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Clostridium difficile Infection (CDI): Use of Preventive Bundle to Decrease CDI Incidences

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
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Abstract

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Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

The challenge of combating *Clostridium difficile* infections (CDI) is a major problem within many health care organizations as CDI adds to the cost of care and is an uncomfortable and sometimes fatal complication of hospitalization for the patient. The practice-focused question for this doctoral project was targeted at patients in hospital settings on a medical surgical floor and asked if *clostridium difficile* preventive bundles reduce the incidence of CDI compared with nonstandardized preventative methods. Using the plan-do-study-act framework, the purpose of this DNP project was to use a *clostridium difficile* bundle approach to study the effects of *clostridium difficile* incidence (CDI) decrease on a medical-surgical unit with high CDI incidences. Standardized environmental cleaning practices resulted in improvement of the patient environment. High-touch cleaning improved from 43.7% to 83.3%. Time between CDI events lengthened from 19.9 days to 30.2, environmental cleaning with the use of Dazo auditing improved from 33.4% to 81.6%, isolation practices improved from 62.7% to 90%, and with the implementation of the nurse-driven CD testing protocol, unnecessary testing improved. Results showed that the CDI incidence on an acute care medical surgical unit was reduced through the use of a *clostridium difficile* preventive bundle in this DNP project. Reducing the incidence of CDI is a significant contribution to social change as this unwanted complication of hospitalization causes discomfort and pain and adds unnecessary cost to health care.

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Dedication

This doctoral project is dedicated to the many patients whom suffer from *clostridium difficile* infections and to all future nursing students to ensure that you can achieve your dreams; you just have to be persistent and set life-long career goals.

Acknowledgments

I would like to thank my Lord and Savior Jesus Christ, as without him, I could not have continued the needed faith to follow my career dreams, successes, and dream to be a change agent in nursing. To my husband, Hendrix, you have allowed me to pursue my continued education to achieve the upmost degree in nursing, and for this I thank you. To my children, Yasmine and Jakob, thank you for your selfless sacrifice to allow me to continue my dreams. Hard work and sacrifice pays off! To my family, friends and colleagues, thank you for all your continued support. To my professional mentors throughout my career, Mrs. Laura Smith (I know you are smiling in Heaven), Dr. Barbara Niedz, Dr. Amy Donaldson, and Mrs. Catherine Blise, thank you for your continued support throughout my education journey. Lastly, I would like to thank my project site for allowing me to further my education.

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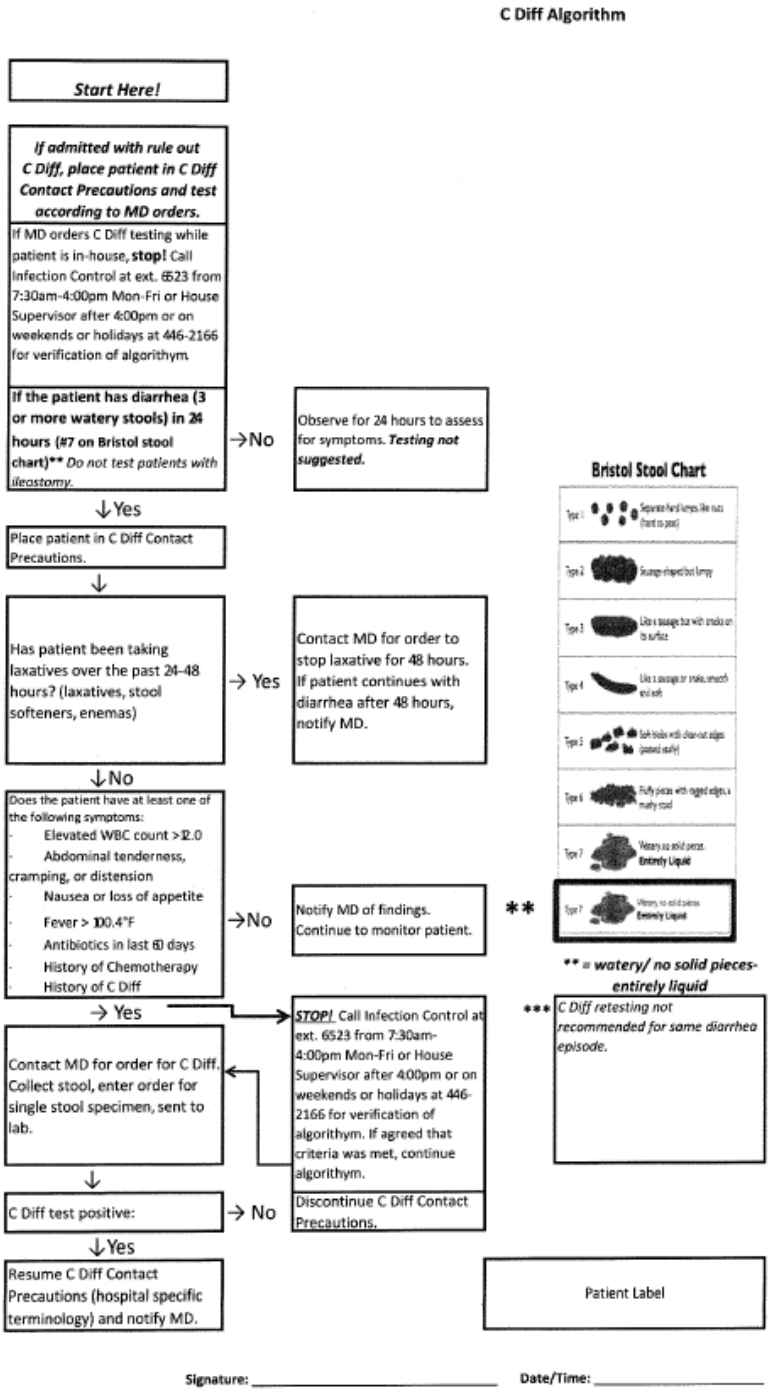

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Section 1: Nature of the Project

Introduction

The problem described in this doctoral project is the increased incidence of *clostridium difficile* infections (CDI) within the hospital on the medical surgical unit. CDI is the number one hospital acquired infection (HAI) within the unit. The implications related to this DNP project to reduce incidences of CDI within the unit will not only improve patient care delivery but will impact social change. The potential positive social change and implications for this DNP project is to reduce the pain, discomfort, and additional comorbid conditions that patients might experience if they contract this infection during a hospital stay. Eliminating CDI from an individual hospital and from all hospitals in a health care system makes a significant contribution to social justice because patients should not go home in a worsened health state than they are when admitted to a healthcare facility.

Problem Statement

CDI plague hospitals across the nation and are the number one infection throughout many health care systems. This is the subject of this DNP project. CDI are the most prevalent HAI within the organization, which accounted for 38% of infections in the year 2016, according to the organization's quality improvement (QI) department. Healthy People 2020 (2011) objectives also resonate with a goal to reduce HAIs within the United States.

Consequences of CDI infections to patients can include an increase in length of stay, cost of care, morbidity, mortality, and discomfort due to extreme diarrheal episodes, unnecessary testing, and increased discomfort. Olson and Scobey (2016) described that from 2000 to 2010, the incidence of CDI increased from 4.5 CDI discharges per 1,000 adult discharges in 2000 to 8.2 CDI discharges per 1,000 adult discharges in 2010 (p. 206). With the tremendous cost associated with hospital acquired infections and the importance of practicing evidence-based care related to *clostridium difficile* (CD) management, this DNP project holds significant relevance to not only standardize CD patient care practices but to also ensure a safer care environment for patients.

Purpose

CD is the most prevalent pathogen among healthcare-associated infection and is recognized by the Centers of Disease Control and Prevention (CDC) as one of the top three urgent threats to public health (as cited in Pechal, Lin, Allen, & Reveles, 2016). There are several gaps in nursing practice that are prevalent in hospitals today. Examples noted were nonadherence to isolation protocols and hand hygiene practices. Identifiable gaps were observed with inconsistent hand hygiene reporting methodology and nurse-triggered reporting that was incorrect and inappropriate as well as unnecessary CD testing that contributed to artificially high rate (Smith & Taylor, 2016). Taken together, these gaps have laid the groundwork for the proposed implementation of a preventive CDI bundle. Associates, leaders, physician collaboration, and development of nurse-driven CDI protocols were some ways that this organization combated CDI.

The practice-focused question for this doctoral project was targeted at patients in an acute care hospital setting: Does a CD preventive bundle reduce the incidence of CDI compared with nonstandardized preventative methods? This doctoral project addressed the gap in-practice by using a collaborative approach and implemented the CDI prevention bundle suggested by the CDC (2012). Components of the bundle were geared toward (a) test for CD appropriately, (b) isolation practices, (c) appropriate personal protective equipment (PPE) practices to include handwashing, and (d) environmental cleaning with an EPA-approved, spore cleaning disinfectant after a patient with CD has been treated (CDC, 2012). Incorporation of evidence-based practices for CD prevention provided standardization of CD practices throughout the organization and allowed for better outcomes with this population by reducing the identified gaps in practice.

Nature of the Doctoral Project

Sources of evidence and data came from literature reviews and analysis of best-practices for CDI management, prevention, and organizational data collection. Data collection was extracted from the electronic medical record (EMR), infection control database, and the collection of the usage of the nurse-driven CDI protocol performed by the infection control department. Secondary analysis was conducted by data collected manually through the EMR and nurse-driven CDI protocol via infection control nurses and the DNP project coordinator. As the DNP project coordinator, I facilitated project meetings, assisted with secondary analysis of the data, and worked collaboratively to develop strategies toward reaching the aim of CDI reduction. Data collection activities were divided amongst the infection prevention nurses to collect electronic reports within

infection control databases related to retrospective data with those patients who developed hospital-acquired CDI within the last 6 months. Pharmacy collected and performed analysis on patients with hospital-acquired CDI and antibiotic appropriateness and the QI department validated data collection from all stakeholders to ensure all components of the CDI preventive bundle were incorporated and/or utilized.

System-wide analysis derived from a business case perspective to explore the amount of appropriate versus inappropriate CDI testing and the number of cancelled tests post CDI improvement implementation. This accounted for some of the financial facility and system-wide burden due to inappropriate CDI testing and nonstandardization of CDI practices. The increase incidence of CDI within the organization, particularly on the medical surgical unit and health system, led to a system wide collaborative to standardized CD practices. Nonstandardization of environmental cleaning practices, hand hygiene compliance, testing protocols, antibiotic utilization practices, and isolation protocols were gaps in practice that attributed to increased incidence of CDI (Aziz, 2016).

This doctoral project highlights CDI testing appropriateness, environmental cleaning practices, improved hand hygiene practices, and nurse/patient education to standardize and prove that standardization of best practices will affect CDI incidences in a positive fashion. Implementation of the bundle occurred over a 6 to 8-week period. As the DNP student project coordinator, I assisted in coordinating stakeholder involvement through strategic planning within a 2-week period. Formulation and design of the CDI nurse protocol took 2 weeks and included a lab for CD testing appropriateness. An

environmental service cleaning checklist and a review of environmental cleaning practices were completed within 1 week. The development of nurse and patient education took 3 weeks, 1 week for product development and 2 weeks to hardwire education practices for nursing staff.

Significance

The primary stakeholder for this DNP project was the patient. CDI causes close to half a million illnesses in 1 year, which attributes to at least 1 in 5 patients who will get CD (CDC, 2012). The enormity of this disease and implications for the population are significant, and without proper treatment and cleaning practices, the CD epidemic will continue. Prevention must be the priority to affect positive change and practices.

Other stakeholders involved in this doctoral project came from a variety of departments and disciplines within the hospital and health system. Stakeholders included senior leaders, including directors and managers, environmental services, pharmacists, front-line nursing staff, physicians, infection control and quality professionals, performance improvement specialists, data analysts, and abstractors. This multidisciplinary approach allowed for a variety of stakeholder collaboration and impacted social change over many health care systems. The Institute for Healthcare Improvement (IHI; 2017) described that the utilization of rapid cycle testing methodologies will employ rapid tests of change to produce vast performance improvement.

The potential contributions of this doctoral project to nursing practice were to formulate standardization and evidence-based protocols to decrease the incidences of

CDI. To do so, nurses need to understand the severity and nature of this disease process. CDI affects a broad population. The basics of stool identification for testing appropriateness is the number one strategy used to improve testing appropriateness in conjunction with implementation of a nurse driven CDI protocol for nursing staff to follow, which was a part of this DNP project. Nurses played an important role in CDI prevention but also were the main gate keepers for stool collection practices. Formulation of a CDI protocol to included guidelines for collection appropriateness, which was important to this DNP project success. Smith and Taylor (2016) recognized that characteristics of watery diarrhea as appropriate for stool testing for CDI patients (p. 71).

Feuerstadt, Das, and Brandt (2014) reported that there has been a significant increase in the severity and incidence of CD infection across hospitals. Lessa et al. (2015) determined that the estimated number of CDI cases in the United States was 453,000. The incidence was estimated higher among females (rate ratio, 1.26), Whites (rate ratio, 1.72), and persons 65 years of age or older (rate ratio, 8.65) (p. 827). Various strains of CDI have altered the epidemiology of CDI, with a notable increase in incidence and severity of the disease with various reportable metrics of mortality rates increasing in intensive care unit population as high as 37% (Feuerstadt et al., 2014). The magnitude of CDI based on data from the CDC from a report based on 2014 data, published in 2016, revealed hospital-onset CDI infection in Louisiana significantly increased in 2013 and 2014. CDI rates have in fact decreased by 32% (state standardized infection ratio, 0.68; CDC, 2016). Thus, there is great potential for the implication of positive social change: a goal to lower the incidences of CDI.

Formulation of an interdisciplinary team, formulation and implementation of a nurse driven CDI protocol, standardization of environmental cleaning protocols, and testing appropriateness was in the scope for this DNP project with guidance and support of senior leadership within the organization. Assembly of the multidisciplinary team was derived of the stakeholders needed to impact change for CDI reduction. For example, utilization of environmental services was pivotal as this department provided essential infection prevention within the organization, and engagement of environmental services did improve and standardize environmental cleaning practices, which was needed for project success (Green, Garrett, & Scanlon, 2016). The American Association of Colleges (AACN; 2016) emphasized how collaboration is vital for the improvement of role differentiation to impact a complex patient care demand. Brainstorming sessions were part of the strategic planning with interdisciplinary team members to discuss gaps in nursing and environmental practices.

Transferability of this DNP project to similar practice areas was outside of the scope of this DNP project. However, the likelihood of implementation and standardization to be transferred to other units within the organization is high. As the aim was to standardize throughout the organization, a pilot unit was selected, a 36-bed medical surgical unit for this DNP project related to a 6-week preimplementation phase and a 6-week postimplementation phase.

There was pilot success. Transferability of this DNP project to other nursing units in the project site hospital as well as those across this large system could be significant. The same approach will be used to assure that standardization of environmental cleaning

practices, handwashing, and appropriate testing, as well as all facets of the CDC bundle, will be implemented using a rapid cycle improvement process with small tests of change in an iterative way, across the system. A multidisciplinary approach, involving the various departments and disciplines impacted one nursing unit, will be replicated over and over, assuring system wide reduction of CDI. The effect of proactively transforming care for the CD patient brought forth social change for the population by way of producing positive outcomes and standardized nursing care.

