UTILIZING A NURSE DRIVEN PROTOCOL/ALGORITHM IN THE REDUCTION OF HOSPITAL ACQUIRED CLOSTRIDIUM DIFFICILE

by

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Abstract

Clostridium difficile (C. difficile) infection (CDI) is a growing health problem worldwide and particularly in healthcare settings. In the United States, C. difficile affects over half a million people annually, leading to adverse outcomes for patients, providers, and institutions due to a negative association with mortality, morbidity, hospital stays, and financials. This DNP project employs an evidence-based initiative to decrease hospital-acquired C. difficile (HA-C. difficile) rate, utilizing a Nurse Driven C. difficile Protocol/Algorithm that elucidates testing appropriateness; the *Plan-Do-Study-Act* model was used for implementation. The staff was educated on the protocol utilizing an online platform and in-patient unit-based huddles. Pre- and post-implementation data was collected using a chart audit review tool. Project results were analyzed using an independent two-sample t-test at a 0.05 level of significance (95% confidence level) to investigate the chances of differences at a 95% confidence interval. One-way ANOVA, Multiple Linear Regression, and Tukey's Honest Significant Difference (Tukey's HSD) were also used for data analysis. The ten questions chart audit tool was used to investigate 29 attributable HA- C. difficile. Results were significant, $t(16) = 2.434$, $p = .027$. There was a significant rate in C. difficile rate during pre-and post-implementation of the nurse-driven protocol with the rate being higher post-implementation ($M = 6.50$, $SD = .707$) than pre-implementation ($M = 5.25$, $SD = .683$). The result was significant at the $p < .05$ level of significance. Consequently, this DNP project can be utilized to add to existing and further research studies on the various attributed variables of the Nurse Driven C. difficile Protocol/Algorithm.

Keywords: HA- C. difficile, nurse-driven protocol, CDI, *Plan-Do-Study-Act*, attributed, testing appropriateness

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Chapter One: Introduction and Overview

Clostridium difficile (C. difficile) infection (CDI) is a growing health problem worldwide and a significant health threat in healthcare settings. C. difficile is a spore-forming anaerobic gram-positive bacillus, resulting in a pathological condition that ranges from mild diarrhea to pseudomembranous colitis, as well as cases of death (Desai et al., 2016). C. difficile causes the most common gastrointestinal nosocomial infection and is the leading cause of antibiotic-associated diarrhea. CDI is known to cause severe diarrhea and colitis, which is inflammation of the colon. C. difficile is one of the major causes of healthcare-associated infection and is associated with the increase in mortality, morbidity, and economic cost in the healthcare setting (Barker et al., 2017). With the nationally increasing prevalence and the severity of disease, C. difficile is considered one of the urgent threat pathogens nationally and worldwide. Therefore, it became critical to place C. difficile surveillance as a component of the Emerging Infections Programs (Roser & Flinchum, 2018). Given the prevalence and the severity of CDI, along with the required reduction program and health care surveillance activities, this scholarly project seeks to identify the impact of an implemented Nurse-driven protocol in reducing hospital-acquired CDI rate.

Significance of the Problem

As C. difficile becomes a leading cause of health-associated conditions, nationally and worldwide, the health care setting must ensure appropriate measures are taken to decrease hospital-acquired infection and improve patient safety outcomes. In the United States, C. difficile affects over half a million people annually, with the increase and severity of the cases seen in the

older population (Center for Disease Control and Prevention [CDC], 2021a). One in every 11 cases of patients 65 years and older diagnosed with C. difficile will die within a month of being infected. One in every six cases of C. difficile infected patients will be re-infected within 2-8 weeks (CDC, 2021a).

In 2011, C. difficile was estimated to cause nearly half a million infections and 29,000 deaths in the United States, with older adults being especially vulnerable (Schultz et al., 2018), and a total of 15,591 cases of C. difficile infection in 2018 (CDC, 2020b). Research shows that the number of estimated cases requiring hospitalization between 2012 to 2017 ranges from 223,900 to 272,300. According to the Centers for Disease Control and prevention, in 2017, there were an estimated 223,900 cases in hospitalized patients and 12,800 deaths in the United States, with one billion estimated healthcare costs. Therefore, the Center for Disease Control and Prevention (CDC) has included CDI rates among hospital-acquired complication/infections (HAIs).

