the chi-square test was the most appropriate statistical analysis for the quality improvement project because the variables met the criteria. Descriptive statistics were used to generate frequencies for categorical variables and means and standard deviation for continuous variables. Results from statistical analysis, providers' surveys (see Appendix C), pre and post intervention treatment time, and disease trends, were analyzed using graphs (See

Appendix F). This approach in addition to tables of results from chi-square statistics enabled visualization of trends in treatment delays and it provided quick updates for sharing data with stakeholders. The use of graphs made comparing treatment data from the quality improvement intervention group with data from the three months preceding the DNP student's intervention easier.

Cost-Benefit Analysis/Budget

This quality improvement project did not require an operational budget because all required activities were within the DNP student's position description and within her scope of nursing practice (see cost analysis in Appendix A). This project was an opportunity to improve communication, improve disease surveillance, and training of enlisted military personnel in data collection and using excel spreadsheets.

Ethical Considerations

The University of Massachusetts, Amherst (UMass) Institutional Review Board (IRB) and hospital's IRB approved this DNP project. The reviews ensured that the project is in compliance with the Health and Human Services (HHS) Office of Human Research Protection (OHRP, 2009) policy for protection of human research subjects, as dictated in the Code or Federal Regulation title 45, subpart 46 (45 CFR 46).

There was no physical harm to patients and no harm is also expected in the future from the use of their data. The DNP student uploaded all information collected in an Excel spreadsheet. To prevent accidental disclosure, the DNP student adopted protective measures that prevented unnecessary exposure of patient information. All information collected for evaluating the impact of this project was stored in a password protected electronic database. All electronic files containing identifiable information were

password-protected to prevent access by unauthorized users and only the project coordinator had access to the passwords.

The DNP student followed the same patient protection rules that are currently in place at the target site for data that was accrued in this quality improvement project. As with all health care settings in the United States, all employees at the site of the process improvement intervention site were also in compliance with mandatory Health Insurance Portability and Accountability Act of 1996 (HIPAA) training, which, among other guarantees, protects the privacy of patients' health information (Modifications to the HIPAA Privacy, Security, Enforcement, and Breach Notification Rules, 2013). Also, all personnel with access to patient data followed the target site's standard for access and disclosure of patient information.

Results

Data was obtained from patients that received their care from providers in the Infectious Disease clinic and were diagnosed with chlamydia, gonorrhea and syphilis from August 10th 2017 through February 5th 2018. All patients, 20 years and older were eligible to participate regardless of underlying condition. There were a total of 127 male patients during the six-month period of which 68 were diagnosed and treated for at least one of the three sexually transmitted infections in the three months preceding the intervention period and 58 were treated in the three months of the nurse-led communication intervention. The age range of patients was 20-70 years with an average age of 35.2 years as shown in Table 1.

Table 1
Summary of Sample Used in Nurse-Communication Intervention Process Improvement Project

N	Pre-PI Group	PI Group	Minimum Age	Maximum Age	M	SD
126	68	58	20	70	35.21	10.95

Note. N= sample size, Pre=before, PI=process improvement, M=mean, SD= standard deviation.

Of those men seen in the clinic diagnosed with an STD, 51(40%) were HIV positive men and 66 (52%) of men were on Truvada for pre-exposure prophylaxis (PrEP), with nine (7%) of patients neither HIV positive or on PrEP (Table 2). This criteria was captured as a variable was to help understand if being in any one of the aforementioned groups contributed to delays in treatment times. However, it was noted that neither HIV status nor PrEP enrollment was a factor in treatment delays as illustrated in Table 2.

Table 2
Patient Characteristic Including Criteria That Prompted a Provider to Order Testing for Chlamydia, Gonorrhea and Syphilis

	Gender		Patient Visit Type		
N	Male	Female	HIV	PrEP	Non-HIV or PrEP
126	126	0	51	66	9

Note. N=sample size, HIV=human immunodeficiency virus, PrEP=Pre-exposure prophylaxis.