Social Change

The social change impact to decrease the spread of CD in the environment was significant. Reducing CDI on a single medical surgical nursing unit and expanding the project to the entire system will have a related impact that can potentially include patient homes and physician's offices. There was a decrease in harm to the patient related to CD testing appropriateness and infection prevention through effective hand hygiene practices and evidence-based CD protocols and ultimately improvement and management of CDI within hospitals and communities. Patient pain associated with diarrheal episodes can decrease healing and limit mobility, which can increase incidence of mortality and comorbid conditions (Davis, Yin, Blomberg, & Fung, 2016). Ensuring standardization in nursing practice and a culture of safety to patients positively impacted populations and communities, all positive social change emerged from this DNP project.

Summary

To decrease CDI incidences within the organization, stakeholder collaboration must exist. Multidisciplinary collaboration allowed for the formulation of best practices

within the organization and health care system. The relevance to nursing practice to improve CD standardization and the exploration of concepts and models to decrease CDI incidences was a goal that was achieved within the organization.

Section 2: Background and Context

Introduction

Increased incidence of CDI is a national and state burden across the United States. Improvement of nursing practice regarding CD management and CD prevention to decrease patient harm was my aim in this DNP project. To improve nursing practice and/or implement strategies for improvement, collaboration did exist. In this section, the concept, models, and theories, relevance to nursing practice, local background and context, role of the DNP student, role of the project team, and summary are described.

Concepts, Theories, and Models

The utilization of concepts, theories, and models to improve nursing practice has been embedded in nursing practice through early findings overlaid by Florence Nightingale in 1859 who challenged nurses to embrace social good related to the social class injustices of her time (McCurry, Revell, & Roy, 2009). Conceptual frameworks, theories, and models coexist to provide the framework to improve not only patient care delivery systems but to improve nursing practice. The concept of infection prevention in the context of reduction of CDI incidences with the utilization of the integrated theory of health behavior change and the use of a performance improvement model (plan, do, study, act; PDSA) was the blueprint to achieve the DNP project outcome.

Clostridium difficile Infection

The concept of CDI prevention with an aim to reduce CDI incidence is complex and requires detailed strategies for improvement. This spore-forming bacterium is transmitted through the hand of the health care worker or via contaminated environments

(Bardut, 2015). Lessa et al. (2015) described the burden of CDI within the United States in 2011 and identified the active population in 10 geographic areas whose cases were identified as positive for CD (p. 825). The authors revealed that a total of 15,461 cases were identified, with 65.8% as health-care associated and 24.2% present on admission (community acquired; Lessa et al., 2015). CDI incidence in the United States was 453,000 (95% CI, 397,100 to 508,508,500) with increased incidence amongst females (rate ratio, 1.26; 95% CI, 1.25 to 1.27), Whites (rate ratio, 8.65; 95% CI, 1.56 to 2.0), and people 65 years and older (rate ratio, 9.65; 95% CI, 8.16 to 9.31; Lessa et al., 2015).

Feuerstadt et al. (2014) viewed the severity of CDI, diagnosis, hospital acquired versus community acquired, and the increase incidence of CDI over a period of January 2006 to December 2011 (p. 1265). This cohort was divided into patients diagnosed with CDI between 2006 to 2008 (CDI 06-08) and 2009 to 2011 (CDI 09-11), with CDI 09-11 showing changes in medication exposures resulted in decreases severity in the disease. That is, more aggressive treatments produced better outcomes and decreased mortality compared to CDI 06-08 (17.1 vs. 13.1%, $p < 0.01$; Feuerstadt, et al., 2014).

Pechal et al. (2016) described that the highest incidence of CDI was among elderly patients greater than 65 years of age with a higher mortality (8.8%) compared to adults (3.1%) and pediatrics (1.4%; $p < 0.0001$; p. 1). The elderly population is at a higher risk for increased mortality and increased length of stay with an average length of stay of 8 days compared to younger adults (7 days) and pediatrics (6 days; $p < 0.0001$; Pechal et al., 2016). As concluded in Pechal et al. (2016) study, the incidence of CDI is

highest within the elderly population, and, therefore, the need for standardized care practices is required to have a positive impact within all realms of populations.

The epidemiology of CDI has changed since the 21st century. CDI severity and incidence amongst the older population (greater than 65 year of age) has increased (DePestel & Aronoff, 2013). In the United States, 93% of the total deaths from CDI have occurred in patients greater than 65 years of age, which constituted 92% of the total CDI-related hospital stays in the United States in 2009 (DePestel & Aronoff, 2013). DePestel and Aronoff (2013) reported an increase in the mortality rate of health-associated CDI increased almost 4-fold between 1997 and 2005 (5.7 vs. 1.5 percent; $p < 0.001$). Therefore, there is a need for standardized CDI practices.

Within the health care setting, the boundaries and likelihood of the CD contaminant is high, and without standardized nursing practices, environmental cleaning, and appropriate testing practices, harm will continue to plague organizations. The use of a bundle approach to improve infection control practices, reduce patient harm, and apply universal standardization was strategically necessary. In a multisite stepped-wedge randomized trial conducted by Hall et al. (2016), the authors noted that use of a bundle approach concurrently improves implementation processes and has a great impact on process of care especially with environmental cleaning in CDI reduction.

Strategies to Prevent CDI

Recommendations to improve care for the CD patient and prevent further occurrence was obtained by (a) development of a nurse driven CD testing protocol; (b) implementation of nurse education to include care of the CD patient, isolation protocols,

and hand hygiene via an educational database for all nursing staff with attestation and validation; (c) utilization of the targeted solutions tool (TST) for hand hygiene monitoring; and (d) environmental cleaning with an EPA-approved, spore cleaning disinfectant for all patient areas. Each of these strategies has demonstrated effectiveness in reducing the incidence of CDI in hospitals; however, the taken together as a bundle approach has showed a positive impact to improve CD practices overall. Strategies to improve CD practice required objectivity and strategic alignment. Strategies for improvement to reduce CDI have impacted not only patient care but overall infection prevention practices throughout the organization (Hall et al., 2016).

Hand hygiene improvement.

The relative impact of health care workers' hands being contaminated in the spread of CD is alarming (Jullian-Desayes et al., 2017). Current monitoring and hand washing techniques for infection control prevention is important. For example, use of soap and water versus alcohol-based hand-rub is a key hand washing improvement strategy as CD spores are resistant to alcohol (Jullian-Desayes et al., 2017). Hands must be washed with an antimicrobial soap for a minimum of 15 seconds (Pelleschi, 2008). Measurement of hand hygiene technique appropriateness and surveillance were two major hand hygiene improvement strategies for this DNP project.

The current hand hygiene practice adopted by the World Health Organization of direct observations, covert observations, "secret shoppers," unit champions, and trainers needed great improvement (Pan et al., 2013). Proposed implementation of the TST was a main strategy to improve and control hand hygiene compliance throughout the facility.

According to The Joint Commission (2017), TST specific to handwashing practices uses robust process improvement with data-driven, problem-solving, systematic concepts and the incorporation of Lean Six Sigma and change management methodologies.

Shabot et al. (2016) showed that the use of the TST allowed for achievement of a highly reliable hand hygiene compliance rate, which was based on 31,600 observations and an average baseline hand hygiene rate of 58.1% (p. 6). A hand hygiene compliance average of 84.4% was achieved during the "improve" phase (Shabot et al., 2016). In the first 13 months of the Six Sigma control phase, a 94.7% hand hygiene compliance was attained with a 95.6% final compliance rate after 12 months of the control phase ($p <$ 0.0001; Shabot et al., 2016 p. 6). During the improvement phase, 145.1 observations were noted with a p value versus baseline value of 0.298 (Shabot et al., 2016). During the Control 1 and 2 phases, a total of 231.4 observations were performed with a p value versus baseline of 0.024 sustainable improvements (Shabot et al., 2016). In the quest to reduce CDI and other HAI, having a high-level tool to track hand hygiene compliance is needed. Hospital acquired infection rates decreased further by relative rates of 49% and 45% respectively (Shabot et al., 2016). Improvement in hand hygiene compliance has not only effected a reduction in CDI but in other HAIs as well (Shabot et al., 2016). Accountability and ownership is important for process improvement sustainment.

TST methodology.

The TST is a systematic, web-based tool which utilizes rapid process improvement (RPI) methodologies derived from Lean Six Sigma (Shabot, et al., 2016). TST mirrors Lean Six Sigma's five stages (Define, Measure, Analyze, Improve, and

Control). The baseline phase was utilized in this DNP project. Other components of TST are relative to the engagement of secret observers to observe unit hand hygiene compliance and collect data and input into the web-based TST tool. Once secret shoppers were identified, specific web-based training via training videos were required with an exam at the end of the training to be passed with at least a 90% compliance rate with proof of passing with printed certificate of examination (Shabot, et al., 2016). The Manager, charge nurses, and secret observers within the unit were identified as just in time coaches (JIT) as to provide "real time" coaching/education when opportunities arrive (Shabot, et al., 2016). (Appendix H).

Isolation practices.

Guidelines of the CDC mandate contact isolation for all patients with CDIs (Pelleschi, 2008). Adherence to appropriate barrier precautions and appropriate usage of personal protective equipment (PPE) was a major strategy to reduce CDI within the organization. The use of contact precautionary measures such as the use of gowns and gloves for all contact with CDI patients should be used to decrease transmission (Vassallo, Tran, & Goldstein, 2014). The authors note that with the utilization of appropriate PPE and barrier precautions, a 20% decline in CDI associated with infection prevention and control measures (Vassallo, Tran, & Goldstein, 2014). Isolation precautions and appropriate PPE utilization is needed to decrease CDI rates. Even with suspected infected patients whom may have signs and symptoms of CD should be place on contact isolation precautions until CD testing is ruled out. As this precautionary

measure can assist with further CD contaminate spread to other patients and health care workers as management of infections is relevant (Kaba et al., 2017).

In a population-based cohort study conducted by Daneman, et al., (2015) the authors studied patients admitted to an acute care facility from the period of April 2011 to March 2012 and hospital prevention practices were observed (p. 435). The assessment of preventative CD practices including isolation practices were studied and revealed that 159 hospitals had variable isolation practices as only 24% of patients were isolated at the onset of diarrhea symptoms (Daneman, et al., 2015). The authors hypothesized that standardized prevention methods and early isolation precautionary measures would have an impact on CD incidences; the hypotheses were supported as these measures resulted in a 26% reduction in CDI (Daneman, et al., 2015).

Environmental cleaning.

Proper and consistent environmental cleaning practices are needed to decrease incidence of infection within organizations (Warrack, 2014). Multiple cleaning products and variation in environmental cleaning when the patient is discharged or moved to another room (i.e., terminal cleaning) is noted to increase infection risk (Balsells, et al., 2016). Spores of CD thrive on hospital surfaces and stringent surface cleaning is needed to decrease CDI incidence (Pelleschi, 2008). According to Barbut (2015) multiple factors can inhibit proper environmental cleaning practices such as (a) rapid room turn around; (b) variation in cleaning product use and/or improper product concentration, and (c) undervalue of housekeeping staff (p. 290). In a study performed by Best et al., (2014) utilization of a standardized checklist and a hydrogen peroxide decontamination process

decreased the incidence of CDI (p. 25). In this study, pre-cleaning practices showed a that CD continued to be present in environmental services in 43% of patient rooms and post-cleaning practices with the utilization of a standardized cleaning checklist and use of a hydrogen peroxide based cleaner showed a reduction by 86% ($p < 0.0001$) (Best, et al., 2014). A strategy to be used will be changing of the current environmental cleaning solution (1:10 bleach) to house-wide cleaning practice with a sporicidal peracetic acid/hydrogen peroxide-based daily cleaner (Oxycide) and incorporation of a daily environmental checklist for standardization of cleaning of CD patient rooms (Goldstein, et al., 2015). In an effort for standardization with cleaning throughout the organization, every patient care area was cleaned with sporicidal peracetic acid/hydrogen peroxide-based cleaner (Oxycide) (Goldstein, et al., 2015).

Although environmental cleaning practices are important to decrease CDI, measurement of cleaning thoroughness was identified. The use of an ultraviolet (UV) light system that dries on surfaces, but is removed with standard cleaning is an effective cleaning practice to utilize in hospitals (Hall et al., 2016). Marking of "cleaned' surfaces with marked gel dots of frequently touched surfaces was utilized as an environmental checklist which is highly recommended by the CDC as best-practice for auditing practices for appropriate environmental cleaning for CDI and infection control prevention (Hall et al., 2016). Vassallo, Tran, and Goldstein (2014) conducted research related to the effects of decease CDI in comparison to the utilization of the CDC's program for *clostridium difficile* infection prevention which included use of ultraviolet (UV) light for environmental surface decontamination follow up (p. 1094). According to Vassallo, et al.,

(2014) use of UV light has been associated with the decrease of CDI (p. 1094). Although more statistical data is needed related to the use of UV lighting for environmental decontamination follow up, the use of UV lighting was utilized as a validation tool for proper cleaning surfaces. Regular audits and feedback was provided to environmental services staff and promote educational opportunities to improve environmental cleaning practices throughout the organization.

Early detection and proper testing.

Early detection and proper testing was important to identify not only to minimize over reporting that may impact or produce unwarranted hospital penalties for CDI occurrences, but allowed for proper patient treatment (Balsells, et al., 2016). As the organization transitioned from two-step diagnostic (single strain) testing to a polymerase chain reaction (PCR) testing for CD, PCR testing is faster and more sensitive test, which potentially inflated (hypothesis) CDI rates as this specific test was noted to not be utilized appropriately. (Stahlmann, Schonberg, Hermann & Von Muller, 2014). Polymerase chain reaction assay is an in vitro, 45-minute real-time test which provides qualitative detection of toxinogenic strains (Cioni, et al., 2016). It was presumed that with the change in testing hence the sudden increase in CD was increasing due to increase testing sensitivity. As with early detection, testing appropriateness is as significant as clinical presentation.

Proper stool testing can prevent false negative and, or false positive CD results (Murad, et al., 2016). For example, CD testing should be utilized with diarrheal stool (liquid stools only) and proper specimen handling should take place (Murad, et al., 2016). In a study conducted by Murad, et al., (2016) 48 patients were tested utilizing the Bristol

stool chart with a 96% specificity of testing appropriateness (p. 10). Testing of stool specimen's other than deemed appropriate (liquid stool) can produce unwarranted CD results (Yoo, 2015). Balsells, et al., (2016) described the importance of testing policies and the use of standardized criteria with utilization of the Bristol stool chart or definitions of CDC clostridium definition of $\geq$ 3 unformed stools in $\leq$ 24 consecutive hours (p. 6). Therefore, the need for a proposed CD nurse driven testing protocol was needed to guide nursing practices for CD testing appropriateness.