The national burden of C. difficile is related to increased morbidity and mortality, disease-specific complications, increased length of stay, hospital readmission, and colectomies. According to Desai et al. (2016), the economic burden outcome for primary and recurrent CDI are directly related to the costs for hospitalization, pharmacotherapy, healthcare professionals, and medical procedures, as well as indirect costs due to productivity losses, number of hospitalization days, and lost productivity (Desai et al., 2016). For example, the National Institute of Health reported (a) an average cost of C. difficile case management was $42,316, (b) an average attribution cost of $21,448, (c) an average cost per case of hospital-onset C. difficile was $34,157, and (d) a total annual cost of C. difficile related in-patient days of nearly 2.4 million (Joint Commission Center for Transforming Care [JC], n.d.). The rising economic cost

has led to the required hospital-acquired condition (HAC) reduction program from the Center for Medicare and Medicaid Services (CMS). With the institution of such a program, health care facilities are forced to place a strategic emphasis on reducing hospital-associated conditions such as C. difficile that occurred in the hospital and were not present on admission (Schultz et al., 2018).

Background of the Project

Patient care outcomes are an integral part of the healthcare environment and preventing harm has been the focus in providing safe patient care. The Institute of Medicine (IOM), Crossing the Chasm and the Future of Nursing (as cited in Moran et al., 2020), has urgently called for fundamental change in healthcare delivery. One of the six aims for healthcare improvement from the IOM is avoiding injuries to the patient through the application of quality improvements, thereby improving patient health outcomes. In the transformation process of healthcare delivery, healthcare organizations must implement a more effective process in making changes in healthcare deliveries. In addition, governmental agencies such as CMS have set priority conditions and mandates that stimulate innovations and initiate changes to improve health care outcomes.

Nursing practice plays a critical role in the fundamentals of healthcare deliverables, such as improving patient safety outcomes. By utilizing evidence-based practice, clinical practice guidelines, and best practice models, there has been significant improvement in (a) patient care outcomes, (b) health care cost, (c) efficiency, (d) mortality, (e) morbidity, and (f) patient satisfaction. Decreasing patients harm by reducing the incidence of hospital-acquired CDI aims to improve patient care outcomes.

Statement of the Problem

CDI leads to negative outcomes for patients, healthcare providers, and healthcare institutions due to an association with mortality, morbidity, prolonged hospital stay, and financial implications. Globally, C. difficile is the leading cost of hospital-associated infection, which mainly affects the elderly and hospitalized patients (Balsells et al., 2016). CDI burden is under-recognized, creating the associated challenges in case detections, thus hindering prevention (Balsells et al., 2016). Additionally, the prevention of CDI is a national priority. The United States Department of Health and Human Services (DHHS) has established a 2020 reduction goal of 30% for hospital-onset CDI from the 2015 national baseline (White et al., 2020).

C. difficile hospital-associated rates are among the highest within this New Jersey level 1 trauma system hospital, with a rate of 5.04 per 10,000 patient's days. This is in comparison to another hospital that is similar in size and acuity within the system with a C. difficile rate of 2.56 per 10,000 patient days. Therefore, reducing hospital-acquired C. difficile (HA-C. difficile) has become the organization's corporate and hospital-based strategic goal. Healthcare institutions must use strategies to implement programs or evidence-based initiatives in reducing HA-C. difficile. The research question seeks to determine or validate whether a Nurse Driven C. difficile Protocol/Algorithm will significantly reduce hospital-acquired CDI. The purpose of the project is to employ an evidence-based initiative to decrease HA-C. difficile rate, and improve patient outcomes, resulting in a decrease in hospital costs.

Purpose of the Project

The purpose of this scholarly project was to determine if a Nurse Driven C. difficile Protocol/ Algorithm improves the early identification of community-acquired C. difficile (CA-C. difficile), thereby decreasing HA-C. difficile. The Joint Commission Center for

Transforming Healthcare (n.d.) believes that C. difficile rates and mortality can be reduced by focusing on a wide range of patient care aspects, including early identification and empowering nurses to take on a leading role in ordering tests and patient isolation.