Differences in the Pre-Intervention and Intervention Groups

In testing for timely treatment for the groups, data was analyzed using chi-square test statistics. The DNP student observed that there were no statistically significant differences between the pre-intervention group and the group that received the communication intervention ($\chi^2 = 0.942$, df=1, p=0.332). The Fisher's exact test (p=.436) and Likelihood ratio (p=.330) also suggested that the null hypothesis that there is no relationship between nurse-communication intervention and treatment rates should be retained.

Table 3
Chi-Square Analysis of Data from Pre-Intervention and Nurse-Communication Intervention Groups

	Value	df	Asymp.Sig. (2-sided)	Exact Sig. (2 sided)	Exact Sig. (1-sided)
Pearson's Chi-Square	.942	1	.332		
Continuity Correction	.602	1	.438		
Likelihood Ratio	.948	1	.330		
Fisher's Exact Test				.436	.219
N of Valid Cases	126				

Note. df= degrees of freedom, Asymp=asymptomatic, Sig=significance, N=number

Even though this analysis indicated that there were no significant differences in the pre-intervention group compared to patients who received treatment for chlamydia, gonorrhea and syphilis, positive effect of the nurse-communication intervention were noted by plotting treatment data into graphs. More patients were treated within 72 hours in the last month of the nurse-communication intervention coincided with the end of the holiday season and the return to stable clinic hours as illustrated in Figure 1.

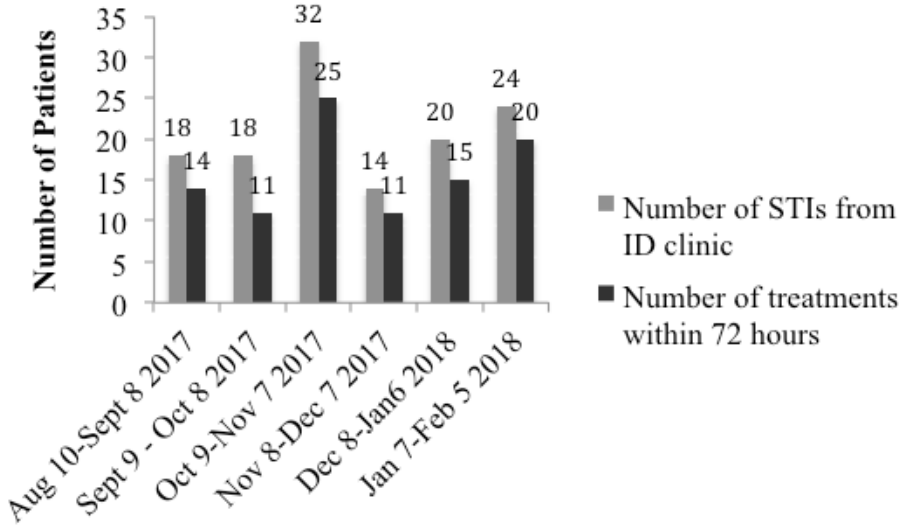

Figure 1. Number of sexually transmitted infections (STI) from the Infectious Disease clinic and number of patients who were treated within 72 hours from August 10, 2017 through November 7, 2017 (pre-intervention) and November 8, 2017 through February 5 2018(intervention).

Figure 2 also clearly depicts the positive correlation between the nurse-communication intervention and the rate of treatment within 72 hours as the nurse-communication progressed. The correlation was more positive toward the end of the intervention, which is an indication that the intervention was effective in reducing treatment delays. Outpatient clinic closures due to the Thanksgiving and Christmas holidays combined with impromptu clinic closures due to inclement weather conditions in late November through early January were theorized to have delayed treatment at this hospital in the past. This trend was clearly evident throughout the three months of the nurse-communication intervention. Figure 1. Shows a gradual increase in the total number of patients who were treated during the nurse-communication intervention. Perhaps a longer intervention time could have led to an increase in the number of patients with chlamydia, gonorrhea and syphilis that are treated within 72 hours.