The impact of a CDI bundle.

The impact of the utilization of a *clostridium difficile* infection bundle is geared to decrease CDI incidences (Goldstein, 2015). Individual components of the CDI bundle included strategies to reduce the incidence of CDI: (a) test for *clostridium difficile* appropriately; (b) standardized isolation practices, implemented early; (c) appropriate personal protective equipment (PPE) practices including handwashing; and (d) environmental cleaning with EPA-approved, spore cleaning disinfectant (Guillemin et al., 2015). These are the same components that were implemented in this DNP project.

Cruz-Betancourt et al., (2016) utilized preventive methods in the intensive care unit over a 12-month intervention period where 217 high-risk patients were identified and 62 were excluded from the study (p. 2). The total inclusion sample size for this study was 157 patients and the incidence of CDI within the unit decreased by a rate of 3.12 (incidence rate), which showed statistical significance ($p<0.0001$) and great impact for CDI incidence decrease and bundle impact (Cruz-Betancourt et al., 2016). A major conclusion to this study noted the utilization of implementation of CDI bundles usage and

interdisciplinary preventative measures is effective with CDI incidence reduction (Cruz-Betancourt et al., 2016).

In a multi-site stepped-wedge randomized trial study performed by Hall et al., (2016) the impact of a CDI bundle was viewed in 11 Australian hospitals (p. 1). The multimodal intervention utilized clearly aligned cleaning practices, hand hygiene surveillance, isolation precautions, and improved nursing practices with a decrease in CDI incidence by 40% (Hall et al., 2016). After a significant meta-analysis was conducted, 20% post-intervention reduction in infection risk was noted (Hall et al., 2016). The combined mean of infection rates pre-and post-infection deemed statistically significant with at 95% confidence level ($p<0.000$). Hospitals with this proposed impact will be studied to view if the impact of a CDI bundle will indeed decrease CDI incidence, but also improve overall patient care outcomes.

Integrated Theory of Health Behavior Change

The integrated theory of health behavior (ITHBC) theory is an essential part of achieving goal, promoting health, and preventing illness across the globe (McCurry, et al., 2009). An essential component for advance practices nurses is to incorporate theory to improve nursing practice. The integrated theory of health behavior (ITHBC) change is multifaceted (Ryan, 2009). This theory is person-centered and suggests that interventions should be directed to increasing knowledge, beliefs, and improves outcomes. Ryan (2009) describes the use of theoretical framework improves intervention, and improves patient outcomes (p. 161). The use of this theory affected not only the patient, but nurses as well. Integration of proper hand hygiene practices for the patient and nurses did not

only reduce the spread of infection, but improved outcomes for their families and communities. For example, educating and teaching families isolation practices will protect the spread of CDI to other areas of the facility and into the community (Balsells et al., 2016). The integration of ITHBC related to this DNP project was directed toward identification of knowledge gaps in nursing and patients related to CDI prevention, the skills and knowledge needed for both nursing, patients and all other stakeholders to understand the enormity of CD, and the overall improvement of health status for the patient with an aim to "do no harm" (Ryan, 2009).

Plan Do Study Act

Improvement models are developed to improve quality and patient outcomes. PDSA (Plan, Do, Study, Act) was the performance improvement model used for this DNP project. This performance improvement model derived from W. Edwards Deming is used to help teams improve quality of care (Donnelly & Kirk, 2015). A project team was convened with a clear aim, or measurable goal. The first step is "plan" with a set objective to reduce CDI incidences. The second step is "do" with plan implementation, the third step is "study" which is an analysis of the data and the process formulated to achieve the aim, and lastly "act" which is an important element in identifying actionable items (if needed) if an incremental change was achieved. If such change is not attainable, PDSA cycles were repeated four time until the desired goal was achieved. This performance improvement model guided this DNP project as a framework to assist in obtaining the overall aim of reduction of CDI incidence as illustrated in Figure 1.

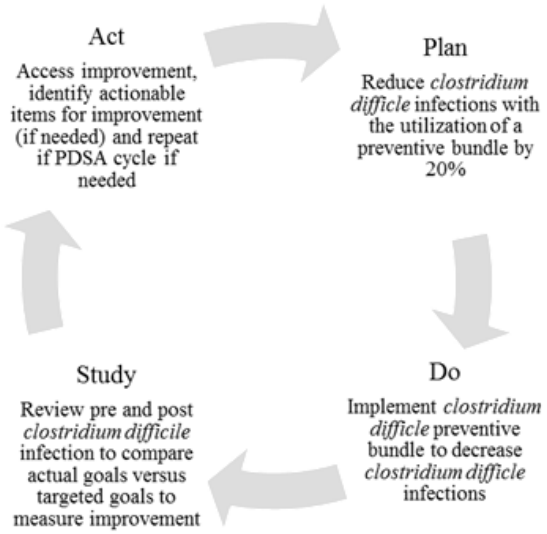

Figure 1. Plan, do, study, act performance improvement model.

Local Background and Context

According to metrics provided by the QI department, 38% of hospital acquired infections (HAIs) are *clostridium difficile* infections for fiscal year 2016. A sense of urgency erupted in the organization as CDI was the number one infection throughout the entire health system as well. To standardize care practice, the premise for this DNP project was developed.

This DNP project took place within a 36-bed Medical Surgical floor. This unit had an increase of CDI within the past year with a total of 18 CDI incidents. As CDI prevails as the number one infection within the organization, a sense of urgency was infused as the need to investigate, formulate, standardize, study, and implement evidence-based practice for improving CDI prevention practices. With hospital acquired infections consisting of greater than 38% of the total harm, CDI incidences continued to increase due to CD practice fragmentation. Although CDI is a state and local concern, a

"hardwired" process had not yet been developed. According to national statistics reported by the Center for Disease Control and Prevention (CDC) (2015) the most frequent hospital-acquired infection is CDI resulting in 29,300 deaths per year (p. 1). Louisiana data published in 2014 by the CDC noted that CDI decreased by 32% (lower compared to national average) (p. 1). Louisiana hospitals reported a significant increase in CDI between 2013 and 2014 and among the 75 hospitals in Louisiana with enough data to calculate a standardized infection ratio (SIR), 1% significantly higher (worse) than 0.92, the value of the national (SIR) (CDC, 2016).

Hospital Aim

The organization has consistently been penalized over the past three years has for hospital acquired infections (HAIs). *Clostridium difficile* infections has manifested as the number one infection throughout the organization. The burden of hospital-acquired CD infections coupled with preventability and variability of nursing practice for the CD patient prompted this doctoral project (Daneman, Guttmann, Wang, Ma, Gibson, & Stukel, 2015). To reduce harm and provide evidence-based practices to guide standardized care for the CD patient, an interdisciplinary team was formed to aid in efforts to reduce CDI incidences. This doctoral project was structured around identifying nursing practice gaps, improving patient care for the CD patient and standardizing practice throughout the organization.

Strategic alignment with the organizational goals to prevent harm to our patients and the mission of "Extending the Health Ministry of Jesus Christ" provided the framework for this DNP project. To attain the goal of decreasing CDI incidence within

the medical surgical unit and eventually the organization, nurse practice gaps needed to be analyzed. What is required by the nurse to care for this population? Development of a preventative nursing practice guideline was important. Guillemin et al., (2015) describe precautions include contact isolation, hand hygiene, and reorganization/coordination of nursing care (p. 39). Ensuring that nurses were aware and understood the essentials of preventative practices related to caring for the CD patient was important.

State and Federal Mandates

As part of strategic planning form state and federal agencies the Affordable Care Act (ACA) (2010) allows for patient protection and the entitlement to affordable health care (Aroh, Colella, Douglas, & Eddings, 2015). Centers for Medicare and Medicaid Services (CMS) established valued-based purchasing (VBP) reimbursement program to lower health care cost and heighten quality of care across the nation (Aroh, et al., 2015). VBP is a budget neutral program that allows health care organizations to obtain up to 1% of Medicare dollars to decrease harm and optimize care to include CDI. Pay for performance through state and federal regulation and billing mandates reward organizations for safe care to patients. Quality achievement and performance is guided through governmental regulations with a "demand" that all patients are to receive standardized care, with no ill effects. There was a time in the now distant past, which hospitals were paid regardless of untoward patient outcomes. This is no longer the case. If a patient acquires an infection while present in the hospital (a hospital acquired infection, HAI), present reimbursement practices will result in reduced revenue. With an annual health-care cost at $1.1 billion and short-term inpatient CDI management costs of

$2,500 to $3,200 for each hospitalization (Feuerstadt, 2014), Louisiana hospitals reported a significant increase in CDI between 2013-2014 (CDC, 2016). This is a state and local epidemic that needed to be addressed.

Role of the DNP Student

As the project lead for this doctoral project, development of a project charter to ensure identifiable roles and responsibilities were disseminated to the team. My role and responsibility as the DNP project coordinator was to aid as a "subject matter expert" and resource to assist with process improvement. This process cannot be effective with a single individual involved; it required a team approach. A collaborative effort existed with key stakeholders to assist with process improvement. McNamara, Rafferty, & Fitzpatrick (2016) describe that an interdisciplinary strategy for transferring knowledge into nursing practice is needed to meet the goal of quality improvement (p. 1200).

In my 16 years as a nurse, the evolution of nursing and health care practice has changed. Changes in nursing practices and high demands of the bedside nurse continue to emerge. The ability to impact quality and improve nursing practice is an overall career aims for me. Quality improvement processes, standardized nursing practices and production of positive patient outcomes are needed to ensure organizational success (Schlock et al., 2014). Deviations in nursing practice can produce patient harm. No biases have been addressed in this DNP project. Implementation of evidence into nursing practice was important motivational factor for this DNP project.

Role of the Project Team

In the initial planning stage, clear definition of the intended aim was

developed. A project team was utilized to work collaboratively to ensure that standardization in organizational and nursing practice co-exists. As the project lead, a core team of subject matter experts was assembled. Core team members of the project team included senior leadership sponsor (chief medical officer), project leader (DNP student), infection preventionists, environmental services, laboratory services, pharmacists, and front- line nursing staff. Senior leadership served as support and as the physician champion for the project. As the project leader, I facilitated the project and provided structure, guidance and performed secondary analysis of the data. Infection preventionists served as subject matter experts related to CDI and brought forth regulatory compliance, standard, and recommendations for best practices in CDI management. Environmental services were responsible for appropriate cleaning in patient care areas and were empowered as the leaders for infection prevention (Green, Garrett, & Scanlon, 2016). Laboratory services were responsible for all CD specimens testing. Front-line nursing staff provided feedback on nursing care practices and assisted in the development of a CDI nurse-driven testing protocol.

Timeline for the Project

With the development of this DNP project specific timeliness for all stakeholders were addressed. Project meetings were set for every two weeks with specific “to dos” for each discipline. The area of time that this DNP project covered was a 6-week pre-and 6-week post implementation period. The timeline template included a brainstorming session with all interdisciplinary team members and data review, team collaboration and review of current CD practice and strategies, analysis of current isolation and testing

practices, nurse-driven protocol development, and team discussion of implementation, action plan, and sustainability. Implementation of the bundle occurred over a 6-week period. As the DNP student project coordinator, I assisted in coordinating stakeholder involvement through strategic planning between a two-week period. Formulation and design of the CDI nurse protocol took two weeks to include lab for CD testing appropriateness. Environmental service cleaning checklist and review of environmental cleaning practices was completed within one week. Development of nurse and patient education took three weeks, one week for product development and two weeks to hardwire education practices for nursing staff to include hand hygiene with TST.

Summary

Gaps is nursing practice can lead to patient harm. Identification of nurse practice gaps requires interdisciplinary collaboration and team work. To identify gaps in nursing practice, front-line staff involvement is important. Collaboration with subject matter experts to define the problem and develop strategies for improvement not only aligns with organization and strategic goals and missions, but ultimately is patient centric with an aim to “do no harm”. To improve a patient outcome which is an expectation not only by our nurse practice act and responsibility as nurses, but government and state mandates require that quality is at the forefront for each care delivery. Collection and analysis of evidence not only supported the intended aim to decrease CDI, but required investigation and research of evidence-based practices, but allowed for objective data analysis to view if a problem in nursing and/or organization practice did exist.

Section 3: Collection and Analysis of Evidence

Introduction

The increased incidence of CD due to nonstandardized health care practices is significant. Identification of nursing practice gaps related to the care of the CD patient was explored to identify strategies for patient care improvement and improve patient safety. The global epidemic of the spread of CDI and the nursing role in the care of this population is complex. Multiple strategies and a multidisciplinary approach are needed as nurses are essential stakeholders in the strategic planning for CDI prevention (Smith & Taylor, 2016). In this section, I describe the practice-focused question and sources of evidence, reveal outcomes and research related to CDI supported by archival and operational data, describe evidence generated for the DNP project including the participant, procedures, and protections, describe the analysis and synthesis of the data, and provide a summation of the collection and analysis of evidence.

Practice-Focused Question

CDIs are the number one cause of infection within the organization. Mitigating risks for continued spread is important. CDI as known as “deadly diarrhea” impacts more than 500,000 million illnesses in 1 year (CDC, 2015). Nonstandardized CD prevention, environmental cleaning practices, hand hygiene practices, and precautions was amongst the gaps in practice. The practice-focused question for this doctoral project was targeted at patients in an acute care hospital setting: Does CD preventive bundle reduce the incidence of CDI compared with nonstandardized preventive methods?

In process measures included utilization of an environmental cleaning checklist to measure if terminal cleaning was occurring 100% of the time, hand hygiene compliance rates with utilization of the TST, and the number of rejected CD tests postimplementation of the nurse-driven CD protocol. As the purpose was centered on prevention, the approach of development and implementation of CD preventive bundles to reduce the incidence of CDI was significant. Data collection and analysis for this DNP project derived from systematic analysis of CDI rates within the organization.

Operational Definitions

Sources of evidence and data came from a literature review and analysis of best-practices for CDI management, prevention, and organizational data collection. Data collection was extracted from the EMR, infection control database, and the collection of the usage of the nurse-driven CDI testing protocol performed by the infection control department. I, the DNP project coordinator, performed secondary analysis with data collected manually through the EMR and nurse-driven CDI protocol via infection control nurses. As the DNP project coordinator, I facilitated project meetings, assisted with secondary analysis of the data, and worked collaboratively to develop strategies toward reaching the aim of CDI reduction.

Sources of Evidence

Utilization of prevention bundles to decrease CDI incidence serves as catalysis to improve CD practices (Abdullatif & Noymer, 2017). Sources of evidence that was relied upon to address improvement of CDI incident reduction was derived from CDC databases, researched publications, and compiled organizational data. An important piece

of evidence related to CD was the change in the testing mechanism for CD. Within the last year, CD positive statuses were derived from an Alere Tox A/B Quik Chek test to a real-time PCR assay (Davis et al., 2016). This test is an alternative gold standard to a stool culture with a sensitivity of 86%, specificity, 97%, which is used within the organization used to detect CDI gene toxin (Abdullatif & Noymer, 2017).

