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A Policy Change to Reduce Hospital-Acquired Clostridium Difficile Infection Rates: A Quality Improvement Project

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A Policy Change to Reduce Hospital-Acquired Clostridium

Difficile Infection Rates: A Quality Improvement Project

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NUR7801: DNP Practicum III

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**University of St. Augustine for Health Sciences
DNP Scholarly Project
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Abstract

Practice Problem: At a small community facility in Los Angeles County, there was a reporting rate of hospital-acquired *Clostridium difficile* cases that was higher than both state and national benchmarks.

PICOT: The PICOT question that guided this project was: In acute care patients aged 18-90, does not retesting for CDI for at least seven days compared to retesting in less than seven days reduce the incidence of false positive CDI tests during the first seven days of the hospital stay?

Evidence: The evidence demonstrates that if patients are tested initially for *Clostridium difficile* and then retested seven days after, the rate of hospital-acquired *Clostridium difficile* decreases.

Intervention: A facility policy was implemented to restrict CDI testing until seven or more days after the initial test.

Outcome: A total of 19 patients were initially tested for *Clostridium difficile*. Medical personnel determined that only two of those patients needed a second test, which was done after seven days. There were no hospital-acquired cases during the project period, unlike during the same time frame the previous year.

Conclusion: The project results supported the literature showing that waiting seven days before performing a repeat *Clostridium difficile* test can reduce the number of hospital-acquired *Clostridium difficile* cases by reducing false positives. This was beneficial to the hospital which was able to reduce costs, and improve the quality of the care.

A Policy Change to Reduce Hospital-Acquired Clostridium Difficile Infection Rates:
A Quality Improvement Project

The purpose of this project was to implement a policy change that would reduce the number of patients being misdiagnosed with hospital-acquired Clostridium difficile infection (CDI). Infections caused by the bacteria can cost hospitals as much as \$3.2 billion annually (Surawicz et al., 2013). This paper describes the significance and the framework of the problem, synthesize and interpret the related literature, define practice recommendations, describe the project setting, report the project mission and objectives, discuss the project implementation and evaluation, and explain its dissemination.

Significance of the Practice Problem

Clostridium difficile is a gram-positive bacterium (Block et al., 2018). It is a leading cause of gastrointestinal illness. About 500,000 patients contract CDI each year, resulting in 30,000 deaths in the United States (Lee, 2018). According to Mao et al. (2018), Caucasian patients have a higher risk for CDI when compared to African-American, Hispanic, Asian and Native American patients. Infection rates have increased steadily since the year 2000, mostly affecting the elderly (Pechal, et al., 2016). Eighty percent off patients who die from CDI are 65 and over; one out of every 11 patients who are aged 65 or over will die if they contract the infection (Pechal, et al., 2016). Patients who have CDI have been known to have long lengths of stay can be increased by as much as six or seven days (Chopra et al., 2015). According to Zhang et al. (2016), the cost per hospital-acquired CDI case is \$34,157, CDI case management and CDI-attributable costs per case are \$42,316. However, the length of stay, and the costs associated with a complex infection, are not the only concerns, as patients who contract CDI are twice as

likely to be readmitted to the hospital (Chopra et al., 2015). Readmission costs for CDI can be as high as \$13,000.

Due to the costs of this preventable infection, the Centers for Medicare Medicaid Services (CMS) mandates hospitals to report CDI rates. The CDI data is calculated by the Standardized Infection Ratio (SIR) as required by the National Healthcare Safety Network (CDC, 2018). The SIR is computed by dividing the number of observed CDI infections by the number of predicted infections. If the SIR is >1 , then there were more CDI cases than predicted, based on the 2015 national aggregate data (California Health & Human Services Agency, 2017). The goal is to have less than that (CDC, 2018). According to Pimentel, et al. (2018), “CMS is seeking to shed light on this type of preventable patient harm and raising the stakes by putting financial penalties and a hospital’s public reputation at risk” (p.414).

Patients or their families may further damage a hospital’s reputation by suing the hospitals because of CDI. If the patient or family can prove that medical negligence was involved, then they have a case (Boeschen, n.d.). In one lawsuit where a patient died due to CDI, the facility had to pay \$218,500 (Waldsmith, n.d.).

Reducing CDI rates, hospitals will improve patients’ quality of life. Lowering hospital-acquired CDI will decrease length of stay, death, and suffering from symptoms and time spent in isolation (Block et al., 2018). Patients’ family members who visit will be at a decreased risk of contracting CDI (Barker et al., 2017). And hospitals will reduce the potential for costly CDI-related hospital stays and CMS penalties.

Framework of the Problem

For the purpose of this project, the Kurt Lewin Change Theory was utilized (Cumbler et al., 2013). This model has been used previously for this type of project (Shingler-Nace et al.,

2019). It has three steps: unfreezing, change, and refreezing (Cumbler, et al., 2013). The *unfreezing* phase consists of convincing people to change their current pattern of behavior (Cumbler et al., 2013). For the current project, this step involved implementing an evidence-based policy so that CDI testing cannot be repeated within a seven-day period, and educating the staff about the new policy.

Before this policy change, patients who came into the hospital with diarrhea were tested initially for CDI. Then the test happens again within a day or two; most of these patients would have had a *Clostridium difficile* test orders three times within a three-day period. As described in the Themes from Literature section of this paper such repeated testing is not warranted because it increases false positives. Thus, the practica site's Handling Patients with *Clostridium Difficile* Infections Policy was changed under the section that states, "Testing will be performed using EIA." A statement was added that if a patient has been tested once, they will not be retested until seven days have passed. This policy can be reviewed in Appendix A.

In the *change* phase, people are convinced that the new way is better (Cumbler et al., 2013). The nurses at the practica site were shown a brief PowerPoint presentation so that they understood the severity of the CDI testing problem, and why the change was necessary. Then, in the refreezing phase, the change becomes a new and accepted process (Cumbler et al., 2013). The refreezing step was deemed complete when the staff realized that they are not being reminded to stop reordering the CDI testing. Ongoing monitoring of CDI testing at the facility in question was conducted by the project manager, charge nurses and the infection preventionist.