The literature supported the immediate need in decreasing HA-C. difficile, with a shown gap in early identification, opportunities for obtaining specimen in a timely fashion (within the first three days it is considered community-acquired), and criteria for stool collection. The criteria for stool collection are the presence of clinical symptoms of consistent diarrhea equal to 3 or more unformed stools within 24 hours. Additionally, inappropriate ordering, such as practitioners who order C. difficile testing on patients with days of constipation followed by loose stools or patients currently on laxatives/ stool softeners, shows gap in practice. Health care providers often focus on CDI as the primary cause of diarrhea, yet less than 20% of diarrhea in hospitalized patients is attributable to this pathogen (Wanik et al., 2019). Numerous research studies focus on prevention bundling and algorithms (Barker et al., 2017; Roser et al., 2018; Shultz et al., 2018) to include antibiotic stewardship, laboratory testing, and environmental focus (hand hygiene and room cleaning). However, it appears there is a gap in assembling all the preventative bundles in one place and empowering nurses to take the lead in reducing HA-C. difficile.

Nurse-driven protocols create an atmosphere of autonomy, collaboration, and an increase in staff satisfaction (Lockhart, 2020). Nurse-driven protocols are evidence-based tools used to improve safe patient care outcomes and efficiency in care delivery (Lockhart, 2020). In addition, the successful implementation of the Nurse Driven C. difficile Protocol/ Algorithm may decrease HA-C. difficile. As previously implemented evidence-based nurse-driven protocols such as ventilator weaning, alcohol withdrawal, and catheter-associated urinary tract infection prevention

and catheter removal has successfully demonstrated improvement in patient care outcome, this project will also contribute to best practice in decreasing HA-C. difficile rates.

Research Question

HA-C. difficile impacts the safety and patient outcomes of hospitalized patients, and the safety of our patients should never be compromised. As a healthcare leader, improving patient care outcomes and providing a safe, effective, and efficient environment is vital. To decrease HA-C. difficile infection, the following question is asked:

Will the implementation of a Nurse Driven C. difficile Protocol/Algorithm decrease hospital-acquired C. difficile infection rate?

PICOT Question

The DNP project framework utilized the abbreviated PICOT formula, defined as Population (P), intervention (I), comparison (C), the expected outcome (O), and the time frame for the project (T). The PICOT question for this project is: For hospitalized patients in acute care at risk for acquiring C. difficile (P), will the implementation of a Nurse Driven C. difficile Protocol/Algorithm (I) decrease hospital-acquired C-difficile (O) compared to a standard provider-led care algorithm (C) over 12 weeks (T).

Population

The project was implemented in an in-patient acute care setting, a level one trauma academic teaching hospital in New Jersey, specifically addressing all admitted patients at risk for acquiring C. difficile. The at-risk population are patients with (a) recent hospitalization, (b) those admitted with diarrhea, (c) recent intraabdominal surgery (d) recent antibiotic therapy (e) age> 5, and (f) medications such as proton pump inhibitors (PPI).

Intervention

The Nurse Driven C. difficile Protocol/Algorithm was developed in the initial five weeks of the project planning. The C. difficile Task Force, consisting of Clinical Nurse Educators, Nursing Directors, Staff Nurses, and the Director of Infection Prevention collaborated to develop the protocol and provide feedback for approval. Once the approval was granted from the C. difficile Task Force and the hospital Nurse Executive committee, staff education was initiated. As mandatory education for all staff, the approved Nurse Driven C. difficile Protocol/Algorithm was placed on the hospital educational platform (Health Stream). The timeframe for HealthStream learning management system training was six weeks. Simultaneous in-person education was conducted at the in-patient unit level during daily safety huddles. In addition, education was disseminated through the weekend Clinical Assistance and Professional Education (CAPE) program, done by the assigned Clinical Nurse Educator. The last weeks of implementation included rounding on specific in-patient units gathering feedback regarding the tool, barriers to its use, and ideas regarding the change. The initial implementation of the Nurse Driven C. difficile Protocol/Algorithm was paper format, with future planned placement in the organization's electronic medical records (EMR). However, based on the nurse-driven protocol/algorithm specific criteria for ordering a C. difficile testing, Informational Technology (IT) has developed an "automatic hard stop" in the EMR, thus, preventing the entering of an inappropriate order for laxative given within the last 48 hours. However, the "automatic hard stop" will be expanded to include (a) new tube feed within the last 24 hours, (b) oral contrast within the last 24 hours, and (c) bowel prep within the last 24 hours.