Information provided from the CDC (2015) website has revealed that inclusion and exclusion criteria within the past 5 years have changed. Inclusion criteria for CDIs are those patients who develop CDIs (hospital-acquired) after 3 days of hospitalization. A specimen is classified as healthcare facility-onset or hospital-onset. This means the specimen collection date is > 3 days after the patient's facility admission date, where the facility admission date is Day 1 (CDC, 2015). Exclusion criteria are those patients who have CDI present on admission and are tested less than 3 days upon admission (CDC, 2015).

The collection and analysis of CDI rates in relation to the implementation of the preventative bundle. The impact of the concept of prevention and a proactive approach to impact CDI rates was analyzed as part of the DNP project correlation of evidence. In this DNP project, I attempted to ascertain a multifaceted prevention bundle to impact CDI incidence within the 36-bed medical surgical unit (see Davis, 2016).

Published Outcomes and Research

A literature review is an important aspect for providing research and evidence to improve health care issues that may occur. The problem of CDI within the organization is a needed health care issue to address, and the need of exploration of best practices is

important in the development of improved CD practices. Databases and search engines used to collect evidence and strategies for improvement included Medline, ProQuest, Google Scholar, Cochrane Library, Walden Library, BioMed, Medscape, Wiley Library, CDC and NHSN databases, and EBSCO from 2006 to the present year.

Key search terms and combinations of search terms used were as follows: *clostridium difficile, prevention bundle, nosocomial infections, prevention program, infection control, hospital cleaning, cleaning bundle, cost-effectiveness, patient care, nurse's work, infection prevention and control, infectious diseases requiring isolation, nursing bundle, prevention bundle, clostridium difficile trends, hospital trends, epidemiology, PCR testing, c diff testing, valued-based purchasing, HAC program, hand hygiene, TST, The Joint Commission, CDC, NHSN, AIM PDSA, colitis, c diff spread, c diff risk,* and *c diff impact*.

The scope of the literature review for this DNP project derived from literature and a research review from CD practices, epidemiologic studies, data reviews, cross-sectional analyses, and multiple system reviews. Research and literature related to CD was reviewed from 2006 to the present day. Although much of the literature included retrospective analysis from prior years, the focus was within this period to ensure the formulation of best practices. Types of literature and sources searched ranged from CDC and NHSN guidelines, developed studies related to CD bundle prevention, CD testing appropriateness, treatment, and practices, and chronological review of implications and gaps in nursing practice.

Archival and Operational Data

Archival data from previous years in addition to current operational infection control rates provided a baseline against which to demonstrate improvement. Data was supplied by infection control nurses and other supported databases from CDC and NHSN state comprehensive datasets. The identification of CDI laboratory-identified events was the source of inclusion for and operational data that were explored. All data were de-identified for this DNP project. As noted by the CDC (2015), the CDI LabID SIR can only be calculated at the quarter level or higher; therefore, SIR rates were not studied in this DNP project, but the number of CDI incidences was reviewed for the scope of this DNP project to detect CDI incident improvement. The relevance of viewing CDI incidences (raw numbers) was needed for comprehensive data analysis to determine the effect of CDI outcomes (CDC, 205). Since the CDI LabID SIR rate is calculated on a quarterly basis, raw CDI incidences were tracked and trended due to the DNP project timeline. The data were tracked and measured weekly, de-identified, and provided in an Excel file format for secondary analysis by me. The timeline for the implementation of the DNP project team and implementation of the bundle was approximately six weeks pre-and post-analysis; thus, prolonged success and/or measurement of relative rates for CDI improvement are out of scope of this DNP project (long-term improvement/control).

Evidence Generated for the Doctoral Project

Participants.

The DNP project team had one project executive sponsor who was the chief medical officer (CMO), medical surgical nursing directors and manager, environmental

services staff, one pharmacist, two front-line staff nurses, infectious disease provider, two infection control nurses, one quality manager, one certified Lean Six Sigma Master Black Belt specialist, one data analyst, and one abstractor and DNP project coordinator. Selection process for stakeholders for this proposed DNP project was derived by the needed resources to improve CDI incidence within the organization. As CD is a multifaceted, complex disease, to combat; strategic planning took place. Multiple complexities to decrease the incidence of CDI within organizations require standardized practices in reporting, testing, and environmental cleaning (Cruz-Betancourt, 2016). This is how the above-named stakeholders were relevant to the project aim of decreasing the incidence of CDI.

Procedures.

Process improvement requires a multitude of data collection and reporting techniques. Quality tools that were used for this DNP project was the utilization of statistical process control (SPC), control charts to display data to identify how processes or outcomes change over time (Joshi, Ransom, Nash, & Ransom, 2014). The utilization of SPC was a major tool used to display statistical significance in this quality improvement project (Joshi, Ransom, Nash, & Ransom, 2014). Elements of the control chart show the specifications of a desirable and undesirable level of variation. Special cause and common cause variation can be visualized with a control chart which can be noted if a specific data point extends outside the upper specification or lower specification limit (IHI, 2017). The form of an SPC chart that was utilized was a T chart. A T chart or time-between chart is an alternative to a standard attribute chart when the

incident of interest is relatively rare and a measurement of time between each CD occurrence of the incident can be obtained (Provost & Murray, 2011). Utilizing a T chart allows for each opportunity for improvement/occurrence to be immediately evaluated on the chart and is useful to identify improvements (infection reduction) to view if process for improvement will affect the outcomes (Provost & Murray, 2011).

When analyzing CDI incidences over time, identification of a trend over time will be identified or defined as six consecutive data points increasing or decreasing overtime (Joshi, Ransom, Nash, & Ransom, 2014). Validity and variability was developed by primary source verification and inter-rater reliability of data analysis and measurement (IHI, 2017). Construct validity was determined by proposed correlation between concepts. For example, dissemination between environmental cleaning product usage of which was effective for environmental decontamination.

Measurement analysis was derived by studying of "raw" CDI incidences instead of CDI standard infection rations as this data is only correlated on a quarterly basis. Standard infection ratios have been derived from CDC recommended parameters in acute care hospitals. Data was de-identified and provided in an Excel file format and secondary analysis was conducted by infection control nurses and DNP project coordinator. No tools were created for statistical analysis for this DNP project.

Education.

A robust education program was developed via power point presentation for all stakeholders to visualize specific timelines, goals, and project aims that will need to be achieved for DNP project success. Education was developed and discriminated to reflect

isolation practices, hand hygiene compliance, nurse-driven protocol and CD testing appropriateness (Balsells, et al., 2016). Seventy Medical-Surgical associates were educated (nursing staff and nursing aides). A total of 75 environmental services associates were educated as well. A total of 10 education sessions was offered to capture this audience. (Add power point attachment)

Protections.

Ethical protection within research is a necessity to protect human subjects. As part of stakeholder accountability and privacy, all stake holders had current HIPAA competency to protect project and health care information. According to the US Department of Health and Human Services (2014) the HIPAA privacy rule establishes national standards to protect patients' medical records and other personal health information (p. 1). Authenticity of data and interdisciplinary relationships are important in the success of project design and implementation (Priest, et al., 2006). The development of working relationships and recruitment of project stakeholders involved strategic alignment to focus on each touch point to decrease CDI incidences within the organization.

Ethical protections involved protection of human research subjects. Through HIPAA compliance this was accomplished as no direct human interaction will be involved in this DNP project. The basic HHS policy for protection of human research subjects applied to research involving the collection or study of existing data, records, pathological specimens or diagnostic specimen, will be identified in this DNP project study (HHS, 2014).

The Institutional Review Board for Ethical Standard in Research (IRB) is responsible for all Walden University research and complies with ethical standards and U.S. federal regulations (Walden, 2017). As this DNP project required statistical and data analysis IRB approval was needed. IRB approval was secured: 01-32-19-0072831.

Analysis and Synthesis

Data collected were recorded, tracked, organized, and analyzed using statistical process control (SPC), control charts (T chart) to display data to identify how processes or outcomes change over time (Joshi, Ransom, Nash, & Ransom, 2014). Analysis and synthesis utilizing a T chart utilized CD rates (incidences) pre-and post-bundle implementation will occur in the "study" phase of the PDSA cycle. This was viewed via CDI rates post interventions, increase hand hygiene compliance rates, increase environmental compliance rates (UV-light data), and with the number of CD tests ordered (rejected) pre-and post-bundle implementation. Utilization of a control chart will assist in viewing how process or outcomes will change over time and CDI incident improvement (Joshi, Ransom, Nash, & Ransom, 2014). This form of analysis with the use of QI macros program allowed for structured analysis of the data. QI macros is an Excel program which can formulate multiple statistical analyses with specificity and statistical significance. Data integrity was compiled via inter-rater reliability for management of abstraction and data collection and analysis. Inter-rater reliability is import to data integrity because if multiple stakeholders are involved in this process, statistical analyses can be jeopardized. Opportunities for improvements and/or outliers were validated by secondary verification to ensure validity by the DNP project manager.

Elements of the T chart show the specifications of a desirable and undesirable level of variation. Special cause and common cause variation can be visualized with a control chart which can be noted if a specific data point extends outside the upper specification or lower specification limit (IHI, 2017). When analyzing CDI incidences over time, identification of a trend over time will be identified or defined as six consecutive data points increasing or decreasing overtime (Joshi, Ransom, Nash, & Ransom, 2014). Analysis procedures that was used in this DNP project to address decrease CDI incidence was validated by decrease in the total number of *clostridium difficile* infections versus increase compliance with preventative bundle elements. This was derived through environmental cleaning and appropriate testing validation and construct validity. PDSA performance improvement methodology was used to guide process improvement in this DNP project. Planning to achieve decrease CDI incidence, implementation of the strategies to improve, study the outcomes (data) of the proposed outcomes, and finally "acting" upon the results (positive or negative) was determined as four consecutive PDSA cycles occurred as the intended result was not achieved initially (decrease CDI incidence) (Donnelly & Kirk, 2015). In process measures was captured via a two-week period of data collection to include UV light cleaning monitoring for environmental cleaning appropriateness, percentage of cleaning compliance (n=50), hand hygiene audits (n=160), chart audits to view the percentage of appropriate isolation practices for CD patients, and the number of CD lab specimens declined, percentage of inappropriate CD tests ordered.

Summary

Improvement of CD practices within the organization required a multidisciplinary collaboration, reporting transparency, and strategic alignment to impact positive change within the organization. As CDI incidences rise, patient harm increases, and health care cost will continue to rise. As this DNP project developed strategies for improvement, the aim was overall CDI incident reduction and improves patient care outcomes.

Section 4: Findings and Recommendations

Introduction

The number one infection throughout the organization, CDI, continues to climb, and gaps in practices were identified by the DNP project team. A bundle approach to decrease CDI was developed and disseminated on a medical surgical unit to address the practice question: Do CD preventive bundles reduce the incidence of CDI compared with nonstandardized preventative methods? The DNP project was conducted in a not-for-profit Catholic hospital in Louisiana on a 36-bed medical surgical unit with high CDI incidences. The period analyzed January 2017 through February 2018. In process measures reviewed were (a) CD testing appropriateness via testing protocol, (b) number of CDI incidences, (c) environmental cleaning rates via UV light testing, (d) isolation compliance rates, and (e) hand hygiene compliance rates. Analytical strategies used in this project were to ensure that interrater reliability was maintained throughout the project and during the data collection phase. Statistical analysis was completed by primary and secondary verification processes. Primary analysis and verification were conducted by the infection preventionists, and secondary analysis and data verification were performed by the DNP project coordinator. In Section 4, I describe the findings and implications, recommendations, contribution of the doctoral project team, and strengths and limitations of the project.

Findings

Testing Appropriateness

A nonstandardized approach was noted prior to the development and implementation of a standardized CD nurse-driven testing protocol (see Appendix B). The need for development of such a protocol was due to inflated CDI rates within the organization. To reduce CDI incidences within the organization, CD testing appropriateness needed to be addressed not only as a strategy for improvement but also to empower physicians to understand the need for standardization. A physician champion was identified by the DNP project team, and a letter was disseminated to all physicians written by the system chief medical officer, highlighting the need for practice change for the CD patient and standardization as CDI incidences was on the rise (Appendix C). The letter addressed the need for enhanced diagnostic practices with specific operational guidelines related to PCR testing (Appendix B). Guidance to all physicians was disseminated in this this letter via e mail and by mail. Physicians also received as attachments to the original letter guidance of laxative and CD testing, the diagnostic algorithm, and the Bristol stool chart (Appendices C, D, and E).

The director of quality improvement at the organization conducted a retrospective chart review to view for CD testing appropriateness. As requested by senior leaders, an organizational view and unit specific data review was conducted for testing appropriateness for this DNP project. De-identified CD tests were reviewed from July 2017 through December 2017, and the de-identified data were provided to me for secondary analysis. The nurse driven testing protocol was developed and initiated in

October 2017. From July 2017 to December 2017, the organization cancelled 118 CD PCR tests. From the initiation of the nurse-driven testing protocol in October 2017 to December 2017, 79 additional CD PCR tests were cancelled with the initiation of the nurse-driven testing protocol (39 PCR tests were cancelled prior to protocol initiated). A total of 20 tests were canceled from the initiation of the nurse-driven testing protocol on the medical-surgical unit, which accounted for 16.9% of the total cancelled tests (see Figure 2).

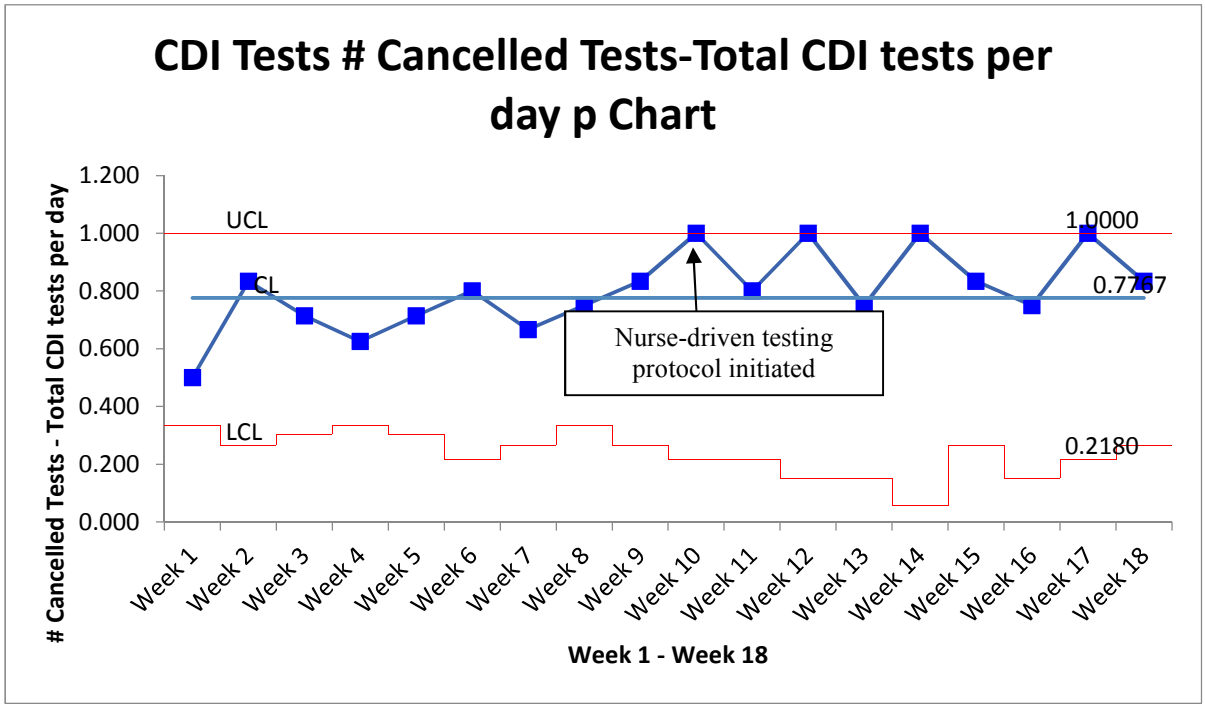

Figure 2. Cancelled CD tests via nurse-driven testing protocol.