PICOT Question

The PICOT question for this project was: In acute care patients aged 18-90, does not retesting for CDI for at least seven days compared to retesting in less than seven days reduce the

incidence of false positive CDI tests during the first seven days of the hospital stay? The population was adult inpatients on the intensive care unit, telemetry unit and medical surgical unit of an acute care hospital. Any patients aged 18 and over were eligible for inclusion. Pediatric patients admitted to the medical surgical unit were excluded. The intervention was intended to reduce the number and frequency of repeat CDI test so that patients exhibiting symptoms of CDI (such as diarrhea or abdominal pain) were tested once, and then only retested once more after seven days in the hospital. The comparison intervention was patients admitted one year prior to the intervention period who had an initial test for CDI and were then retested prior to the seven-day period.

The purpose of the study was to compare the number of positive CDI tests in the intervention group (those patients who have repeat testing after seven days) to the number of positive CDI tests in the group who underwent earlier or more frequent repeat testing. The facility uses the Clostridium difficile A & B test, which gives two results: an antigen and a toxin. A patient is considered positive for CDI if the toxin test comes back positive. Patients who were tested once and had either a negative result or a positive antigen result, and were then retested within three days and have a positive result were deemed “false positive.” The desired project outcome was for there to be a reduced number of false positive results for CDI testing, in an attempt to save the hospital thousands of dollars and avoid treating patients for CDI who do not truly need it during the first seven days of their hospital stay.

Literature Search Strategy

A literature review was performed to answer the PICOT question. In acute care patients aged 18-90 (P), does not retesting for CDI for at least seven days (I) compared to retesting in less than seven days (C) reduce the incidence of false positive CDI tests (O) during the first seven

days of the hospital stay (T)? The first search was performed on the American Journal of Gastroenterology website. The PICOT question was used as the search phrase. The search resulted in one article. The following search was completed on the Biomed Central Journal. The search term used was “repeat testing for Clostridium Difficile”. There were 10 results, and abstracts of the 10 results were reviewed. One article was selected; the other nine results were abstracts from presentations, which are not appropriate for this project.

After these two initial searches, a search was conducted on the Infection Control and Hospital Epidemiology website. The search was limited to open access articles with the date range of 2000-2019, it produced 27 results. All 27 abstracts were reviewed. One article was selected, as this article focuses on repeat CDI testing.

On the PubMed database, the search phrase “repeat testing for Clostridium difficile” was used. This resulted in 72 articles, and all abstracts were reviewed. There were 18 articles pertinent to the topic. Finally, on Search USA, the search term “repeat testing for Clostridium difficile” was used, which produced 17 articles. After the abstracts were reviewed five articles were selected. The search results can be viewed as a PRISMA model in Figure 11.

Literature Search Results and Evaluation

A total of 25 articles were selected based on the inclusion criteria. Six of the articles reviewed were clinical practice guidelines. Each of the guidelines was reviewed using the AGREE tool (Brouwers, et al., 2016). In addition, there were 17 primary research articles and two systematic reviews evaluated using the STROBE model (von Elm et al., 2008).

The evidence table for the primary research articles can be viewed in Appendix B. The evidence table for the systematic reviews can be examined in Appendix C. The articles were analyzed for level of evidence and quality ratings using the method described by Dearholt and

Dang (2012). There are seven levels of evidence, ranging from Level I, which is considered to be a systematic review, to Level VII, which is an expert opinion or consensus statement. The diagram in Figure 12 shows all seven levels of evidence.

Overall, the evidence of the 25 articles reviewed for this project can be rated a Level IV. This rating was given because six of the primary research articles achieved a Level IV evidence rating, but three of the primary research articles only received a VI evidence rating, which brought the overall evidence rating down. In order for the group of articles as a whole to achieve a higher evidence rating, three more primary research articles should have received an evidence rating of Level I.

In regards to quality, the 25 articles reviewed achieved a B for overall quality. This was the case because six of the articles were determined to be A quality, and eight of the 25 articles were rated an A or B for quality. If at least 12 of the articles achieved a rating of A or B, then the whole body of evidence reviewed for this project could have achieved a quality rating of A. Despite only five articles having an A quality, the level of evidence of the group of articles warranted the practice change.

Themes from the Literature

The consensus among the six clinical practice guidelines reviewed is that CDI testing should only be done seven days after the initial CDI test. Bobenchick et al.'s (2019) systematic review (which earned an evidence Level I and a quality grade of A; see Appendix C) considered six practice guidelines for CDI testing and advocated for retesting only after seven days, specifically because retesting sooner can cause false positive CDI test results. Indeed, repeat testing in less than seven days leads to inappropriate treatment because negative results are more likely to be changed to false positives (Aichinger et al., 2008; Buckel et al., 2015; Gade &

Turrett, 2009; Surawicz et al., 2013). Khanna et al. (2012) found that 1,759 patients who were tested twice in the same day, 42 of the results converted to positive. Furthermore, Luo et al. (2013) found that of 2,949 repeated tests, 135 of them converted to positive in six days or less.

The increase in hospital-acquired CDI cases may be due to cases being misdiagnosed from over testing (Grien et al., 2014). This may be because of the sensitivity of the CDI toxin A & B test to result in a false positive (Green et al., 2014; Toltzis et al., 2012). However, Cardona and Rand (2008) found that when they tested patients every day for six days, the patients consistently tested either positive or negative each time, lending support to the conclusions that early repeated testing is not only unnecessary, it is not cost effective (Depshande et al., 2010; Mohan et al., 2006; Mostafa et al., 2018).