Comparison

The current standard of practice regarding the collection of C. difficile stool samples requires a Provider (MD/PA/APN) order. Upon patient admission or hospitalization, if the patient has three or more episodes of diarrhea (unformed stools) in 24 hours and has not taken any laxatives in the last 48hours, the Providers (MD/PA/APN) must be contacted for a C. difficile specimen order. Stool samples must be collected and sent to the lab within three days of admission to meet the community-acquired versus hospital-acquired criteria. However, there has been inconsistencies in practice resulting in stool samples being sent outside the three-day window, increasing HA-C. difficile. In addition, within the current process, it could take five or more hours in initiating any stool collection. One basic factor includes obtaining a provider's order. Furthermore, several isolated sporadic practices have been in place to decrease C. difficile such as isolation protocol, disinfection, and equipment management, resulting in the elimination of specific elements of the standard practice. The Nurse Driven C. difficile Protocol/ Algorithm will provide guidance utilizing the algorithm in the stool collection process, along with the required prevention strategies. For example, in expediting a stool collection process, after two loose stools, the nurse will prepare to collect the stool specimen on the third episode of unformed stool, if within the 24-hour time-period.

Outcome

There are direct and indirect anticipated outcomes in implementing the Nurse Driven C. difficile Protocol/Algorithm. The former being a decrease in the number of HA-C. difficile, while secondarily improve patient outcomes, reduce length of stay, and reduce hospitalization cost.

Time

The proposed DNP project took place over 20 weeks, with the initial eight weeks utilized to plan, develop, and gain approval of the nurse-driven protocol/algorithm through the C. difficile Task Force and Nurse Executive Committee. The staff education was developed for placement in HealthStream, and also utilized for in-person unit-based education within the following eight-ten weeks. The remaining two weeks were utilized to gather the project implementation strategies, implementation barriers, data gathering, and rates. The remaining project timeline evolved over the next five-eight months, to include the implementation phase, implementation feedback, post-implemented barriers, result data gathering, and rates (see Appendix I).

Theoretical Framework

In a review of over twenty research studies, one study contained a theoretical or conceptual framework. The epidemiological triangle approach, and The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care, respectively, were utilized (Craig, 2016). The epidemiological triangle was used to provide a clear understanding of the fundamentals of epidemiology. In contrast, the Iowa EBP model provided a user guide in incorporating the best evidence into clinical practice. Many of the remaining studies were interventional. However, in the review of implemented nurse-driven protocols, Donabedian's structure-process-outcome model and the plan-do-study-act (PDSA) framework were utilized to guide structure change. Therefore, the performance improvement PDSA model was the chosen framework in guiding this DNP project.

Several theoretical frameworks can create organizational change and support the implementation of a quality improvement project. The performance improvement model PDSA was used as the framework to guide this DNP project. In implementing change, the structured

step-by-step systematic approach of the PDSA connects all the essential aspects of the project. Using a performance improvement model to create change can identify the problems in existing knowledge, skills, and systems, or the need to change established ways of conducting business because of the alterations in knowledge, technology, management, or leadership (Nursing World. n.d.). PDSA was used to guide the necessary quality improvement process change. These theoretical frameworks guided the discovery of the evidence, leading to the interventions supported by the current literature, thereby facilitating organizational change.

Plan Do Study Act (PDSA)

Several healthcare systems have successfully utilized the PDSA performance improvement model in processes and outcomes. To support quality improvement and deliver improvement in patients care, the PDSA approach is structured in achieving such change. Therefore, the PDSA cycle can be utilized to adapt and implement an evidence-based practice intervention through the facilitation of organization, team, and individual learning. As defined, the PDSA is a model of an improvement tool used for rapid small-scale tests of change.