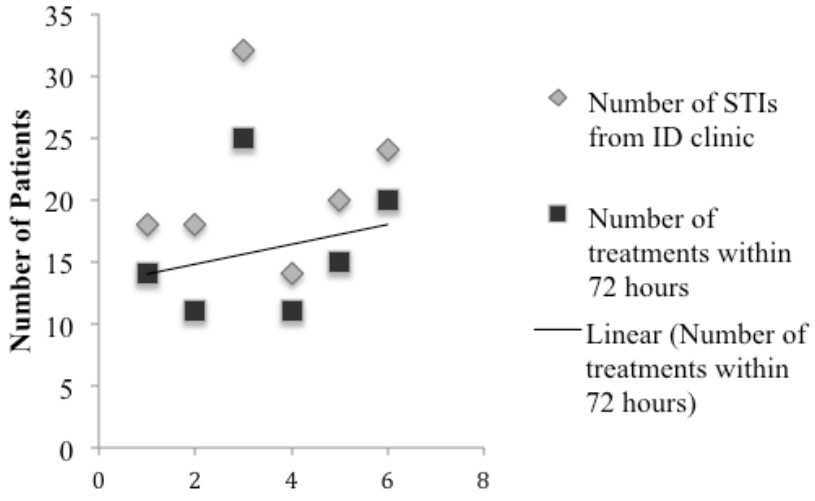

Figure 2. Linear forecast line showing progressive increase in the number of patients who were treated within 72 hours as the nurse-communication intervention progressed.

Provider Survey Results

Qualitative results from provider survey also showed the relevance of the process improvement intervention and providers appreciation of having the DNP student as a team member and to ensure quality assurance. Five out of six providers responded to the survey questionnaire. Out of that number, 40% of providers "strongly agree" and the remaining 60% also "agree" that the nurse-communication intervention was beneficial to the Infectious Disease clinic. Sixty percent of providers "strongly agree" and 40% "agree" that they liked the email communication about abnormal lab results.

To the question of whether emails from the nurse helped providers get in touch with patients faster, 80% of respondents "strongly agree" and 20% "disagree". Eighty percent of providers "strongly agree" that the nurse is part of their team and 20% "agree." Eighty percent of respondents also "strongly disagree" that the email communication was not helpful compared to 20% who "neither agreed or disagreed".

Responses to open-ended questions were also valuable as qualitative data as providers had the opportunity of documenting their perceptions of the nurse-communication intervention beyond the scripted survey questions. Their responses to the question "What were the best features of the QI process or nurse-provider communication included:

1. "I liked getting the extra reminders to call patients about results. Thank you";
2. "Just helps patients to treatment faster";
3. "Improved treatment process";
4. Helpful when fellows had (+) results-To make sure they follow up-Results go directly to fellows";

5. Checks quality services /efficient communication."

To the question "What didn't you like or how might the intervention be changed, one provider did not respond one provider wrote:

1. "No comment"
2. "QI process is great intervention process,
3. "Effective for fellows".

One provider was very detailed in his response writing, "I think we could move towards Preventive Medicine even calling with positive lab results and scheduling for treatment and documenting patient notification. Then we get the email that states "I called and patient is getting treated". At another Veterans Administration clinic, the Nurse Practitioners would call patient, treat, and notify us later. This gets patients treated faster."

To the last open-ended question that stated, "How could the nursing communication improve," 20% wrote "surveys and brainstorming" and the remaining 80% of providers did not respond.

Provider Versus Patient Factors in Treatment Delays

Both staffing patterns and patients' behaviors are the major factors that are responsible for the delays in treatment of chlamydia, gonorrhea and syphilis infections at the site where the process improvement project was implemented. However, the important question was what where the specific factors that lead to delays so that improvements can be made. Therefore, the student reviewed the medical records of all patients who were not treated within 72 hours in both groups to know if treating providers documented the actual reasons, and what those reasons were.

Providers' documentation showed that the factors for delay in patient notification and treatment of chlamydia, Gonorrhea and syphilis infections included:

1. patients were unreachable on their listed phone numbers,
2. wrong or no listed phone numbers,
3. patients request to come for treatment on a day that is convenient for them,
4. patients requested to be treated at a facility that is closer to home or work,
5. patients did not pick up medications that were called in to an outside pharmacy,
6. patients reported that they were on vacation at the time of notification and
7. others feared difficult weather conditions and therefore preferred to be treated at a facility that is closer to home.