A business case was developed to determine the financial impact to the organization related to inappropriate CD PCR testing. The stakeholders involved were I, the infection preventionists, financial analysts, and the quality coordinator. We were asked to develop a business case for the organization's senior leaders (see Table 1). The

organization for this DNP project was labeled as "Ministry A". This was presented to senior leadership and the physicians in a medical staff meeting.

Table 1

Financial Impact Cost Saving for Cancelled Tests (July 2017-December 2017)

Ministry	Cancelled tests	Cost per test	Total savings
MS Unit	20	$36	$ 720
Ministry A	118	$ 36	$ 4,248
Total	118	$36	$4,248

Note. MS Unit included in total savings calculation.

As the DNP project chair, I was asked to place a financial dollar amount estimating the cost of harm for the CD patient. After conferring with case management to delineate the diagnostic related group (DRG) for the CD patient, the incremental cost for the CD patient was calculated and determined by primary source verification from a financial analyst within the organization that the cost to care for a patient who exhibits a hospital-associated CDI is $922. The incremental cost associated with CD was calculated by multiplying the additional length of stay associated with CD by the discounted cost per patient day for CD patients. The lengths of stay, DRGs, and direct variable costs (for room and board and ancillary services) were queried for all CD patients' fiscal year to date. The cost per patient day was calculated and then discounted by 25% to account for the decrease in ancillary services towards the end of a patient stay. The lengths of stay for all non-CD patients were queried by DRG (only for patients with the same DRGs as the CD population). The average length of stay variance was calculated at the DRG level and multiplied by the CD cases for each DRG to calculate the incremental days associated

with CD. The incremental days associated with CD was divided by the total CD patient to determine the additional length of stay associated with CD.

Clostridium difficile Incidences

CD was identified as the number one hospital-associated infection within the organization. The quality improvement team verified that CDI accounted for 38% of the total harm for the organization. A bundle approach was proposed as a strategy to decrease CDI within the organization. A retrospective data analysis was conducted by the infection preventionists, and I performed secondary analysis. De-identified data were reviewed from the period of January 2017 to March 2018. A notable increase in HAIs due to CD was noted on the medical surgical unit. The T chart (or time-between chart) was used to illustrate the time between CDI occurrences, see Figure 3 (Provost & Murray, 2011).

Preimplementation of the CD bundle the total mean of days per CDI incident equaled 19.9 days. Postimplementation of the CD bundle, the mean days per CDI incident, equaled 30.2 days. CD best practices implemented via a bundle approach to decrease CDI were initiated October 2017 (Appendix F). With the initiation of the CDI bundle, there was a notable decrease in CDI incidences on the medical surgical unit (see Figure 4).

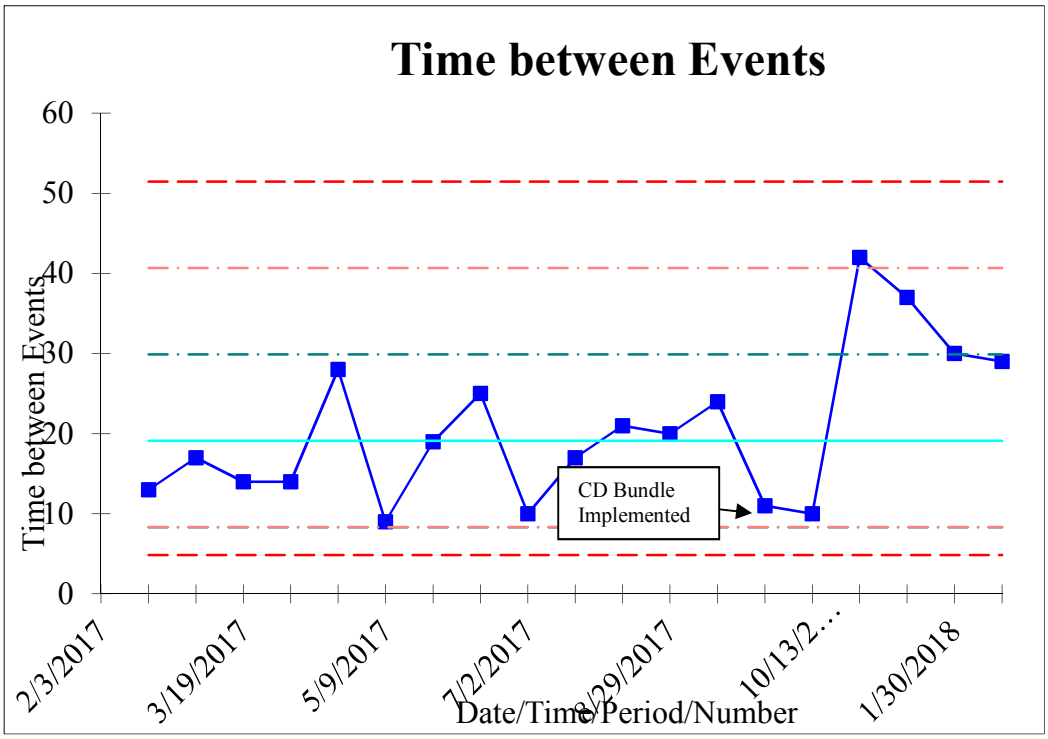

Figure 3. Days between CDI events.

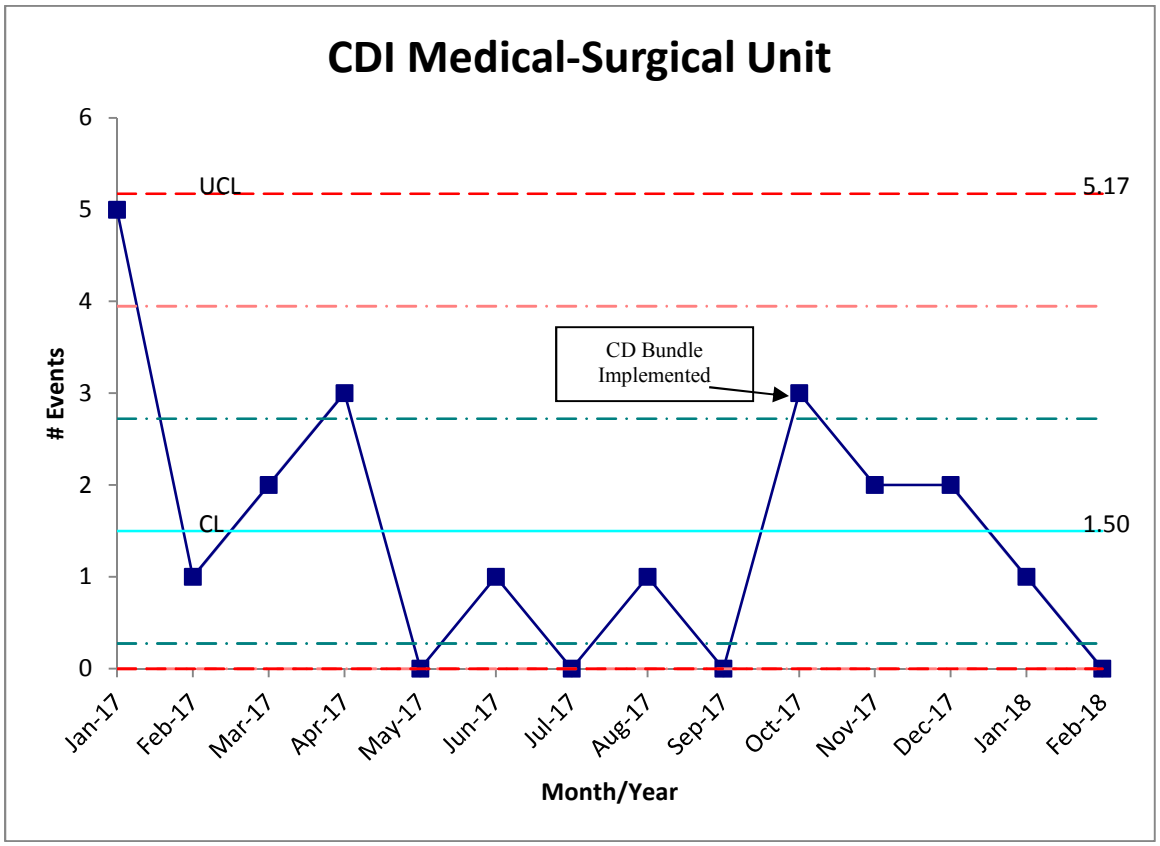

Figure 4. CDI incidences medical-surgical unit.

Environmental Cleaning

Standardization of environmental cleaning was a major component to decrease CDI within the organization. A multidisciplinary team was developed to include the Infection Preventionists, Environmental Manager, DNP project coordinator, and Quality Coordinator. A Daily DAZO Audit Tool was developed to validate and standardize environmental cleaning throughout the organization (Appendix G). Consistency in cleaning of "high touch" cleaning surfaces was found to be an opportunity on the MS unit. Cleaning products were changed to a more standardized approach to clean all patient rooms with one universal cleaning methodology/solution (Oxycide); Oxycide was used to clean all patient rooms as an infectious CD room and inspection of the pH solution for

appropriate concentrations of Oxycide was monitored to ensure cleaning validation. To ensure proper dilution of Oxycide, a pH of 3 is noted when the solution is properly diluted to ensure disinfection appropriateness. Weekly inspections by direct observation was performed (n=32) by the Infection Preventionists and Environmental Services Manager to validate proper solution dilution. Direct observations were conducted 16 weeks pre CD bundle and 16 weeks post CD bundle implementation. During the 16 week pre CD bundle implementation phase, appropriate Oxycide pH compliance was performed 56.25 percent of the time and during post CD bundle implementation phase, Oxycide pH compliance was performed 87.5% with noted appropriate pH testing (see Figure 5). This was a noted improvement of 31.25%. Immediate in-time reeducation was performed for those opportunities for improvement for when proper pH was not maintained for the Oxycide cleaning solution. Continued monitoring will be conducted to validate Oxycide dilution appropriateness as the aim is to have appropriate pH level 100% of the time for effective CD cleaning which will be out of scope of this DNP project.

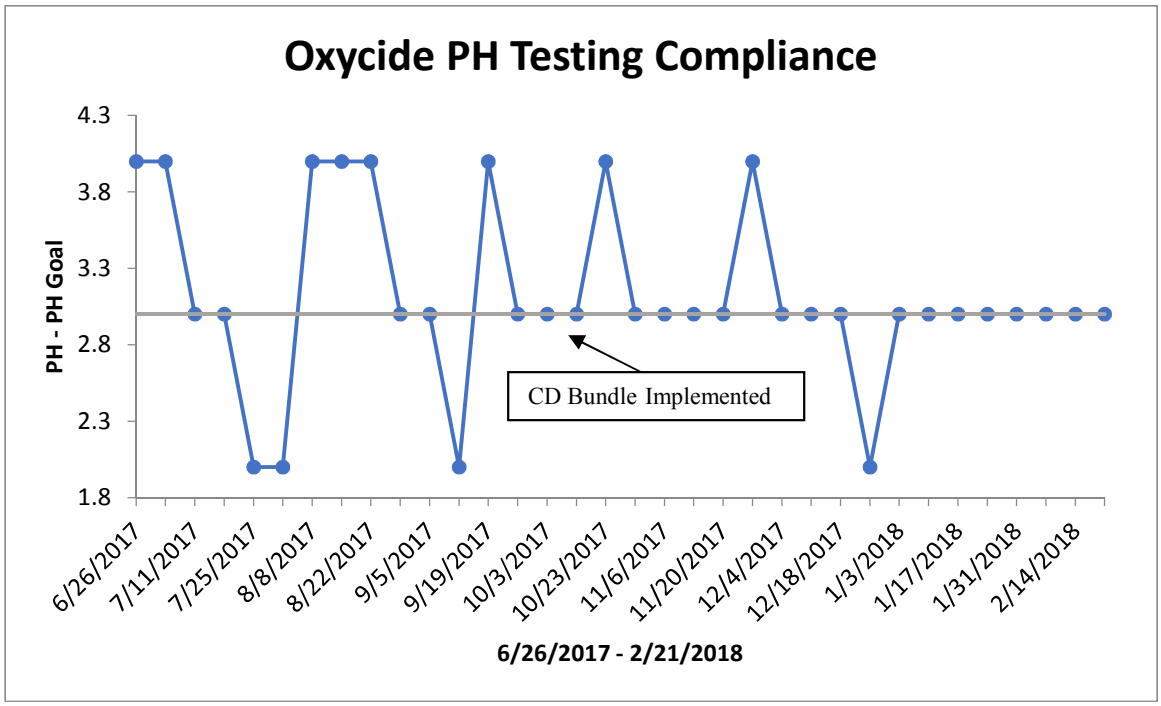

Figure 5. Oxycide cleaning pH validation.

Daily DAZO monitoring was also performed by a retrospective validation process to confirm high-touch surface cleaning during the 34-week Dazo monitoring period for high-touch cleaning (n=126). During the 18-week post CD bundle implementation period, high-tough surface cleaning was performed correctly 83.3% of the time for the total compliance rate. (See Figure 6). Pre-bundle DAZO compliance rate was 43.7% (see Figure 6). High-touch surface cleaning was improved by 36.9% from pre-bundle to post-bundle implementation.