According to the Institute of Health Improvement [IHI] (2016), the PDSA is a practical implementation model for quality improvement efforts. PDSA consists of four-cycles that guides the test of change to determine whether there is an improvement of the implemented change. The initial phase of the PDSA cycle starts with the "plan" and the proposition of the question, "what are we trying to accomplish?" Thus, cultivates a spirit of inquiry regarding existing clinical practice issues and also quantifies ideas, and processes of change, leading to improvements (IHI, 2016). Concerning HA-C. difficile, analyzing the cause and effects of the data related to the increase in the organization's HA-C. difficile rate has generated an action plan. The plan

includes integrating the best practices with strong supporting evidence and collaborating with key stakeholders such as the organization's leadership and the C. difficile Task Force.

In carrying out the change or activity and collecting the data, the “Doing” phase is accomplished. During the “Doing” phase, the Nurse Driven C. difficile Protocol/ Algorithm was developed, evaluated, and approved; staff received education, and implementation of the performance improvement change occurred, thus, disseminating and integrating new knowledge into practice. The next phase of the PDSA is studying the data collected. In this phase, the post-implementation data of the Nurse Driven C. difficile Protocol/ Algorithm was quantified regarding the decrease in HA-C. difficile rate, thereby creating a foundation in clinical and disease prevention, evaluation, and analysis of gaps in the implemented process.

The last phase of the PDSA cycle is, "Act," which evaluates whether the test of change was successfully achieved or if further alteration of a specific area of the performance improvement process were required (IHI, 2016). Critical judgment and systems thinking are essential in evaluating the evidence and providing the best outcome in decreasing the organization’s C. difficile rate. Successful implementation of the Nurse Driven C. difficile Protocol/Algorithm would continue the PDSA cycle through the act of sustainability planning.

Significance of the Project

Despite the efforts to decrease C. difficile in both prevention and treatment modalities, the rates continue to rise, resulting in healthcare challenges. HA-C. difficile prolongs patient hospitalization, as patient clinical outcomes are complicated by colitis, mega colon, electrolyte imbalance, and possibly death (Zhou et al., 2019), resulting in an increase in length of stay. An increase in mortality and morbidity is also associated with C. difficile (Louh, 2017). The associated cost of HA-C-difficile places an undue burden on healthcare

organizations. As C. difficile infection has now been added to hospital-acquired conditions (HAC), healthcare organizations are faced with financial penalties by governmental healthcare organizations. The United States Department of Health and Human Services has established a 2020 reduction goal of 30% for hospital-onset CDI from the 2015 national baseline (White et al., 2019). Healthcare organizations and clinicians must develop strategies for innovative prevention and treatment modalities to avoid the financial implications.

The successful implementation of the DNP project contributed to the overall organization's patient safety model. As a High-Reliability Organization, patient safety is the number one priority, and hospital-acquired CDI is a national and organizational priority. A High-Reliability Organization must provide safe and high-quality care, including implementing policies and guidelines in preventing patient harm. Hospital-associated infections (HAIs) are preventable harms that are included in the Leapfrog's hospital rating group, which assess, and grant ratings based on established standards. The Leapfrog Group is a nonprofit watchdog organization that serves as a voice for health care consumers and purchasers, using their collective influence to foster positive change in U.S. health care (The Leapfrog Group, 2021). In addition, hospitals report C. difficile cases to the CDC's National Healthcare Safety Network (NHSN) and give Leapfrog permission to obtain that information directly from NHSN (The Leapfrog Group, 2021). Therefore, the DNP project contributes to the healthcare commitment in impacting patient care outcomes. Incorporating the Nurse Driven C. difficile Protocol/Algorithm may reduce HA-C difficile rate, improve patient outcome, and decrease hospital cost and stay length. In addition, it contributes to a decrease in the organization's strategic C. difficile count (less than 49/year) and the standard infection rate (SIR) by CMS definition of best quartile.

Definition of Terms

Definitions and terms within this DNP project define the terms and concepts that are used in the body of the text. The defined terms and concepts will grant clarity, familiarity and understanding to the reader. In addition, differentiating the terms and concepts creates insights and value to the intended purpose of the study. For this evidence-based project, the following terms are used throughout the body of the text.