Hospitals can avoid such false positives, or changes from a negative to a positive result, by limiting CDI testing. Kamboj et al. (2018) showed that out of 31 hospitals, 15 of them have a policy in place restricting repeat CDI testing within seven days. Other studies showed that a hard stop could be added to a facility's medical charting software to prevent CDI retests. For example, both Quan (2018) and Block et al. (2018) did experimental studies showing that a hard stop in the electronic medical record reduced repeat test orders significantly. In addition, Madden et al. (2018), which was also an experimental study that earned an A rating for quality, demonstrated a 41% reduction in repeat testing.

Regardless of the clear benefits attributed to less frequent CDI testing, some healthcare staff believe that ordering multiple CDI testing is necessary. Both Zilberg et al. (2011) and Blanco et al. (2018) explain that many clinicians order multiple CDI test after the initial is negative. This mindset seems to be an attempt to overcome the testing sensitivity; however, it

increases the risk of false positives. The majority of the articles reviewed for this project clearly state that repeat testing should be restricted to five to seven days after the initial test.

Practice Recommendations

Using the available evidence, it is clear that if repeat testing for CDI is restricted to being performed seven days or more after the initial testing, then the risk of creating false positives for hospital-acquired CDI is reduced. All of the clinical practice guidelines reviewed indicated that repeat CDI testing should not be performed until seven days after the initial test. In various primary research studies the same result was also discovered.

Project Setting

The setting for this project was a 117-bed acute care hospital in Southern California. The hospital has been in practice for over 50 years. In 2011, the hospital was purchased by the Avanti company making it part of a four-hospital system in Los Angeles County. In 2018, the hospital was purchased by the Pipeline Company. There are over 270 staff members and 200 physicians. The hospital is accredited by the Joint Commission for primary stroke, the lab and the facility. The units consist of an emergency department, an intensive care unit, medical-surgical unit, and telemetry unit. The patient population is 66% Hispanic, 13% Caucasian, 13% Asian, 6% African American, 1% American Indian, and 1% Pacific Islander or other. The top five admitting diagnoses are: abdominal pain, hyperglycemia, heart failure, chronic obstructive pulmonary disease and altered level of consciousness.

The facility's mission statement is "to provide affordable, high-quality healthcare services to our communities with consistency and compassion." The facility vision statement is "each life is a priority." There are three organizational charts. At the top are the head members of the Pipeline Company. Below them are the heads of the Avanti Company. The last one is the

hospital organizational chart. The members at the top are Governing Board, the Chief Medical Officer, the Chief Executive Officer and the Chief Nursing Officer. Below them are the various departmental directors such as: Lab, Radiology, Dietary, Housekeeping, Cardiopulmonary, Infection Control, Quality, Emergency Management, Education, and Nursing Directors. The culture at this facility is very diverse. There is staff from a plethora of backgrounds including: African American, Caucasian, Filipino, Korean and others.

The check sheet method (see Appendix D) was utilized to assess the need for a change regarding CDI. During this assessment it was determined that the facility had seven cases in 2017, three cases in 2018, and 11 cases in 2019. In Figure 13 is a comparison of the SIR for the hospital, the state benchmark and the national benchmark. The CMS (2019) uses the winsorization process to evaluate the results of hospital acquired infections. Based on this process the hospital is below the fifth percentile for CDI for the time period of January 2017 to December 2018.

The key stakeholders at the hospital are: the Chief Executive Officer, Chief Nursing Officer, Infection Preventionist, Infection Control Chairman, Chairman of the Governing Board, the Chief Medical Officer, Chief of Medicine and a controller.

They are very concerned about this issue. After hearing some ideas on how to address this problem, support was offered. This project was carried out with the assistance of the infection preventionist, educator, and the nursing supervisors.

A SWOT analysis was conducted on 10/4/2019; the results are in Appendix E. Some of the strengths identified were the support from the key stakeholders and the preceptor. The opportunities to address the CDI problem were the strong leadership structure, the new hospital ownership and the heavily involved medical staff. One the main weakness was the restrictions of

the electronic medical record. At this time, a hard stop to prevent multiple CDI orders could not be put in place. One of the main threats to the project success is the high nursing turnover rate.

Project Overview

The mission of this project was to reduce the risk of false positive CDI results. The vision of this project was to reduce the number of hospital-acquired *Clostridium difficile* cases. The project's mission aligns with the mission of the facility, as the mission's focus is on high-quality care. The short-term objective was to change the policy so that patients could not be retested within seven days. One long-term objective was to educate the staff and monitor to ensure that repeat orders are not being done before a 7-day timeframe. Another long-term objective was to decrease costs related to CDI. One example of how this project could help the hospital achieve its mission of high-quality care is that it could help provide appropriate care for patients, so that hospital-acquired CDI does not occur. One possible risk or unintended consequence was the resistance of nurses to the policy change. As an incentive, the facility's staff recognition program was utilized for nurses who are routinely following the new CDI testing policy.

Project Plan

The change model used for this project was the PDCA Cycle (Johnson, 2016; see Appendix F). The PDCA stands for *plan, do, check, act*. This model was chosen because it was a good fit for the project. It has been used for similar projects like this (Block et al., 2018). This is also the standard model that the facility utilizes, so the staff was familiar with it.

Plan

The *plan* was to create the new policy. The current infection control manual was reviewed, and the policy was revised to include that a patient tested for CDI will not be retested within seven days of the first test. The policy was changed with the assistance of the Infection

Preventionist. Barriers to this change were not expected, because the key stakeholders were very concerned about this topic. The form in Appendix G contains the evidenced-based practice council approval letter and Appendix H contains the signatures of approval from the stakeholders.

Do

The *do* step involved educating the staff and applying the policy. The ARCS instructional design model was utilized (see Appendix I). This model focuses on getting the nurses attention, showing them the relevant evidence, giving them confidence and raising their satisfaction. A meeting was held with the educator to discuss the education plan for the change. The education was conducted with the assistance of the infection preventionist, educator and the nursing supervisors. Once 80% of the nursing staff had been educated on the new policy, the policy went into effect on 2/27/20. Once the policy was in effect, ongoing monitoring of patients with CDI testing was conducted. The monitoring was completed with the assistance of the charge nurses. A barrier to this step was the high nurse turnover at the facility. In an effort to combat this, the policy was added to the nursing orientation educational material. This way all new incoming nurses were aware of the policy. The nurses signed an attestation form that they are knowledgeable of the policy change. See Appendix I for the attestation form.