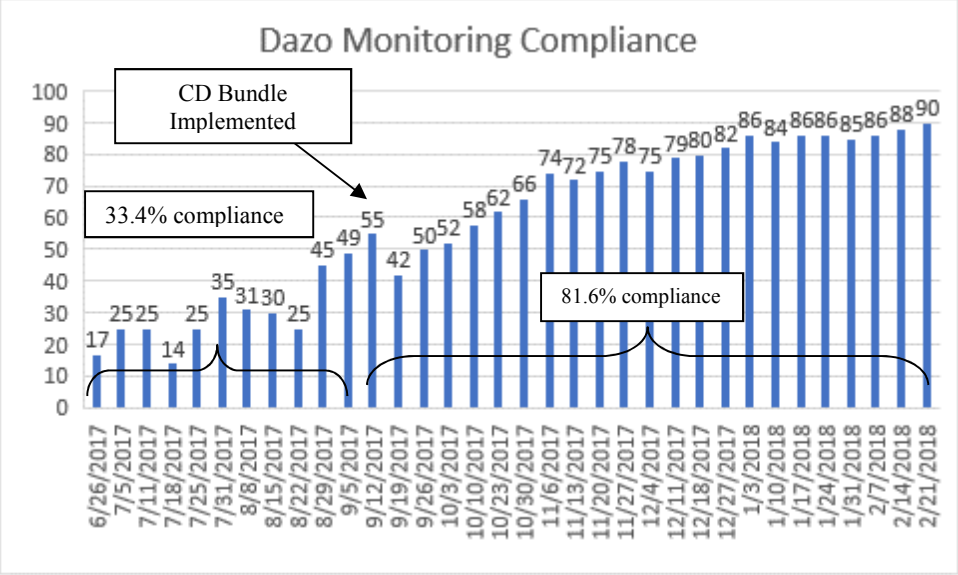

Figure 6. DAZO monitoring compliance.

During the post implementation phase of the CD bundle, I the DNP coordinator performed a secondary analysis to note the five-common high-touch surfaces which were not cleaned (see Figure 7). The top two high-touch cleaning defects which accounted for 56.3% of the total defects for high-touch cleaning were noted as bedside table and bed rail cleaning. Validation and verification of proper patient room cleaning was conducted by the Director of Environmental services via the Dazo audit tool (Appendix G) daily with 1:1 coaching with those associates with compliance rates less than 90%.

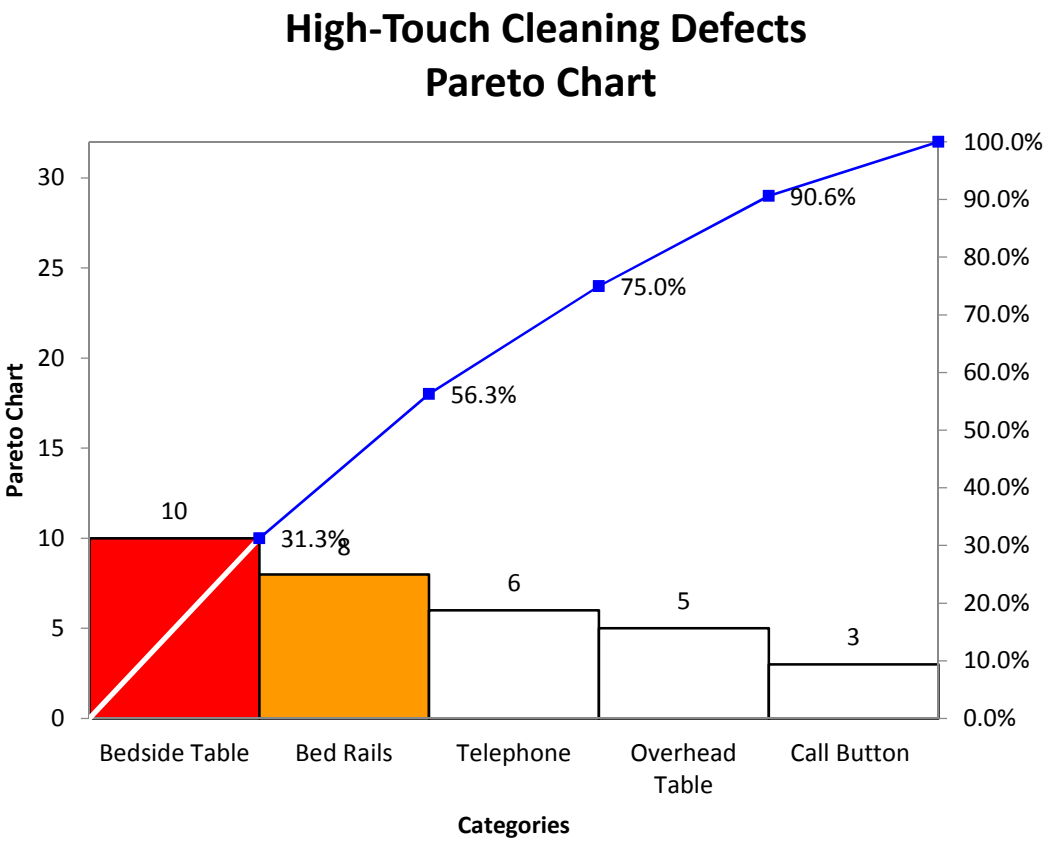

Figure 7. High-touch cleaning defects.

Isolation Compliance

Isolation compliance was monitored by direct observation for an 18-week period (n=65). Contact precautions as part of the isolation compliance were instituted immediately for patients with diarrhea. Signage was placed for patients with confirmed or suspected CDI, personal protective equipment in the form of an isolation caddy was initiated as a component of the isolation bundle (Koll, et al., 2014). Isolation compliance pre-bundle implementation was 62.7% and post-bundle implementation was 90%. A 27.3% increase was noted in isolation compliance from pre and post CD bundle implementation (see Figure 8).

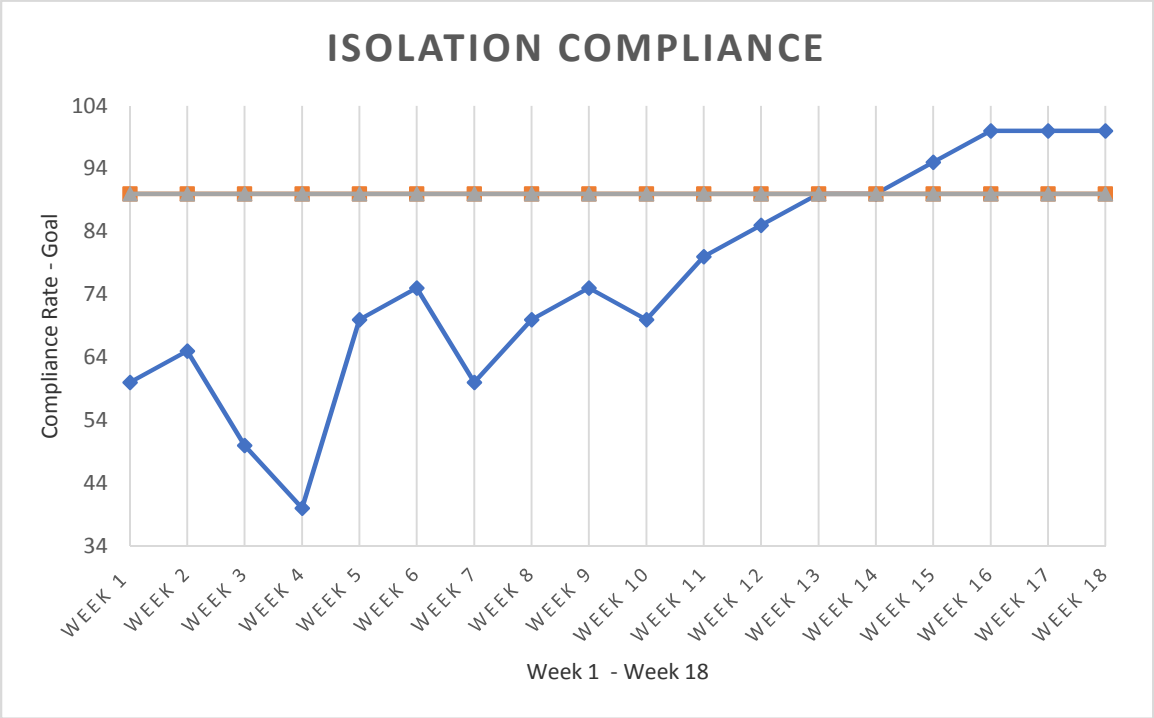

Figure 8. Isolation compliance.

Hand Hygiene Compliance

Hand hygiene is an important component as an infection prevention strategy to decrease infections in hospitals (Martinez, Leffler, & Kelly, 2012). The importance of educating all hospital stakeholders that alcohol-based hand gels are not recommended to combat CDI was an import piece to guide hand hygiene compliance throughout the unit.

Education about the importance of hand hygiene via soap and water was provided and compliance rates were measured by direct observation. Pre bundle implementation hand hygiene monitoring was completed through a "secret shopper" approach. A retrospective review of hand hygiene data from January 2017 to December 2017 were analyzed by the QI team and recommendations were made for a new hand hygiene monitoring approach. Accordingly, hand hygiene monitoring was initiated in October

2017 using the Targeted Solutions Tool (TST) (Appendix H). Direct observations with the utilization of TST totaled 160 observations (n=160). The time from October 2017 to December 2017 is noted to be the baseline phase of the new hand hygiene performance improvement project. The unit's hand hygiene compliance rate during the DNP project analysis over a 16-week period was 76%. Determination of new hand hygiene compliance rates was noted to be a true representation of the units' compliance rate per the Infection Preventionists. Prior to implementation of the TST, observations regarding hand hygiene were overinflated. The new standardized methodology of hand hygiene surveillance limits the observations to two timeframes: in and out of the patient's room. Observations are also captured that relate to factors surrounding patient contact, facilitating additional problem solving. This allowed for better measurement of hand hygiene compliance (see Figure 9).

Figure 9. TST methodology.

Areas of opportunity for hand hygiene improvement were noted in several categories (see Figure 10). The top three opportunities for improvement were related to a combined total of 76.9% of the total defects which included, frequent entry or exit of the

patient room, improper usage of gloves, and hands full. These data will be used for additional problem solving to improve compliance with hand hygiene requirements that ultimately affect the CDI rates and other hospital acquired infections.

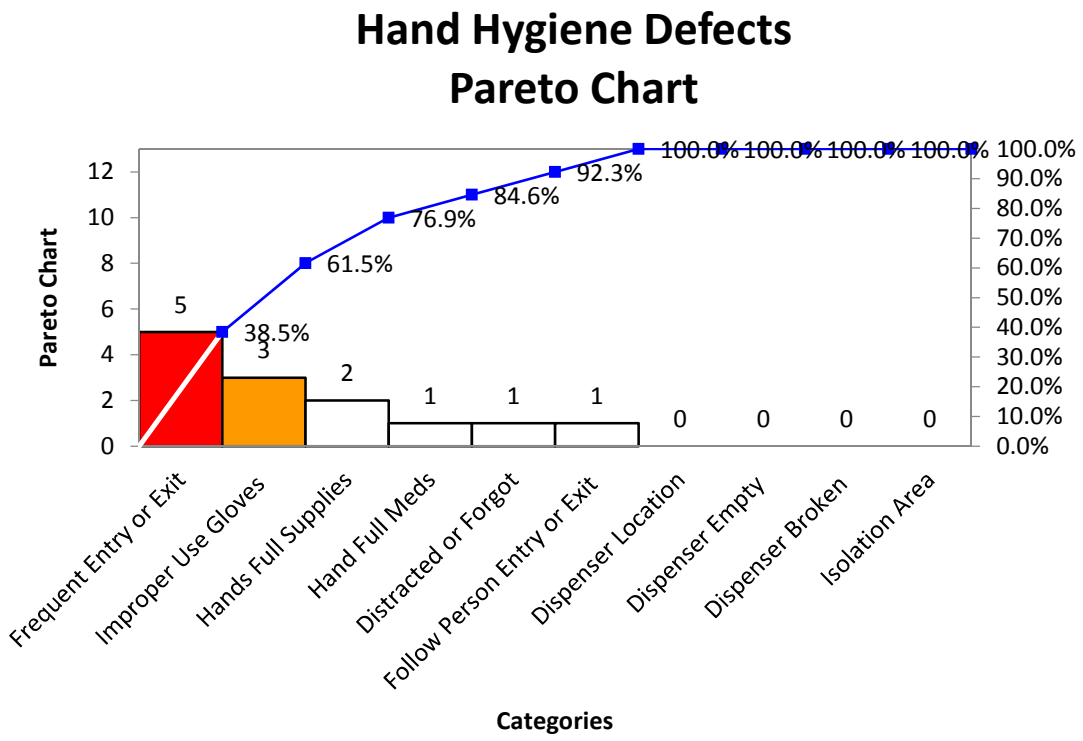

Figure 10. Hand hygiene defects.

Implications

Policy

Collaboration among a variety of stakeholders took place to improve quality within the organization to reduce *clostridium difficile* infection (CDI). The improvement will have an impact on the organization's harm reduction rate and affect policies within in the organization in the management of CDI and the care of the patient who is infected *clostridium difficile* (CD). For example, utilization of a CD screening tool to be used on admission determining patient risk of developing a CDI during hospitalization is

presently under development at the project site as a result of this DNP project. The nurse-driven protocol for CD testing appropriateness is also under development as a result of this DNP project and another example of how the information system will be used to improve CDI outcomes within the organization. The literature reviewed in the DNP project infused the QI team with adequate evidence, collaboration between a variety of stakeholders helped to improve CD outcomes with the utilization of a bundle approach throughout the project.

Social Change

The need for continual surveillance to impact CDI rates is needed to not only impact care for the CD patient, but to ensure that outbreak management is considered. The use of a bundle approach to combat CDI incidences is needed as containment of CD requires a multifaceted approach. Many domains are affected that impact the spread of CD. Improving patient, family, and visitor education is needed to close gaps and embed the importance in communities of issues such as hand hygiene and timely diagnosis to hinder the spread of CD throughout the community. This will positively impact social change to improve infection control practices and decrease harm for patients.

Recommendations

One pertinent recommendation emerging from this DNP project can be summarized as the continued use of the standardized methodology to gather hand hygiene data to systematically address not only areas of opportunities, but to identify specific stakeholders related to hand hygiene compliance. In this DNP project, a variety of stakeholders were not identified as registered nurses were the population identified for

hand hygiene compliance. Proposed recommendations would be for a variety of stake holders to be studied related to hand hygiene compliance moving forward (physicians, techs, dietary, etc.). (Appendix H).

As part of one component of the CD bundle, environmental cleaning was identified as a gap in practice. A positive recommendation noted through this DNP project, the cleaning of high-touch surfaces by nursing staff was identified as best practice to decrease infections (Pelleschi, 2008). Nursing staff will now wipe down high-touch surfaces each shift with the addition of environmental services cleaning each shift as well. A systematic approach to validate environmental cleaning is now standardized and performed consistently to ensure proper cleaning throughout the unit (Appendix G).

Contribution of the Doctoral Project Team

Working collaboratively to propose strategies to improve patient care for the CD patient was the ultimate aim of this DNP project. Each stakeholder had a precise responsibility contributing to project success. Improving CD within the medical surgical unit required a multifaceted approach that involved senior leader support, environmental services, infection preventionists, laboratory personal, quality personnel, physician buy-in, nursing support, and ancillary department participation. The DNP project was successful due to this collaboration. With specific aims needing to be achieved, the goal was to streamline, standardize, and reduce the gap in practice for the CD patient. Development of the nurse-driven testing protocol and Dazo audit tool (Appendix A & G) were collaboratively achieved by the infection preventionists, front-line nursing staff,

physician champion, laboratory manager, environmental manager, quality coordinator, and DNP project coordinator.