Clostridium difficile infection (CDI): the term CDI is a positive Clostridium difficile (C. difficile) spore-forming anaerobic gram-positive bacillus, identified through a positive laboratory test result for C. difficile toxin A or B, or any detection of toxin-producing C. difficile organisms by culture or other laboratory means on an unformed stool specimen (Schultz et al., 2018).

Hospital-acquired C. difficile (HA-C. difficile): the term hospital-acquired C. difficile is defined as any hospitalized patient with positive laboratory test results of C. difficile performed after the fourth day of hospital admission (Kavazovic et al., 2019).

Community-acquired C. difficile (CA-C. difficile): the term community-acquired C. difficile is defined as any hospitalized patient with a positive laboratory test result for C. difficile within the first three days of admission (Yu et al., 2019).

Task Force: Task force is defined as a group of professional nurses with clinical expertise, positioned as a decision-maker that supports the activities or mission of a specific task (American Congress of Rehabilitation Medicine (n.d.).

C. difficile Task Force: the C. difficile Task Force is defined as a group of professional, including Clinical Nurse Educators, Nursing Directors, Staff Nurses, and the Director of Infection Prevention.

Hospital Nurse Executive committee: the Hospital Nurse Executive committee is defined as a group of senior leadership within the organization consisting of the Vice President of Nursing, Assistant Vice President(s) of Nursing and Medical Staff.

Nurse-driven protocol: the nurse-driven protocol is defined as a set of requirements or steps to follow in identifying CA-C. difficile, and the isolation of patients with clinical symptoms, while simultaneously decreasing the incidence of HA-C. difficile (Wanik et al., 2019).

Hospital-Acquired infection (HAI): the term hospital-acquired infection is defined as any infections that are not typically present in the patient prior to hospitalization (Centers for Medicare and Medicaid Services [CMS], 2019).

Nature, Scope, and Limitation of the Project

The DNP project utilized a quantitative design approach to accomplish the goals of the identified problem. The quantitative method evaluates the effectiveness of an intervention on patient outcomes and creates a structure that defines the timing of observations, interventions, and strategies used to ensure objectivity (Mateo & Foreman, 2014, p. 135). The goal of the study design is to have few inherent limitations and minimize potential bias (Mateo & Foreman, 2014). However, significant knowledge gaps or biases often exist within research study designs, resulting in an inquiry or a study question relevant to healthcare outcomes. The implication that attribution of an HA-C. difficile could occur due to inappropriate ordering and collection of stool specimen identifies a gap in knowledge and practice, thereby, creating an inquiry.

Scope

The scope of the DNP project resides within the span of patients admitted within an acute care setting. The patient population includes all adults over 18 years of age admitted to the 621-bed Trauma level one/tertiary hospital in-patient units (ICUs, medical-surgical units), within the project's six-month implementation period. The data were generated from all patients that meet the at-risk HA-C. difficile definition of acute diarrhea (defined as three or more unformed bowel movements in 24 hours), within three days of hospital admission, and (a) has not taken any laxatives/ stool softeners in the last 48 hours, (b) has not started on new tube feeds, and (c) has not received oral contrast or bowel prep within the last 24 hours; unless abnormal white blood count (WBC) and abdominal pain, accompanied with diarrhea occurs. The Nurse Driven C. difficile Protocol/ Algorithm were applicable for all hospitalized patients at risk of acquiring C. difficile.

Limitations

The quantitative study design often presents limitations in the potential source of bias (selection, intervention, and measurement) and threat to validity, as studies implemented to evaluate the effectiveness of intervention show several threats to external and internal (Mateo & Foreman, 2014). Based on this assumption, a minor modification to the study is inevitable, primarily through a lack of treatment fidelity, sampling decision, data collection, and new information—a quantitative study design sample size. According to Mateo and Foreman (2014), there is no ability to predict in advance precisely how many participants are needed to produce a meaningful result. The sample size of the HA-C difficile studied was limited based on the number of patients that met the clinical symptom/ criteria, along with the application/ adherence to the Nurse Driven C. difficile Protocol/ Algorithm.