Provider factors based on the review of patients' records include: patient notification closer to the 72 hour mark or later, provider being out of office, clinic closures, patient referral to another clinic for treatment without appropriate follow up. In a few cases medical school interns on rotation in the Infectious Disease clinic saw patients and communication about positive test results for those patients was directed to the supervising physician.

Chi-square test analysis of treatment data for both the pre-intervention and the nurse-communication intervention was statistically significant that providers and patients were equally responsible for delays in treatment ($\chi^2 = 61.725$, df=1, p=.000) as shown in Table 4 below. This finding is an indication that providers also need to improve on following up on laboratory orders, on timely notification of patients, and on following-up on patient referrals for treatment at outside facilities.

Table 4
Chi-Square analysis of data from patient factors and provider factors that led to treatment delays

	Value	df	Asymp.Sig. (2-sided)	Exact Sig. (2 sided)	Exact Sig. (1-sided)
Pearson's Chi-Square	61.725	1	.000		
Continuity Correction	57.773	1	.000		
Likelihood Ratio	64.976	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	126				

Note. df= degrees of freedom, Asymp=asymptomatic, Sig=significance, N=number

Discussion

Even though chi-square statistical analysis comparing the nurse-communication intervention with data from the three months preceding the intervention was not statistically significant with p=.426, monthly treatment data showed an improvement. Plotting the data for both groups on a graph showed that 83% of patients were treated for chlamydia in the last month of the intervention compared to a high of 78% in the preceding three months.

This may be an indication that the study would have had a greater impact on timely treatment if the timeline was extended or perhaps if the intervention was not implemented during the holiday season. Providers' survey results confirmed that the active surveillance of nurse-communication intervention improved timely notification and treatment of chlamydia, gonorrhea and syphilis infections and will also improve the nurse-provider relationship. Patient and provider factors for treatment delays were similar in the month's preceding the intervention and also during the intervention phase.

The knowledge of Kurt Lewin's Change theory helped with the anticipated resistance that often occurs due to change in large organizations such as the hospital where this intervention was implemented. Supervisors were convinced that there is a

need for change in the reporting of abnormal test results by presenting data on delayed treatments of chlamydia, gonorrhea and syphilis infections.

As a subject matter expert on communicable diseases and treatment guidelines, the DNP student's department trusted her therefore, the transition from freezing of the intended change overlapped with the refreezing stage. As a result, the proposed nurse-communication intervention was adopted as the standard for communicating abnormal chlamydia, gonorrhea and syphilis results even before the end of the three months intervention.

Findings from the nurse-communication intervention further confirm what is already known that quality improvement interventions can improve organizational functions. It is also widely documented in the literature that nurse-led communication improves interprofessional collaboration, improves nurse-provider relationships and facilitates better patient outcomes. Providers who completed the post intervention survey for this process improvement intervention stated that the timely communication of abnormal chlamydia, gonorrhea and syphilis results led them to view the nurse as a member of their team. The importance of inter-professional teams working in the best interest of the patients is supported in this DNP Project.

Setting Facilitators and Barriers.

Facilitators of the DNP project were the department's daily communicable disease report, which demonstrated a steady rate of sexually transmitted infections among patients who receive their care in the Infectious Disease clinic, and the monthly tracking data, which also showed ongoing delays in treatment.

No problems were encountered with communicating with providers in the Infectious Disease clinic because the DNP student was a part of the multidisciplinary team that meet regularly to discuss patients who were seen in the current week as well as those arriving in the near future. This insight about patients was helpful for planning ahead and become familiar with patients in order to monitor results closely. The presence of adequate support staff to implement the project was also a benefit.