Plans to continue this DNP scholarly project are needed to achieve sustainability of the project (Koll, et al., 2013). To establish process control over time, strategies for continuing improvement will be needed over time. Plans to extend the project beyond the DNP doctoral project will occur with continuing collaborative efforts and using the DNP project tools to continue CD testing appropriateness improving care on a continuum and maximizing patient outcomes.

Project Strengths and Limitations

Strengths and limitations of any project are noted to improve project outcomes and sustain improvement over time (Koll, et al., 2013). Identification of strengths and limitations allow for identification of needed change within the DNP project. Project strengths and limitations will be disclosed below. Project strengths and limitations are noted in scope of this DNP project.

Project Strengths

Strengths of this DNP project to utilize a preventive bundle to decrease CDI incidences were successful. Appropriate management of CDI, including infection control practices, environmental cleaning/disinfection, testing appropriateness, hand hygiene compliance and early isolation practices were major strategies to improve CD incidences on the unit. Prevention and control during the DNP project study period is noted to be successful with improve interprofessional collaboration and decrease transmission and CD spread prevention (Gravel, et al., 2009). With construct of specific preventive

methodologies to reduce CDI incidences within the unit, decrease CDI incidents were noted. Best-practices were also adopted due to the control of CDI within the study unit. Direct patient care focuses were also noted to improve the overall outcome of patient care within the unit to include but were not limited to potential decrease spread to other patients and/or families and an ultimate decrease in hospital infection rates (Pokrywka, et al., 2014).

Limitations

This DNP project is not without limitations. A direct correlation to decrease CDI could not be correlated from specific CD bundle components. With the utilization of TST methodology for this DNP project, registered nurses were there only stakeholders studied related to hand hygiene compliance. Prior hand hygiene methodologies were not studied to review comparison data Full utilization of the TST methodology was limited due to direct observation limitations and time. Sustainment of performance improvement will be out of scope of this DNP project. Applicability of findings related to CD bundle components were limited due to the inability to examine the effectiveness of preventive bundles targeted toward those patients whom may have been colonized with *clostridium difficile* versus those patients who has specific hospital acquired *clostridium difficile* (Grigoras, et al., 2016).

Section 5: Dissemination Plan

Dissemination Plan

Dissemination of evidenced-based practice to improve patient outcomes is the aim for this quality improvement DNP project. As the focus was to decrease CD incidences on a medical surgical (MS) unit, dissemination means using the CDI bundles throughout the organization to improve care for the CD patient. The distribution of the bundle approach to decrease CDI on a single medical surgical unit resulted in a 47.6% decrease in CDI on the unit. Incorporation of this evidence-based practice will also be shared as a best practice as a system approach to standardize care throughout the health system. This DNP project marks the start of a nursing culture hallmarked by an evidence-based practice (EBP) with the use of research findings, quality improvement data, clinical expertise, and patient values to guide health care decisions (IHI,2017).

Analysis of Self

In the almost 2 years that I have been a DNP student, I have gleaned an enormous amount of knowledge, skills, and educational experiences to improve not only future nursing practices but an array of expertise in leadership, advanced nursing practice, improved health outcomes, and informed health care policy, just to name a few. As a DNP student, I have not only broadened my knowledge-base in using EBP to improve patient and health care outcomes but have developed a global perspective to professional practices in nursing.

Nurse Scholar

I have improved my nursing leadership skills and have become a nurse scholar by using EBP to improve health care outcomes applying research findings and using collaborative efforts throughout the organization to guide health care and nursing practice decisions to improve health care delivery. I used interprofessional teams to improve patient outcomes. For example, I used a multifaceted approach with a variety of stakeholders to improve care for the CD patient, which allowed for successful dissemination of EBP to improve patient outcomes. Rapid cycle testing to evaluate performance improvement was also noted to be beneficial and successful.

Advance Practice Nurse

Providing leadership to employ evidence-based strategies and research to reduce hospital-associated infections such as CD within the organization was achieved. According to the AACN (2017), the need for leadership and employment of research-based nursing practices is needed (p. 2). In this DNP project experience, I not only assisted in leading the development of EBP but used DNP educational Competency III, clinical scholarship and analytical methods for evidence-based practice (see AACN, 2006). As the DNP project coordinator, I assisted in research of best practices of care for the CD patient, assisted in the development of infection prevention strategies, and overall helped improved care for the CD patient. I assumed a leadership role that will allow for improved learning and general application of clinical practice guidelines and improve nursing practice. An example of a specific leadership role was that I was the assigned project lead for this quality improvement project. Adoption of an evidence-based culture

is the main strategy to allow not only nurses but all stakeholders within the organization to incorporate and understand the importance of EBP to improve patient outcomes (Green, 2016).

The utilization of EBP to improve patient outcomes and nursing care delivery is one way I learned to advance nursing practice throughout my DNP project. The advancement of the nursing practice is important in the sustainability and the future of nursing. Leading change and the future of advancement of nursing practices were noted with the discussion of strategic planning for nursing practice advancement within the organization. As part of my DNP project experience, I viewed the October 2010, Institute of Medicine's report, *The Future of Nursing: Leading Change, Advancing Health,* and viewed Recommendation 7 in this report. According to the report from the Institute of Medicine (2010), the preparation and/or recommendations of preparation of nurses to assume leadership positions enable continued professional growth in health care. The evolution of the nursing professional and the changing needs of population needs require a broader focus on health care redesign as health care reform continues to exist (Strech & Wyatt, 2013).

Long-Term Professional

Developing long-term professional goals as a DNP nurse scholar will allow for future professional growth in nursing. This scholarly journey has been insightful yet challenging. The challenge pushed me to strengthen my leadership goals and has forced me to become a scholarly change agent to become a successful nursing leader. I now know that the sky is the limit, and I can reach any goal set forth professionally and am

honored to be a scholarly practitioner who will not only pave the way for the future of nursing practice but improve the nursing profession.

Summary

The impact of any type of progression is to have the ability and the will to learn from others. As a nursing professional for 17 years and a DNP student for almost 2 years, the light at the end of the tunnel is ever present. The ability to reflect on my improved way of thinking, using research to impact patient and organizational outcomes, improving communication and collaborative efforts, and increasing the knowledge base in health care policy and reform has truly impacted not only my educational experience as a DNP student but my professional nursing experience to achieve one of the highest accolades in my nursing profession. Not only have my scholarly experiences and role as a DNP project coordinator been life-changing but the support of many DNP professors at Walden University has given me the tools and guidance to succeed.

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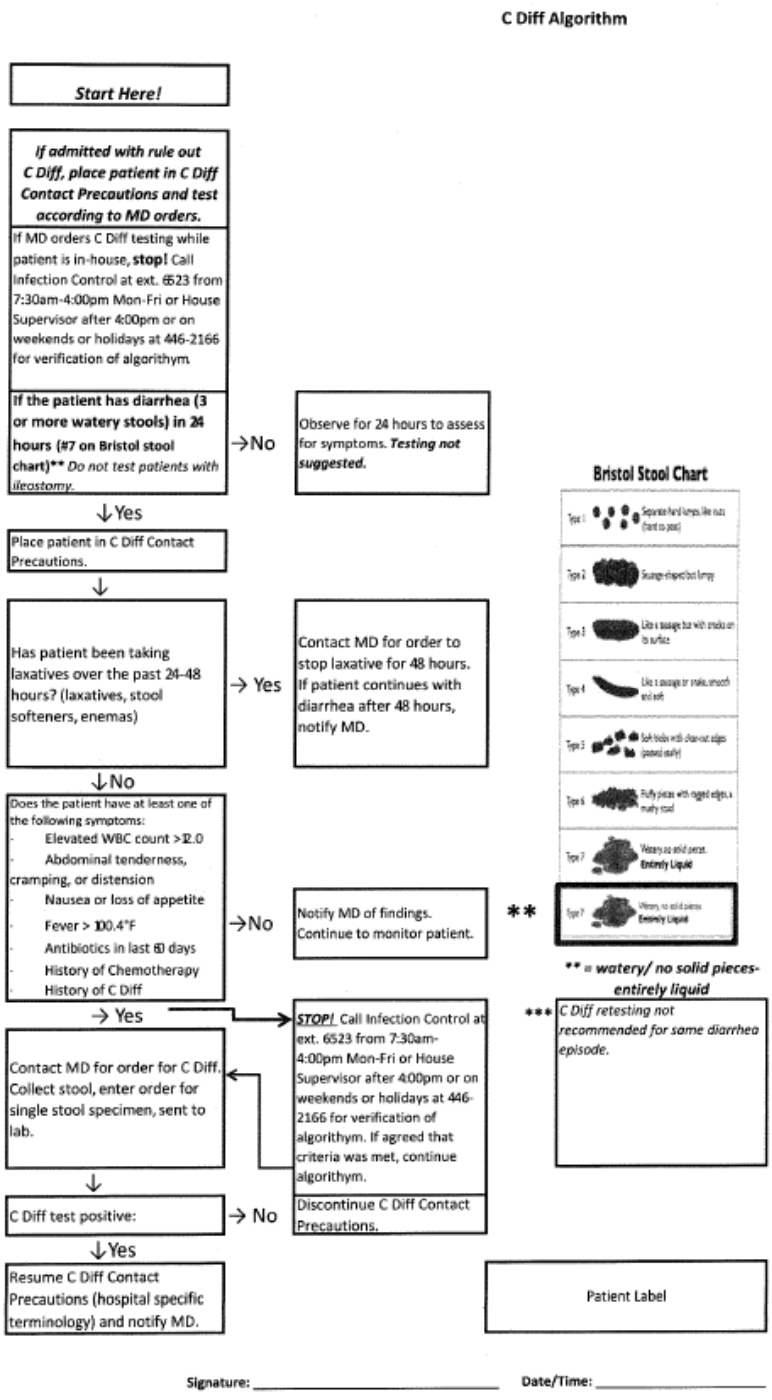
Appendix A: *Clostridium difficile* Nurse-Driven Testing Protocol



Appendix B: Physician Letter-*Clostridium difficile* Guidelines

October 26, 2017

To: The Medical Staff at XXX

From: XXX, M.D.

Re: *Clostridium difficile* Testing Guidelines

Dear Colleagues,

As you are aware, infection prevention and control continues to be a major health care challenge for our hospitals and clinics. As part of the effort for early identification of one of the most troublesome agents of sepsis, the identification of *Clostridium difficile* infection (CDI) as the active infectious agent compared to the less serious condition of colonization, has resulted in a new testing protocol. Implementation of this protocol will allow for greater focus on the most serious hospital-associated gastrointestinal illnesses.

To facilitate enhanced diagnostic practices, the following guidelines are recommended:

C. difficile testing should only be performed on patients with clinically significant diarrhea defined as **3 or more loose or liquid stools that occur in a 24-hour period.**

Providers should ensure that the patient has not been administered laxatives in the prior 24-48 hours as a possible explanation of diarrheal symptoms. *C. difficile* testing should NOT be ordered on patients who have an ileostomy.

C. difficile testing is not recommended as part of a fever workup or evaluation of an elevated WBC unless there is accompanying diarrhea as defined above.

C. difficile testing should not be performed on formed or hard stool or on patients who have had a positive specimen within the preceding 21 days as the test may remain positive for months despite clinical response to treatment.

Due to the sensitivity of PCR test only one specimen will be tested per seven days if the test is negative. When repeat testing is performed for CDI a 7-day period, the pre-test probability for the second assay is so low that the ratio of true-positive results to false-positive results becomes very unfavorable; this could result in misdiagnosis for some patients.

To operationalize these guidelines, the laboratory will not perform a *C. difficile* PCR test in the following:

- Patients who have previously had a positive PCR for C. difficile in the last 21 days
- If stool specimen is received >72 hours after being ordered
- When the specimen received in the laboratory is formed stool or Type 1-6 on the Bristol Stool Chart
- Only one specimen will be tested by PCR per 7 days if tested negative

If there is suspicion of CDI in a newly admitted patient, it is imperative to get the stool specimen to the laboratory promptly. This will allow for early diagnosis and isolation.

Thank you for your continued support of CHRISTUS Health and our continued effort to provide safe, effective care for the patients and communities we serve.

Please contact me if you have any questions or concerns.

Sincerely,

XXX, M. D.

Attachment: Guidance to Providers: Laxatives and *Clostridium Difficile* Testing

Appendix C: *Clostridium difficile* Guidelines to Providers

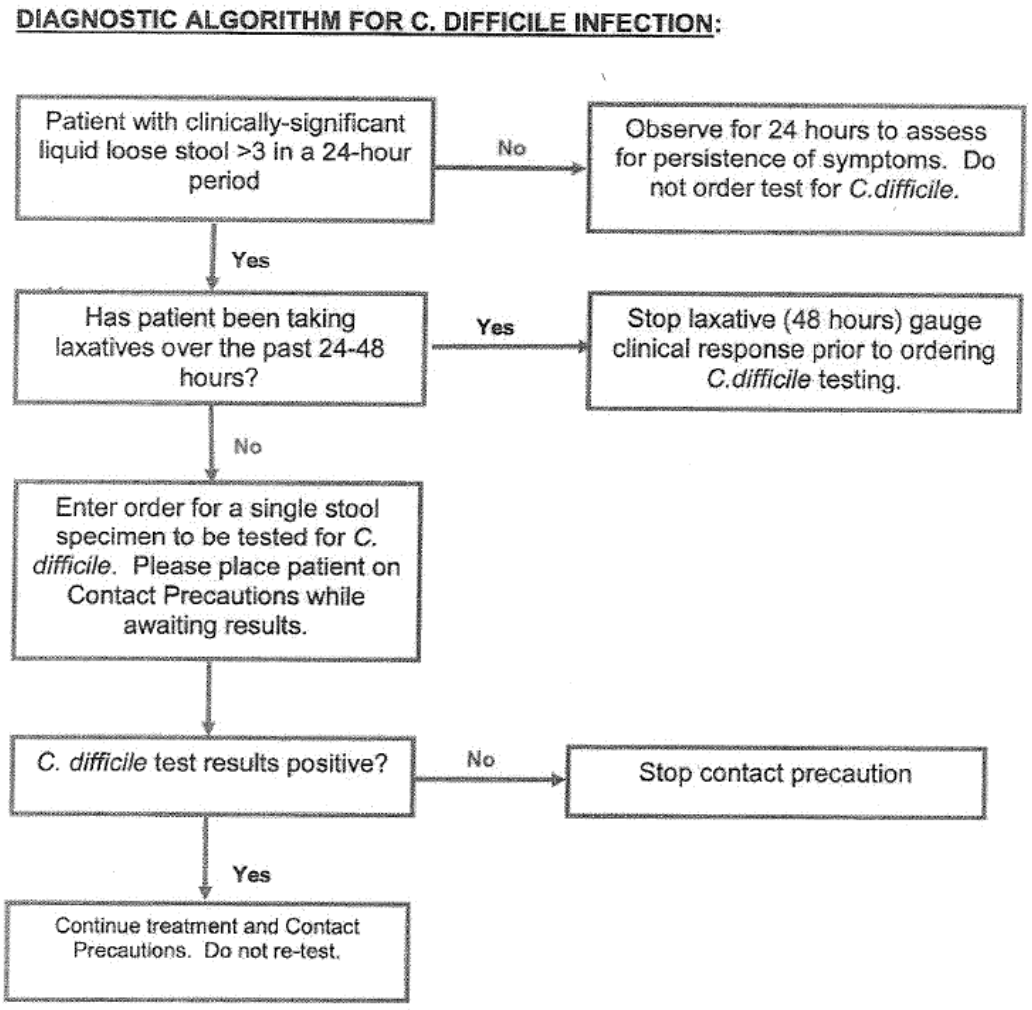
GUIDANCE TO PROVIDERS: LAXATIVES AND CLOSTRIDIUM DIFFICILE TESTING

"The best test to diagnose Clostridium *difficile* (C *difficile*) is not known. There are advantages and disadvantages to all available diagnostic assays. Therefore, it is important for the clinician to be familiar with what assays are used at his or her facility and how best to interpret the results that are generated by those assays. Therefore, it is important for the clinician to be familiar with what assays are used at his or her facility and how best to interpret the results that are generated by those assays. Careful selection of patients to test for C *difficile* is vital. The few studies investigating this issue have found that 36% to 50% of hospitalized patient tested for C. *difficile* do not have clinically significant diarrhea and that 20% to 44% of patients tested were on a laxative regimen. Improving patient selection for testing (eg, only testing patients with clinically significant diarrhea, as well as stopping laxative use before testing) will improve the positive predictive value of the assays. Regardless of which assays is used, it is best to remember to treat the patient, not the test." (Dubberke, E.R., Burnham, C.D., JAMA Internal Medicine. 2015: 175:1801-1802.)