Due to the volume of information and lack of structure, the overwhelming data analysis process can eliminate critical data, vital information, and relevancy. In reviewing evidence related to nurse-driven protocols or algorithms, the volume of information was limited. However, a vast amount of information related to prevention and treatment modalities were factored into the algorithm.

Conclusion

C. difficile is a leading cause of healthcare-associated conditions (HAC). A vast number of research studies have shown a statistically significant reduction in C. difficile result through prevention and treatment methodology. The literature supported the immediate need in decreasing HA-C. difficile, with the shown gap in early identification, opportunities for obtaining specimens in a timely fashion, and inappropriate testing. However, there was limited evidence care bundling designed around Nurse Driven C. difficile Protocol/ Algorithm; although, there is evidence of C. difficile prevention bundling. This project will determine and evaluate the implementation of a nurse-driven protocol to reduce HA-C. difficile. The next chapter will gather and show evidence of the importance of this project through a literature review.

Chapter Two: Literature Review

The review of relevant literature as it relates to Clostridium difficile was exhaustive. The extensive search resulted in current articles related to the epidemiology of C. difficile, community-acquired infections, and hospital-acquired C. difficile. Several terms were utilized to search for research articles and resources on HA-C. difficile definition, prevention, and treatment, to gain a broad perspective of the impact of C. difficile on the healthcare environment. The extensive search resulted in a massive amount of research studies and resources on C. difficile. However, most research articles consisted of many themes related to prevention, testing, and treatment modalities, including antibiotic stewardship and multifaceted bundle treatments. The themes most relevant to a nurse-driven C. difficile protocol were bundles, clinical pathways, and algorithms throughout the search, with limited nurse involvement.

PICO Question

Developing the clinical question is the first step in a scholarly DNP project. In order to implement change utilizing evidence-based practice, the clinician must understand the issue at hand to develop the right question. Formulating a research question is a technique that focuses on the essential elements of the research topic (Mateo & Foreman, 2014) and guides the search for available evidence for implementation. The PICO method will enhance the precision and focus by peeling away and directing the focus to only the most essential component of the research question (Mateo & Foreman, 2014), thereby, providing a structure for the DNP project.

- (P) Population- Hospitalized patients in an acute care setting who are at risk for acquiring C. difficile
- (I) Intervention- The implementation of a Nurse Driven C. difficile Protocol/ Algorithm
- (C) Comparison- A standard provider-led C. difficile algorithm

- (O) Outcome- A decrease in hospital-acquired C. difficile

Will the implementation of a Nurse Driven C. difficile Protocol/Algorithm compared to standard provider-led algorithm decrease the attributable hospital-acquired C. difficile rate?

Literature Search Strategy

An initial search for Clostridium difficile was conducted utilizing MEDLINE (PubMed), CINAHL (Cumulative Index to Nursing and Allied Health Literature), with a five-year result limitation. With such a search strategy, an enormous amount of data (17,499) was generated. To aid in relevancy, precision, and best practice, filters utilized were five years, meta-analysis, systemic review, abstract, free full text, and full text, significantly reducing the number of returned articles to 102. Returned articles showed the terms Clostridium difficile, Clostridioides difficile, C. difficile, and C. diff, all referring to the spore-forming bacteria associated with HA-C. difficile. Inclusion and exclusion criteria were used to limit and expand the search. The exclusion criteria, or areas of C. difficile not been studied include (a) treatments, (b) antibiotic stewardship, (c) probiotic, (d) type of laboratory testing, (e) laboratory algorithm, (f) antibiotic protocols, (g) CA- C. difficile, (h) colonized asymptomatic patients, and (I)the pediatric population.

A more inclusive and comprehensive search was conducted related to the PICO question, including expanding the search to Google Scholar, and ProQuest Central. The following search terms were used for reference: Clostridium difficile, C. diff, practice guidelines, practice, guidelines, protocols, standard, prevention, and control, prevent, evidence- based practice, evidence- based, outcomes, nurse-driven protocol, nurse-driven C. diff protocol, C. diff algorithms, C. difficile bundles, hospital-acquired C. difficile and hospital-acquired infections. Within these criteria, the initial search yielded over 1,431 resources, with duplicates from the

various databases. Further refining for relevancy and inclusion was conducted and evaluated. Utilizing search terms to include location and age specific as it relates to the setting and population of the research question resulted in 105 articles.