Check

In the *check* step, the information technology department was requested to create a daily report that tracks patients with the C-diff A & B test ordered. The nurses taking care of these patients were reminded that repeat testing was not permitted until after seven days. A barrier to this step was that nursing did not have access to request a hard stop in the electronic medical record to stop any repeat orders. Thus, nurses who order a repeat test were, reeducated.

Act

The *act* step included asking the staff their opinions on the change and reviewing the compliance data as well as the CDI rates. The evaluation of the project was conducted from 5/15/20-5/31/20. The schedule for the project is located in Appendix J. The main resources needed were the assistance of at least two of the departmental leaders as well as the nursing staff. My role as project manager was to lead the project. The nurse educator, infection preventionist, and the project manager worked together to educate the staff. Interprofessional collaboration was needed for this project to be a success.

The budget was based on the situation currently at the practica site. Staffing costs were calculated based on the base rate per position and included 57 staff registered nurses \$19,767.60, 14 charge nurses \$6,684.72, five nursing supervisors \$2,803.20, one nurse educator \$320, and one infection preventionist, \$224. Supplies included the following: paper, pen, binder, and laminating paper which totaled \$361.25. The costs of electricity and the computer are not included as they are normally in use in the facility. Services and Statistician were not used. The budget is shown in Table 1.

Project Evaluation Plan

The project was evaluated by comparing the number of CDI cases before implementation to those after implementation. A comparison of the pre-implementation to postimplementation SIR was completed, and a t-test comparing the two numbers was calculated to determine if any change was significant. These data were based on NHSN criteria.

The hospital's IT department created a report that identified patients who were tested for CDI. A review of the number of patients who were repeat tested was performed. The repeat testing percentages were compared and a significance test was calculated. A table was then

developed showing those patients' demographics, including age, gender, and ethnicity. The units the patients were on was included. The emergency department, pediatrics and operating room were not included. The patients' medical record numbers, names, and birthdays were not included to prevent a violation of privacy of health information.

To get a complete picture of the situation before and after implementation, other outcome measures and financial measures were compared: CDI mortalities, length of stay and readmissions. In addition, process measures, including staff education and compliance, were assessed during the project.

Appendix K includes the categories for the data variables. All data were collected onsite and entered into Microsoft Excel in a private office to protect patient privacy. A CDI Detection and Surveillance Assessment was conducted (Minnesota Department of Health, 2018). This tool asks questions about the repeat testing (see Appendix L). If there are multiple "yes" answers on the tool, then the change was successful.

Project Evaluation Results

The data collection took place after 57 (86%) members of the nursing staff were educated by the project manager, nurse educator and infection preventionist. The implementation period for the project was from February 27, 2020 to April 20, 2020. During that time period, a total of 19 patients had CDI testing ordered.

Figure 1. Of those 19 patients 13(68%) were male and 6(32%) female participants.

Figure 2. The racial demographics of the group were 8 (42%) were White, 2 (11%) were Asian, and 5 (26%) identified themselves as another race. Participants' ages varied widely, with a minimum age of 30, a maximum age of 90, a mean of 72, and a standard deviation of 16.9.

Figure 3. Five percent of patients were between the ages of 30-39 and 5% between the ages of 40-49. 11% were between the ages of 50-59 and 11% between the ages of 90-99. 21% were between the ages of 60-69 and 21% between the ages of 70-79;and 26% between the ages of 80-89.

Figure 4. This bar graph displays what units the participants were on when they were tested for CDI, 68% of the patients were in the Intensive Care Unit, 26% were in the Telemetry unit and 5% were on the Medical-Surgical unit.

Figure 5. Participants were admitted from two locations, 12 (63%) from nursing homes and 7 (37%) of the patients were from their own home.

Data on CDI testing from the implementation period (February 27, 2020 to April 20, 2020) was compared to the same time period in the previous year by the infection preventionist and the project manager. From February 27, 2019 to April 20, 2019 there were 63 CDI tests ordered by the hospital compared to 21 tests during the implementation period. A t-test was conducted using Excel 2007 to compare the hospital-acquired CDI test results between pre-implementation (2) and post-implementation (0) time periods. A two tailed distribution was used with a two-sample unequal variance. The calculated p-value=0.16. The alpha for this project was set at > 0.05 , so this result was not statistically significant.

Only two participants had repeat testing performed during the intervention period. Both tests were done appropriately, seven days from the initial test, and they both were negative. The cost of each CDI test performed was \$134.36. In 2019 during the time period in question, \$8,464.68 was spent on CDI tests, while in 2020 only \$2,821.56 was spent by the hospital, demonstrating a cost savings of \$5,643.12.

Figure 6.

The number of CDI cases during the implementation period was zero, compared with two cases in the same period during 2019. Because the typical hospital-acquired CDI cases typically costs \$15,397, and the 2019 time period had two cases; the project resulted in a savings of \$30,794 in 2020. Also, in 2020, the SIR was zero, compared with one from the previous year. The comparison in the SIR rates is located in Figure 7. For both time periods, there were no CDI readmissions and no mortalities.

The nursing staff compliance with the project was 100%. The CDI Detection and Surveillance Assessment was used for evaluation by the infection preventionist and the student, and it is located in Appendix L. Based on all of these data, this project was a success.

Figure 7. This bar graph shows the SIR rate at the hospital during the 2019 pre-intervention period, the California state average, the national average, and the hospital's SIR rate during the 2020 intervention period.

Figure 8. Displayed here are the initial results for the 19 participants, 84% were negative, and 16% were positive.