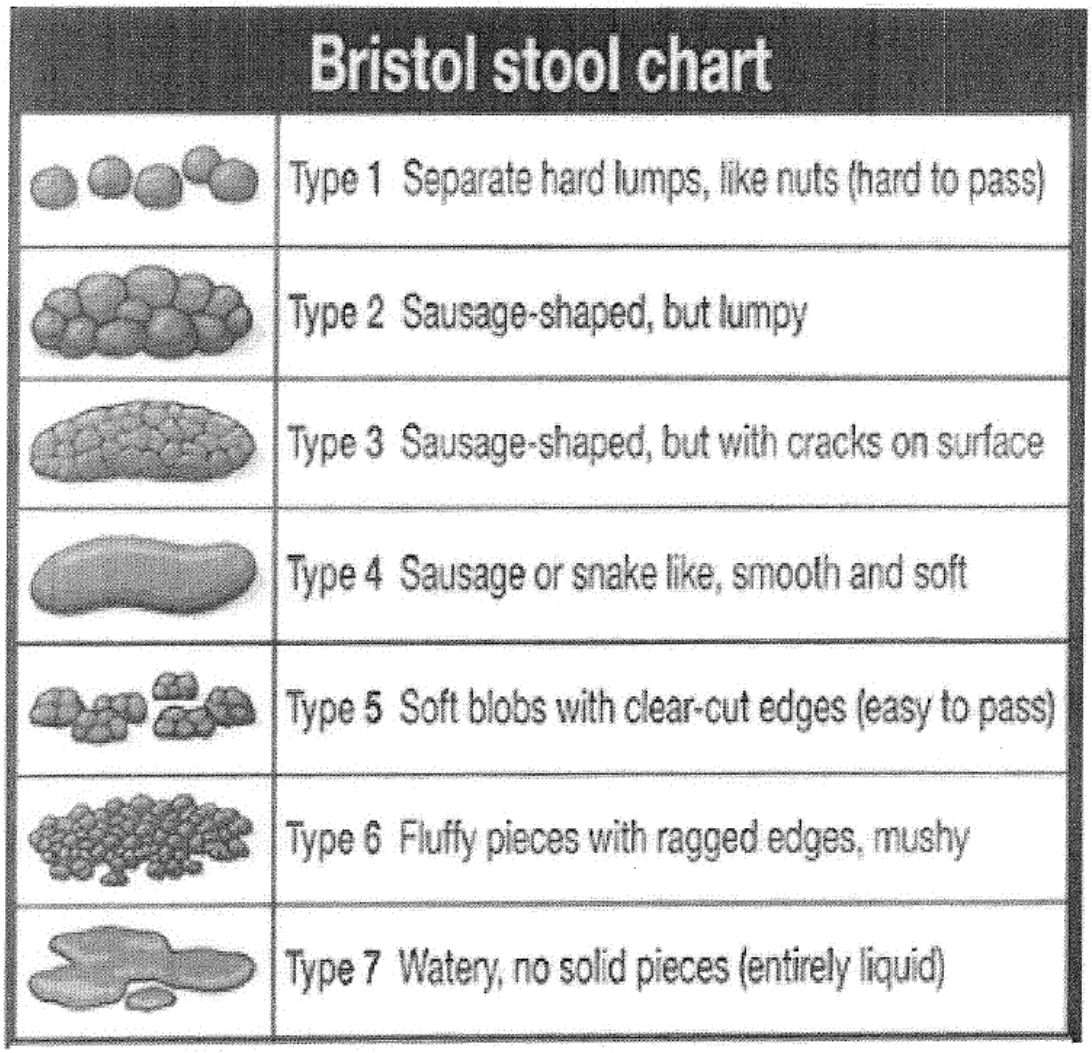
Ensure that the patient has not been administered any laxatives or stool softeners prior to 24 - 48 hours as this may be the possible explanation of diarrheal type symptoms and not C *difficile*.

Discontinue all, stool softeners, laxative medications e.g. docusate (Colace), senna, miralax, ducolax, mineral oil, enemas, milk of magnesia, magnesium hydroxide, magnesium citrate, oral sodium phosphate liquid) 48 hours prior to ordering a clostridium difficile test

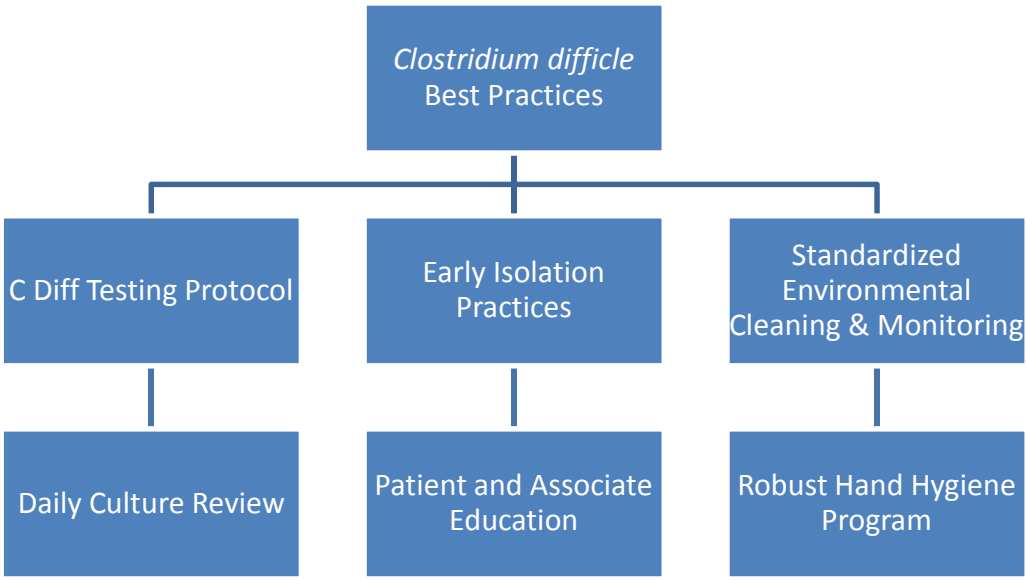
Appendix D: Diagnostic Algorithm for *Clostridium difficile* Infection



Appendix E: Bristol Stool Chart



Appendix F: *Clostridium difficile* Best Practices



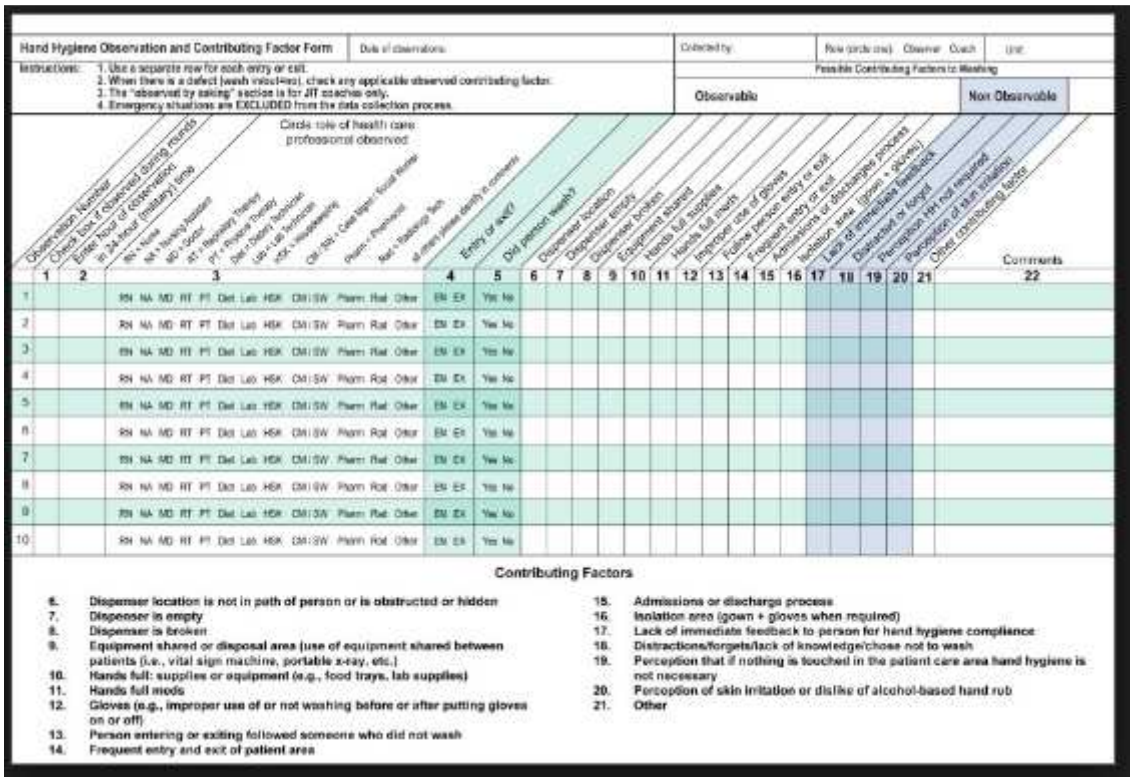
Appendix G: Daily DAZO Audit Tool

Scoring Information		**Audited Areas**	
Unit:		Bed Rails:	Acceptable/Unacceptable
Employee:		Bedside Table:	Acceptable/Unacceptable
Area Type	High-Touch Point Validation	Overhead Table:	Acceptable/Unacceptable
Room Number:		Telephone:	Acceptable/Unacceptable
Scoring Manger		Call Button:	Acceptable/Unacceptable
PI Date		Furniture:	Acceptable/Unacceptable
		Patient Sink Area:	Acceptable/Unacceptable
		Light Switch(es):	Acceptable/Unacceptable
		Door Knobs/Door Levers:	Acceptable/Unacceptable
		Door Push Plates:	Acceptable/Unacceptable
		Toilet Grab Bar:	Acceptable/Unacceptable
		Toilet Seat:	Acceptable/Unacceptable
		Toilet Flush Valve:	Acceptable/Unacceptable
		Restroom Sink:	Acceptable/Unacceptable
		Shower Handles:	Acceptable/Unacceptable
		Bed Pan Cleaning Equipment:	Acceptable/Unacceptable
		Spray Hoses (Restroom): IV Pole:	Acceptable/Unacceptable
		IV Pump Control Pane:	Acceptable/Unacceptable
An overall score less than 90% requires an employee signature. Signed PIs should be filed in the employees personnel file.		Monitor Touch Screens:	Acceptable/Unacceptable
		Final Score:	

By signing this from, I acknowledge that I have reviewed this information with my Manager and understand that it is expected that I make improvements in the areas indicated.

_____	_____	_____	_____
Employee Signature	PI Date	Manager Signature	PI Date

Appendix H: Targeted Solutions Tool



Hand Hygiene Observation and Contributing Factor Form

Date of observations:

Collected by:

Role (circle one): Observer Coach

Unit:

Instructions:
1. Use a separate row for each entry or exit.
2. When there is a defect (wash value!=no), check any applicable observed contributing factor.
3. The "observed by asking" section is for JIT coaches only.
4. Emergency situations are EXCLUDED from the data collection process.

Possible Contributing Factors to Washing

Observable | Non Observable

Circle: role of health care professional observed

Observation Number | Check box if observed during rounds | Enter hour of observation in 24-hour (military) time | RN = Nurse; NA = Nursing Assistant; MD = Doctor; RT = Respiratory Therapy; PT = Physical Therapy; Diet = Dietary Technician; Lab = Lab Technician; HSK = Housekeeping; CM / SW = Case Mgmt / Social Worker; Pharm = Pharmacist; Rad = Radiology Tech; all others please identify in comments | Entry or exit? | Did person wash? | Dispenser location | Dispenser empty | Dispenser broken | Equipment shared | Hands full: supplies | Hands full: meds | Improper use of gloves | Failure person entry or exit | Frequent entry or exit | Admissions or discharges process | Isolation area (gown + gloves) | Lack of immediate feedback | Distracted or forgot | Perception HH not required | Perception of skin irritation | Other contributing factor | Comments

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
2			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
3			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
4			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
5			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
6			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
7			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
8			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
9			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	
10			RN NA MD RT PT Diet Lab HSK CM / SW Pharm Rad Other	EN EX	Yes No																	

Contributing Factors

6. **Dispenser location is not in path of person or is obstructed or hidden**
7. **Dispenser is empty**
8. **Dispenser is broken**
9. **Equipment shared or disposal area (use of equipment shared between patients (i.e., vital sign machine, portable x-ray, etc.)**
10. **Hands full: supplies or equipment (e.g., food trays, lab supplies)**
11. **Hands full meds**
12. **Gloves (e.g., improper use of or not washing before or after putting gloves on or off)**
13. **Person entering or exiting followed someone who did not wash**
14. **Frequent entry and exit of patient area**
15. **Admissions or discharge process**
16. **Isolation area (gown + gloves when required)**
17. **Lack of immediate feedback to person for hand hygiene compliance**
18. **Distractions/forgets/lack of knowledge/chose not to wash**
19. **Perception that if nothing is touched in the patient care area hand hygiene is not necessary**
20. **Perception of skin irritation or dislike of alcohol-based hand rub**
21. **Other**