Conclusion

Delays in the treatment of sexually transmitted infections are a serious problem that should not be overlooked by health care providers since it can have negative consequences for infected individuals and their communities. The findings from this nurse-communication process improvement intervention are a clear indication that there is a need for ongoing nurse-provider collaboration to ensure timely treatment for those patients with positive chlamydia, gonorrhea and syphilis infections.

The steady rate of new STI's at the site of the intervention justifies the need for a quality assurance check through daily surveillance to ensure that treatment is delivered in a timely manner. The treatment rate within 72 hours improved from 78% at the beginning of the nurse- communication intervention to 83% by the end of the three-month period.

The responses from providers were valuable in establishing a team-based approach for the treatment of the three most common sexually transmitted infections at the target site. The input from providers further fortifies the need for daily active surveillance to ensure that patients with positive test results receive timely treatment.

Providers in their responses also showed that they view the nurse as a part of their team and they expressed that the process improvement project was beneficial to them and

patients because it will improve nurse-provider communication and timely treatment of patients. This nurse-communication intervention project was the first to address delays in the treatment of sexually transmitted infections at the hospital where it was implemented.

The recommended 72 hours benchmark has now been adopted as the standard for communicating abnormal results and for the treatment of chlamydia, gonorrhea and syphilis infections. The standard requires the nurse in charge of disease provided daily briefing about pending treatments to the department's staff.

This project was chosen by leaders at the hospital as a valuable quality improvement project and posted for other employees to see to motivate others in positive changes in the workplace. The overall cost of this project was minor when compared to the risk of exposure and spread of chlamydia, gonorrhea, and syphilis from untreated individuals to the military community, to family members, and to the general population. Benefits included avoiding the cost of treatment of advance stages of syphilis, and the avoidance of physical costs such as infertility and a depressed immune system.

The department where this nurse-communication intervention was implemented now requires staff to verify and update patient phone numbers during every visit. Patients were also encouraged to list their preferred method of communication (email or phone call). The department has also acquired a cell phone so that staff can send text messages to patients instead of the traditional phone calls that often go unanswered.

Factors that continued to hinder timely treatment of sexually transmitted infections were multifaceted with both patient and providers sharing the responsibility for delays. Patient factors were mostly related to limited communication and personal preferences such as not responding to phone calls or not picking up medications.

Providers mostly notified patients late or did not follow-up on referrals for treatment at outside facilities.

A limitation to this nurse-communication process improvement intervention is that it was implemented during the holiday season. Data trends for the target clinic show treatments for sexually transmitted infections are typically slow in late November through early January due to facility and clinic closures caused by public holidays and inclement weather conditions. The DNP student believes that the rate of treatment within 72 hours would have increased even more significantly if it were not for the holiday schedule and inclement weather closures.

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Appendix A

Cost/Benefit Table

Item	Cost
Physical Materials	
2 packs of white paper	No cost (available free of charge within practice setting, i.e provider)
2 packs of mutlti-colored highlighters	No cost (available free of charge within practice setting, i.e provider)
Copying/printing of daily communicable disease report	No cost (available free of charge within practice setting, i.e provider)
Computer Information	
Desktop computer equipped with Microspft Excel software (not needed for project)	No cost (available free of charge within practice setting, i.e provider)
Personnel	
DNP candidate as project investigator	3 credits ($750 per credit)= $2,250.00 [not included in total cost given educational benefits of project]. Also included in role description as public health nurse specialist.
Transporation/Travel	
Travel/commuting expenses to/from practice setting (MBTA public transportation/parking)	No cost (available free of charge within practice setting, i.e provider)
Project Space for Program Implementation	
Meeting spaces (located within practice setting)	No cost (available free of charge within practice setting, i.e provider)
Total	
	$0.00

Prepared by Kattie Khadar on June 10, 2017.

Appendix B

Simplified QI schedule

Task	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018
Begin logging all chlamydia, gonorrhea and syphilis in excel spread sheet, monitor treatments, notify providers & patients if no treatment	X	X	X	X	
Send out surveys to providers				X	
Compare pre and post QI data				X	
Results presented to local stakeholders					X

Prepared by Kattie Khadar on June 10, 2017.