Figure 9. Repeated Test Results. Of the 19 patients initially tested for CDI, only two were deemed necessary to retest within the seven-day window. Both patients had a negative antigen and negative toxin result.

Figure 10.

Discussions and Implications

The project asked: In acute care patients aged 18-90, does not retesting for CDI for at least seven days compared to retesting in less than seven days reduce the incidence of false

positive CDI tests during the first seven days of the hospital stay? Our reported findings suggest that retesting patients only after seven days does reduce the incidence of false positive CDI results. Upon initial testing, (3) 16% of patients were admitted with CDI, and 84% did not have CDI.

This project was a successful attempt to change the practice, as 86% of the nursing staff was educated on, and 100% were compliant with, the new policy. One of the reasons for this achievement was due to the collaboration of the team. Nurses were educated by the educator, infection preventionist and the project manager. The charge nurses were the champions on the units. Only once during the project period was a CDI test ordered that did not follow the new policy. This occurrence was made by a registry nurse, but the order was cancelled by the charge nurse of the unit. As no specimen was collected, this did not result in a policy violation.

The project results aligned with the recent literature, that repeat CDI tests should not be performed until at least seven days have passed since the initial test. There were no positive retests, no mortalities due to CDI, and no readmissions. Possible reasons for these results include the low number of participants and the limited time frame. The low number of patients was most likely due to the COVID-19 pandemic. The pandemic led to a stay-at-home order, which reduced the number of patients coming to the facility.

The findings of this project are relevant to practice. The hospital had fewer cases of hospital-acquired CDI during the project period, which demonstrates increased quality of patient care. Because hospital CDI data is required to be reported and is posted online, patients will be able to see the improvement, and the hospital will gain more reimbursement from CMS. The project also resulted in a total costs savings of \$36,437.12, due to reduction in number of tests ordered and no hospital-acquired CDI cases. Due to the success of this project, it should be

replicated, but with a longer time period of at least six months. This project should also be carried out at a hospital with a larger patient census.

Plans for Dissemination

The results of the project were shared with the key stakeholders, the CEO, CNO, Infectious Disease Physician, Chief of Medicine, Chief Medical Officer and the Chairman of the Governing Board. A PowerPoint presentation with the key points of the project was presented at Infection Control Committee. A handout with highlights of the project was posted in the break areas and discussed at nursing department meetings. The results were shared with infection control departments from the other hospitals within the system, as well as with the nursing homes, assisted living facilities and senior centers in the area.

In addition to local dissemination, the abstract will be submitted to the 16th World Congress on Infection Prevention and Control which will take place online on September 16, 2020. The Association for Professionals in Infection Control and Epidemiology was cancelled for 2020; however, an abstract will be submitted for 2021. Results will also be submitted for publication in an appropriate journal such as, *Prevention Strategist* or *American Journal of Infection Control*. The project will be archived in SOAR@USA and the Virginia Henderson Library.

Conclusion

The intention of this paper was to describe each step of a scholarly project that would result in a reduction of false positive, hospital acquired CDI. Hospital-acquired CDI is tremendously costly as well as detrimental for the patients, their families and the facility. The project, which was a policy change implemented using the PDCA Cycle, was successful in reducing both the number of repeated tests, and the number of false positive CDI tests, reported

within seven days of symptomatic patients' admission to the hospital. Findings from this project have been shared with the appropriate parties.

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Table 1

Project Budget

EXPENSES		REVENUE	
Direct		Billing	
Salary and benefits		Grants	0
57 RNs	19,767.60		
14 Charge RNs	6,684.72		
5 Nursing Supervisors	2,803.20		
1 Educator	320		
1 Infection Preventionist	224		
Supplies	361.25	Institutional budget support	0
Paper, Pen, Binder, Laminating paper			
Services	N/A	Expected savings from reduced testing	1,209.24+
Statistician	N/	Expected savings from reduced hospital acquired CDI	15,397+
		Expected savings from reduced length of stay	7123+
		Expected savings from reduced readmissions	13,000+
Indirect			
Overhead			

Total Expenses	30,160.77	Total Revenue	36,729.24+
Net Balance			6,568.47

Figure 11. PRISMA model showing the literature research.

Figure 12. Levels of evidence, adapted from Dearholt, S. L., & Dang, D. (2012). *Johns Hopkins Nursing Evidence-based Practice Model and Guidelines* (2nd ed.). Sigma Theta Tau International.

Figure 13. Comparison of hospital, state, and national CDI Rates for 2019, prior to the intervention.

Appendix A

Handling Patients with Clostridium Difficile Infections Policy

PURPOSE:

To prevent transmission of *Clostridium difficile* from infected patients to other patients during hospitalization.

PROCEDURE:

- A. For patients admitted to the hospital with the diagnosis of *Clostridium difficile* gastroenteritis or rule out *C. difficile* gastroenteritis, or patients with diarrhea, the patient should be placed in Contact Isolation for *Clostridium difficile* which includes adherence to the following:
 1. Patient should be placed in a private room. An order from attending physician for contact isolation is not needed prior to placing the patient in isolation. Also, place a sign on the alcohol hand sanitizer inside the room indicating “Do not use, Wash with soap and water”
 2. A stool specimen should be collected as soon as possible after admission and sent to laboratory for *C. difficile* testing.
 3. Utilize proper personal protective equipment (PPE) including gowns and gloves prior to entering the room to prevent direct physical contact with infected patient, patient care equipment and environmental surfaces within the patient room
 4. Contaminated linens should be handled with gloves and bagged before taken out of the room.
 5. Disposable, dedicated patient care equipment such as thermometer, stethoscope and blood pressure cuff should be used whenever possible. If non-disposable equipment is used, it should be placed in a plastic bag before removal from room by Central Service or other Ancillary Departments, or should be disinfected with bleach-containing wipes prior to removal.
 6. Patient care equipment (IV Poles, Oxygen Flow Meters, assistive devices such as walkers, wheel chairs, etc.) are to remain in the room until patient is discharged or until discontinuation of isolation. Such equipment must be disinfected with bleach germicidal prior to use.
 7. All equipment from *Clostridium difficile* rooms are to be cleaned with bleach containing germicidal.
 8. Patients who develop diarrhea during their hospitalization and Clostridium difficile gastroenteritis is suspected should be immediately placed in contact isolation prior to testing for Clostridium difficile. If test results are negative, isolation can be discontinued.