Appendix C

Post intervention survey questionnaire for Infectious Disease clinic providers

QUALITY IMPROVEMENT EVALUATION

We would like your feedback on your group experience during the three-month **Quality Improvement (QI)** intervention in the Preventative Medicine department. This information is voluntary and will be kept confidential. We appreciate your honesty and ask that you do not put your name on the sheet so that your responses will remain anonymous. Your feedback will help us to improve our processes in communicating abnormal laboratory results. Please fill out this form and return it to Kattie Khadar @ kattie.khadar.civ@mail.mil.

For #1-5, please circle the number along the scale that best represents your counseling experience:

Not Applicable N/A	Strongly Agree 5	Agree 4	Neither Agree or Disagree 3	Disagree 2	Strongly Disagree 1

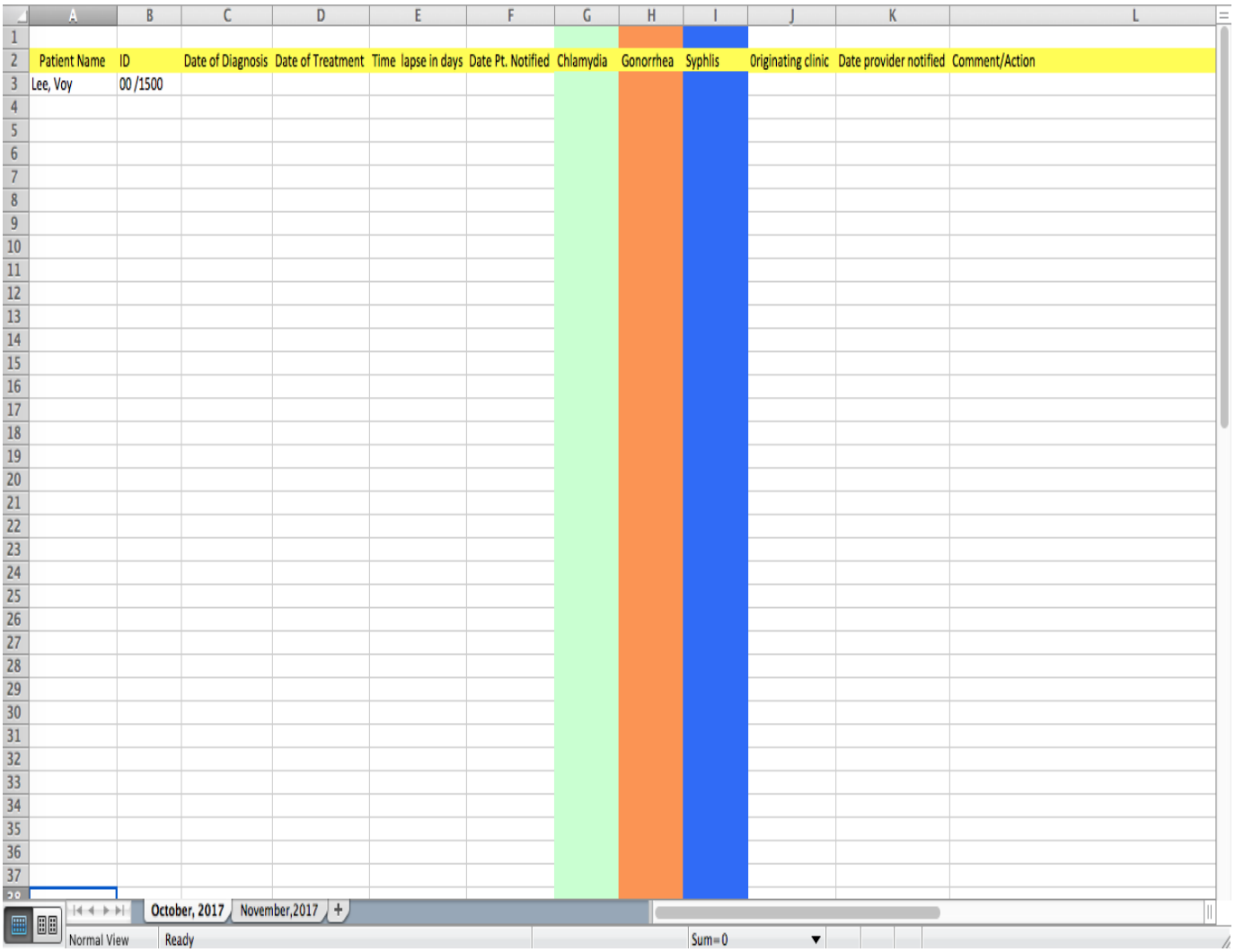
1. The QI project was beneficial to my department. N/A 5 4 3 2 1
2. I liked the email communication about abnormal lab results.
3. The emails from the nurse helped me to get in touch with patients faster. N/A 5 4 3 2 1
4. The email communication helped me view the nurse as part of my team. N/A 5 4 3 2 1
5. I did not feel like the email communication was helpful. N/A 5 4 3 2 1
6. What were the best features of the QI project?_____
7. What didn't you like or how might the intervention be changed?_____
8. How could the nursing communication improve? _____