Admission Screening For Clostridium difficile:

1. On admission all patients are screened for *C. difficile* based on screening criteria below, as part of the admission process. Patients admitted with diarrhea, or had diarrhea within three days of admission, should be tested for *C. difficile* as soon after admission as possible as indicated above, by collecting a stool specimen. For patients admitted through the Emergency Department, a specimen may be collected there if feasible.

2. For patients who meets one criteria each in both category 1 and category 2, patient will be determined as high risk and will be placed on contact isolation and then a stool specimen will be collected if developed loose or watery diarrhea and sent to laboratory for c. difficile testing.
3. This testing will only apply to admission screening and specimen will be tested per screening protocol order. There is no need for an order from the attending physician.
4. Testing is to be done using the following guidelines:

Patient has at least one item in **Category 1** **AND** at least one item in **Category 2**:

Category 1:

- a) ☐ History of C. difficile infection.
- b) ☐ Broad spectrum antibiotic use within last 90 days
- c) ☐ Extended period in LTAC, SNF or Nursing Home
- d) ☐ Is seriously immunocompromised
- e) ☐ Had recent GI or GU surgery
- f) ☐ Taking medication to reduce stomach acid

AND

Category 2:

- a) ☐ Fever
- b) ☐ High WBC (>11,000) on admission
- c) ☐ Abdominal pain

For these patients with suspected C. difficile infections (High Risk), the patient will be placed in Contact isolation precautions. if the stool was found negative for C. difficile, isolation will be discontinued.

5. Testing will be performed using EIA. Patients who have been tested, will not have a repeat test performed within 7 days. Results are interpreted as:
- 6.

Ag	Toxin	Interpretation
Negative	Negative	Patient negative, Treatment not indicated
Positive	Negative	Indicates likely colonization, Treatment not usually indicated. Patient may benefit from Probiotics
Positive	Positive	If clinically correlated, treatment is indicated per guidelines

TREATMENT and discontinuation of isolation:

- A. for patients with *Clostridium difficile* infection, treatment with Flagyl, P.O. Vancomycin or other anti *C. diff* medications may be instituted by the Physician.
- B. Isolation should continue as long as symptoms (diarrhea: more than 2-3 bowel movements daily and loose/watery stools) persist.
- C. Patients with no symptoms of active infections for at least 48 hours may be taken out of isolation upon an order from the treating physician. No testing is needed to discontinue isolation for asymptomatic patients (based on CDC guidelines).

Procedure for disinfection of room:

- A. Upon getting an order for discontinuation of isolation of a *Clostridium difficile* infected patient or if such patient is discharged or transferred, Nursing will inform Environmental Services Department, by phone, of the need for room cleaning post *C. difficile* isolation. Nursing staff will not remove the isolation sign or the “Wash Hands with soap and water” sign from the room.
- B. Nursing should remove all equipment from room prior to arrival of EVS staff. Equipment should be bagged in designated bags before removal from room into soiled utility room.
- C. EVS staff assigned to clean the room will bring with them bleach germicidal solution, along with other normal cleaning supplies and equipment.
- D. EVS Staff will clean the room utilizing “Terminal Cleaning of Isolation Room” procedures. This procedure must include changing the privacy curtain.
- E. After normal cleaning, all surfaces in room and bed will be wiped with bleach germicidal. This step is to destroy any *Clostridium difficile* spores that may be on these surfaces.

- F. Following the completion of the room cleaning, EVS staff will remove the isolation signs and will document the cleaning process in the designated *Clostridium Difficile* Log at the Nursing Station.
- G Equipment taken to the soiled utility room will be picked-up by Central Services Department staff and will be cleaned using bleach containing germicidal.

If room cleaning is to be done while the patient is still in the room, i.e. following discontinuation of isolation, all the above steps will be followed except removal of equipment from the room. Instead, all equipment in the room will be cleaned by nursing using “bleach-based germicidal towels.

Appendix B

Summary of Primary Research Evidence

Citation	Design, Level Quality Grade	Sample Sample size	Intervention Comparison (Definitions should include any specific research tools used along with reliability & validity)	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
Aichinger, et al., 2008	Level IV Grade C	683 patients	An evaluation of repeat testing was performed. The p value was calculated.	There is no value in repeat testing for CDI within a seven day period.	There are no diagnostic gains for repeat CDI testing, this should not be routinely done.	Of the 605 who initially tested negative, 20 of them tested positive on the repeat.
Blanco, et al., 2018	Level VI Grade C	34 staff	This qualitative study was an overview of healthcare workers opinions about an EMR hard stop on repeat CDI testing within 5-7 days	Regarding the prevalence of asymptomatic colonization and the high sensitivity of CDI tests, patients who have tested negative should not be retested within 5-7 days.	There is a gap in the knowledge that doctors and nurses should not retest patients for CDI within 5-7 days.	Nurses believe that patients need to be tested at least twice to be sure of the results. Physicians believe that patients require multiple CDI testing.
Block, et al., 2018	Level I Grade A	N/A	This study compared CDI rates pre and post implementation. Pre and post standardized infection ratios were compared.	Staff must be properly educated on CDI testing.	Having a computerized support tool to stop repeat testing for CDI can decrease hospital acquired CDI	CDI cases decreased by 40% Hospital saved \$60,000. SIR decreased from 1.2 to 0.87.

					cases.	
Buckel, et al, 2015	Level V Grade A	222 tests	This study compared amount of tests and CDI cases pre and post implementation. Descriptive statistics, z test and x2 tests were used.	Making sure that nurses are well educated about CDI, can lead to patients being appropriately tested.	Educating nurses about decreasing repeat CDI testing, leads to a lower amount of repeat CDI test being ordered.	Inappropriate testing is linked to inappropriate treatment. Staff should be educated on CDI testing on orientation and annually.
Cardona & Rand, 2008	Level IV Grade A	3,112 patients	Repeat CDI testing was done on days two and three for patients who were initially negative. Chi square and Yates correction were used.	There is no value to repeat testing within the first week of the initial test.	The data supports not repeating CDI tests within two days and limiting it to over seven days.	Of the repeated tests 0.9% were positive on the same day as the initial, and 10.6% were positive seven days afterwards.
Gade & Turret, 2009	Level V Grade C	268 patients	This was a retrospective study of CDI testing. The positive predictive value and negative predictive values were calculated.	Patients are often tested more than needed for CDI.	At least 16% of CDI testing is not necessary.	After the initial test, 11.9% tested positive on the first repeat, 4.1% tested positive on the second repeat, and less than one percent on the fourth repeat.
Green, et al. 2014	Level IV Grade C	14,875 tests	Created a policy where the lab would reject repeat CDI tests within 7 days. Used Fischer's exact test and t test.	Multiple studies have demonstrated that repeat testing within days yields positive results.	Repeat CDI testing leads to false-positive results.	After the initial test, 1% of tests were negative on the repeat within 7 days.
Grien, et al., 2013	Level IV Grade B	20,836 tests	Reviewed multiple metrics about CDI testing. Calculations performed using chi-squared, t-tests, Wilcoxon rank sum and Kruskal-Wallis tests.	The incidence and severity of CDI is complicated by high rates of misdiagnosis due to multiple tests being ordered.	There was a 48% reduction in testing when a policy was created for the lab department to cancel all repeat CDI tests within a week.	Hospital acquired CDI testing rates were less the EIA test when compared with the PCR and 2T tests. 51% of hospitals use EIA tests.

Kamboj, et al. 2018	Level VI Grade C	31 hospitals	Evaluation of testing practices at 31 hospitals. Tests used were the Pearson coefficient and the Kruskal-Wallis.	Over testing for CDI can over diagnose carriers of CDI as CDI cases.	There was a positive correlation between the hospitals which ordered more tests, more hospital acquired infections and longer length of stay.	Fifteen of the hospitals had a policy on not repeating testing within seven days.
Khanna, et al. 2012	Level IV Grade B	1956 patients	This study compared results of repeat testing CDI within 7 days and after 14 days. Descriptive statistics, x2tests and multivariate regression models were used.	CDI testing is very sensitive.	Repeat testing for CDI has a low yield, and patients with an initial negative test should not be routinely retested.	42 patients who were initially negative, were repeated on the same day as a positive.
Luo, et al. 2013	Level IV Grade C	7,336 patients	This study compared CDI repeat testing pre and post implementation after CPOE alert for CDI repeat test for physicians was in place.	CDI toxin testing is highly sensitive and should not be repeated within seven days.	Unnecessary testing can be eliminated by not repeat testing within seven days.	OF 2,949 repeat tests, only 135 were false positives.
Madden, et al. 2018	Level I Grade A	233,577 and 132,641 patient days	A pop up in the electronic medical record would alert when the CDI test was reordered. Testing rates were compares with t tests and x2 test. The quasi-Poisson	Using diagnostic stewardship can reduce costs and decrease diagnostic error.	Computerized support tool for CDI testing reduced unnecessary inpatient testing.	41% reduction in CDI testing, 31% fewer hospital acquired CDI events

			model was used to compare hospital acquired CDI events.			
Mohan et al., 2006	Level VI Grade C	396 patients	Evaluation of CDI tests was completed.	Even though the EIA CDI test is sensitive, it does not require repeat usage.	Repeat testing is unnecessary and not cost effective.	Of the 78 patients who had a CDI test repeated within seven days only one converted to positive.
Mostafa et al., 2018	Level VI Grade C	20,526 tests	A chart review of past CDI tests were reviewed and compared. Descriptive statistics were used.	Due to the low sensitivity of CDI testing clinicians seem to consistently order repeat testing.	CDI repeat testing should be limited to after seven days.	Of the 970 tests which were repeated within 7 days, 4.5% of them converted to positive. For the converted patients there was a correlation between this and extended length of stay.
Quan et al., 2018	Level I Grade A	N/A	An automated computerized physician order entry verification to enforce no testing if the patient previously had a test within 7 days.	CDI rates have increased partially due to sensitive testing which cannot distinguish between active infection and colonization.	A hard stop prompt would appear if a physician attempted to reorder a CDI test within 7 days of the first.	CDI testing reordered within 7 days decreased by 64%. Hospital acquired CDI decreased by 54%.
Toltzis et al., 2012	Level III Grade C	112	Comparison of amount of true positive results to false positive results. The comparison was done using the x2 test and the Wilcoxon 2 sample test.	In previous study, only 2/3 of positive CDI results were true positives. Physicians have a tendency to over order CDI testing when first result is negative.	The positive predictive value of the CDI test is 64%	40 specimens out of 112 were false positive.
Zilberberg, et al. 2011	Level III Grade C	1,351,156	The x2 test was used to compare the rates pre and post implementation. The Poisson model was used to identify factors associated	CDI testing sensitivity is a possible factor associated with the incidence of hospital acquired CDI.	An increased CDI testing intensity is significantly associated with high CDI rates.	50.6% of CDI cases were hospital acquired due to testing sensitivity.

			with hospital acquired CDI.			
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Legend:

Appendix C

Summary of Systematic Reviews (SR)

Citation	Quality Grade	Question	Search Strategy	Inclusion/Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/Implications
Bobenchick, 2019	A	“repeated testing for Clostridium difficile”	Pubmed	N/A	Patient should only be retested within 7 days in an epidemic situation.	Testing for a cure should not be done as 60% of patients remain positive after treatment.	Testing should not be repeated due to an increase in diagnostic yield of specimens.
Deshpande et al., 2010	C	“repeated testing for Clostridium difficile”	Search USA	N/A	Limiting number of stool specimens sent will reduce false positives.	Clinicians order multiple CDI testing	EIA is the preferred testing method. Repeat testing is unnecessary.