Project coordinator's name _____

Prepared by Kattie Khadar on June 10, 2017.

Appendix D

Daily Communicable Disease Log

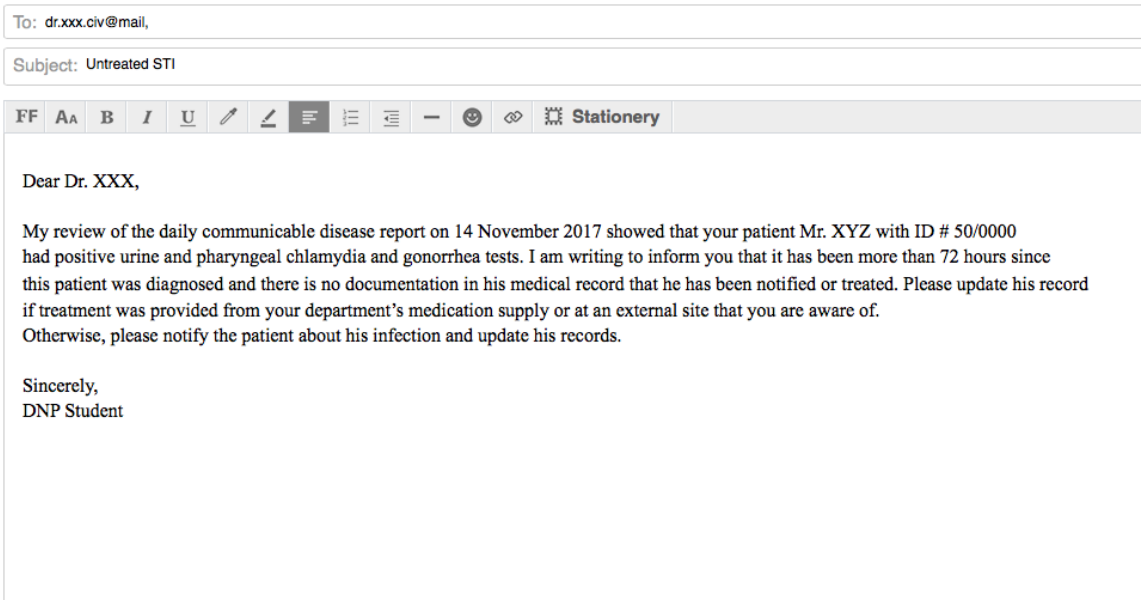


Patient Name	ID	Date of Diagnosis	Date of Treatment	Time lapse in days	Date Pt. Notified	Chlamydia	Gonorrhea	Syphlis	Originating clinic	Date provider notified	Comment/Action
Lee, Voy	00 /1500										

Prepared by Kattie Khadar on June 10, 2017.

Appendix E

Sample of encrypted email that was sent to Infectious Disease clinic providers


To: dr.xxx.civ@mail,

Subject: Untreated STI

FF AA B I U Stationery

Dear Dr. XXX,

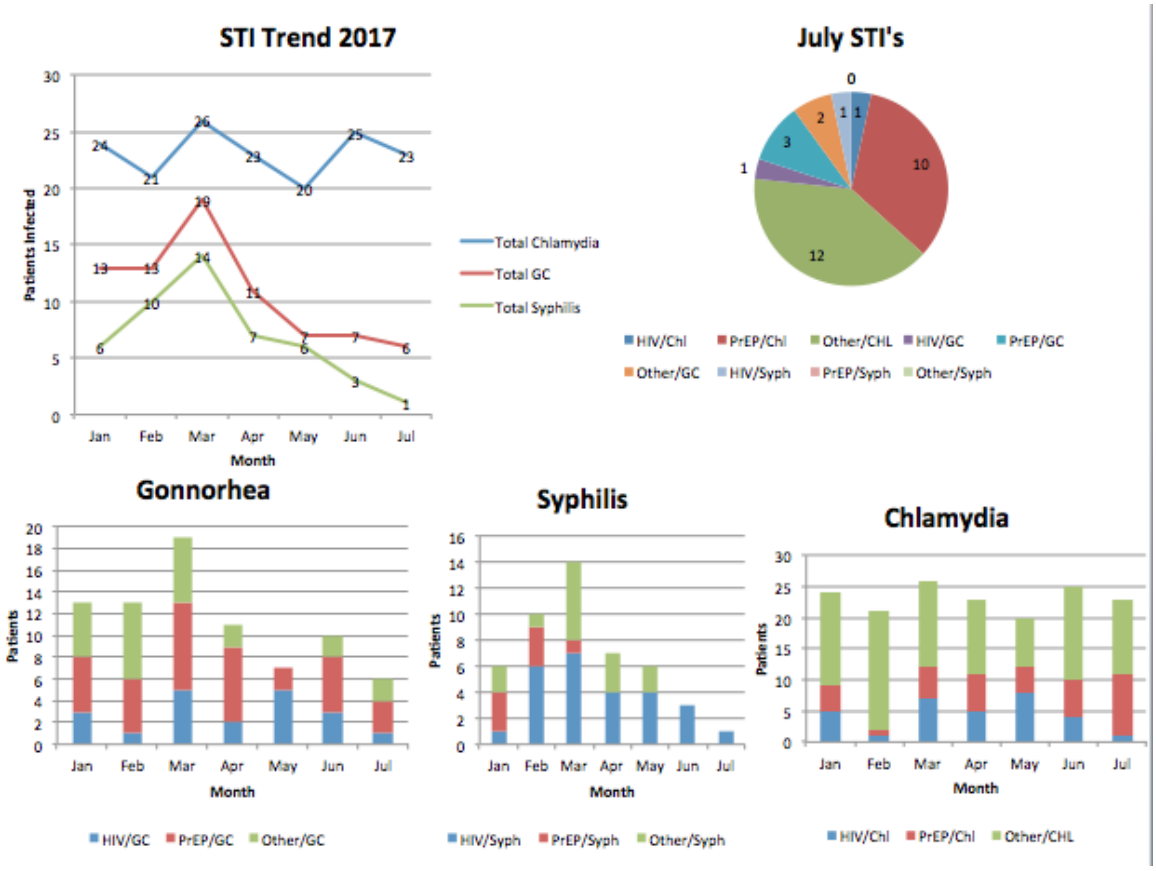
My review of the daily communicable disease report on 14 November 2017 showed that your patient Mr. XYZ with ID # 50/0000 had positive urine and pharyngeal chlamydia and gonorrhea tests. I am writing to inform you that it has been more than 72 hours since this patient was diagnosed and there is no documentation in his medical record that he has been notified or treated. Please update his record if treatment was provided from your department's medication supply or at an external site that you are aware of.
Otherwise, please notify the patient about his infection and update his records.

Sincerely,
DNP Student

Prepared by Kattie Khadar on June 10, 2017

Appendix F

Sample graphs of monthly chlamydia, gonorrhea, and syphilis infections



Prepared by Kattie Khadar on 9/3/2017