Legend:

Appendix D

Check Sheet Method

Defect Type	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q 3 2018	Q4 2018	Totals
HA CDI	2	2	2	1	1	1	1	0	11
Total	2	2	2	1	1	1	1	0	11

Defect Type	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Totals
HA CDI	2	4	3	2	11
Total	2	4	3	2	11

Appendix E

SWOT Analysis

Internal Forces (project)	External Forces (organization or environment)
Strengths	Opportunities
<ul style="list-style-type: none">• Preceptor support• Key stakeholder support• Assistance from infection preventionist and nurse educator• Supporting evidence	<ul style="list-style-type: none">• Strong leadership structure and support• New ownership• Strong and involved medical staff
Weaknesses	Threats
<ul style="list-style-type: none">• Manual data collection due to restrictions in EMR system	<ul style="list-style-type: none">• The high nursing turnover rate• Registry nurse usage

Appendix F

PDCA Cycle

Appendix G
EPRC Letter

University of St. Augustine for Health Sciences

Doctor of Nursing Practice Program

Evidence-Based Practice Review Council

1 University Blvd.

St. Augustine, FL 32086

2/13/20

Dear **Nia Hidalgo**,

Your proposal titled **A Policy Change to Reduce Clostridium Difficile Infection Rates** has been reviewed by the University of St. Augustine for Health Sciences Doctor of Nursing Practice Evidence-Based Practice Review Council (EPRC) and determined to:

___ meet the requirements for research as defined in the Federal Register. You must make adjustments to the proposal to reflect the DNP program requirements and resubmit for additional review. Work closely with your faculty member during this process.

X not meet the requirements for research as defined in the Federal Register. Your proposal reflects an evidence-based practice change project.

The proposal must be implemented as submitted (changes are not permitted). You may proceed to obtain approvals from the facility where the project will be implemented. Implementation may not begin until you are notified in writing by faculty that you may implement the project.

Questions regarding the USAHS approval process should be addressed to Dr. Douglas Turner at DTurner@usa.edu. Questions regarding the facility approval process should be addressed to course faculty.

Sincerely,

Douglas Turner

Appendix H
Handling Patients with Clostridium Difficile Infections Policy

COAST PLAZA HOSPITAL
A Facility of Avera Hospitals

Handling Patients with Clostridium Difficile Infections Policy

All signatures listed below denote acceptance and approval of the policies and procedure contain on this manual. Signature place serve as full approval of all policies, in lieu of each page being signed individually.

Sandeep Bansil, MD Infectious Disease Physician	<u>2/18/20</u> Date
Downapha Britton, RN, MSN, DN Chief Nursing Officer	<u>2/18/20</u> Date
Aida Salatinjants, MD Chief of Medicine	<u>2/18/20</u> Date
Pramod Multani, M.D Chief of Medical Staff	<u>2/18/20</u> Date
Patrick Rafferty, CEO	<u>2/18/20</u> Date
Ricky Bush, MD Chair of Governing Board	<u>2/18/20</u> Date

Appendix I

ARCS Model

Attention	Relevance	Confidence	Satisfaction
Hearing the financial facts about CDI will gain the nurses attention.	A portion of the nurses annual raise is dependent on hospital acquired conditions for their home units. This displays the relevance of the issue to each individual nurse.	The nurses should have confidence in making sure the test is not repeated within seven days. They will have help from the project's team.	The facility's recognition program will be used to reward nurses for their compliance.

Appendix J

Project Schedule

[illegible]

Appendix K

Project Evaluation Table

Variable	Type of Data	Category	Statistical Test
Code number	Nominal	N/A	Standard Percentage
Gender	Nominal	N/A	Standard Percentage
Ethnicity	Nominal	N/A	Standard Percentage
Age	Interval	N/A	Standard Percentage
Hospital Unit	Interval	N/A	Standard Percentage
CDI Initial Testing	Nominal	Process	T test
CDI Repeat Testing within 7 days	Nominal	Process	Standard Percentage
CDI Mortalities	Nominal	Outcome, Financial	Standard Percentage
CDI Readmissions	Nominal	Outcome, Financial	Standard Percentage
CDI Length of Stay	Nominal	Outcome, Financial	Standard Percentage
SIR Rates	Interval	Outcome, Financial	NHSN Module
Staff Education	Unk	Process, Sustainability	Standard Percentage

Appendix L

Data Collection Tool for Evaluation : CDI Detection and Surveillance Assessment

Testing policies followed that:	Yes	No	N/A
Reject formed stools	X		
Submit one stool specimen for initial CDI testing	X		
Avoid serial testing when initial test is negative	X		
Do not test asymptomatic patients	X		
Do not conduct repeat testing during the same episode of diarrhea for confirmed CDI patients	X		
Retest only if CDI symptoms continue or recur after 10 days of treatment			X
Do not perform “tests of cure” post treatment			X
Avoid serial testing of patients	X		

Assessment Questions	Yes	No	N/A
Facility-wide CDI surveillance is in place	X		
Facility applies standardized National Health Care Safety Network (NHSN) CDI surveillance definitions	X		
Facility has a process in place to review and analyze CDI surveillance data	X		
CDI surveillance data is disseminated to facility senior leadership, physicians, patient care staff, and environmental services department, pharmacy, and laboratory staff	X		

Clinical Assessment Questions	Yes	No	N/A
Clinical staff are trained to recognize the signs and symptoms of CDI	X		
Appropriate health care providers are trained to obtain specimens for laboratory testing of patients suspected of having CDI	X		