In addition to the databases, internet search and Google Scholar was used to find additional relevant articles. The Internet search resulted in 15 relevant articles representing strategies and prevention methods in decreasing C. difficile. The studies and guidelines that appropriately addressed the PICO questions were reviewed. However, many of the articles were not relevant to the PICO questions. From the extensive search within the inclusion criteria, only seven articles were found, using the exact title of the study (A Nurse-Driven C. difficile Protocol/ Algorithm), which was retrieved utilizing Google Scholar. Articles included assessed the effect or impact on interventions, such as nurse-driven protocol, best practices for preventions, algorithms, bundles, and clinical pathways, to decrease HA- C. difficile. After further review, 67 resources and articles were selected for further literature review, with 12 articles and resources consisting of interventional studies, qualitative studies, retrospective, quasi-experimental, and systematic reviews. These articles and resources were critically appraised for acceptance using the Johns Hopkins Nursing Evidence-Based Practice (Evidence Appraisal Tools), and the table of evidence was created. In summary 12 articles were selected to support this DNP project.

Conceptual Framework

From the plethora of evidence yielded from the exhaustive search, several articles retrieved as algorithms, protocols, bundles, and clinical pathways were determined to be valuable and applicable to the project, thereby requiring a critical appraisal. The evidence was appraised critically using tools from the Johns Hopkins Nursing Evidence-Based Practice. The Johns

Hopkins Nursing Evidence-Based Practice consists of various appraisal tools with sections divided by the type of evidence and quality of the evidence, synthesizing the pertinent information from the individual evidence (Dang et al., 2022). The synthesis process uses quality, strength (level and quality) to generate the best evidence recommendation for the project (Dang et al., 2022). The hierarchy of the evidence guide consists of levels of research and non-research evidence. Level I through Level III is based on research evidence, while Level IV and V are non-research evidence (Dang et al., 2022). The quality of evidence ratings is 1) A- High Quality, 2) B- Good quality, and 3) C- Low quality. There are eleven evidence appraisal tools based on a quantitative, qualitative mixed design research study, along with non-research designs such as clinical practice guidelines and experiential-based reviews (Dang et al., 2022). Each tool contains specific information to guide and evaluate each type of research study. The chosen articles or studies are categorized and placed based on the level of research evidence and the appropriate quality ratings. The critical appraisal outline can be found in the summary of the evidence table (see Appendix A).

Related Studies

The major theme in the literature review focuses on prevention and treatment methodologies, bundling and protocols, and testing strategies related to C. difficile, thereby, improving patient safety and quality outcomes. Prevention and control of HACs are essential in maintaining patient safety and improving quality outcomes. As a discipline, the nursing profession and healthcare organizations must develop strategies to effectively maintain the highest possible quality of infection prevention and control activities (Palmore & Henderson, 2021). The literature supports several prevention and treatment methodologies in decreasing HACs, such as C. difficile.

Prevention Methodology

There are several recommendations for CDI prevention bundling, including diagnostic testing, empiric isolation, contact isolation, hand hygiene, and environmental disinfection. Musuuza et al. (2019) utilized the Systems Engineering Initiative for Patient Safety (SEIPS) model to examine five sub-processes of the CDI bundle. In addition, clinical pathways, protocols, guidelines, and algorithms are utilized as preventative strategies. These frameworks are developed to primarily prevent HA-C. difficile, with a focus on (a) early detection, (b) testing criteria, (c) order automation, (d) isolation precautions, (e) environmental cleaning, and (f) hand hygiene. Recommendations through regulatory standards and research include staff education and training in stool collection criteria for testing and standardizing assessment tools. For example, to address early detection and isolation of CDI patients, healthcare systems provide education to personnel, (a) update the CDI testing policy, (b) implement a CDI testing algorithm for nurses, (c) improve C. difficile testing practices, and (d) establish a C. difficile testing audit tool for laboratory personnel (White et al., 2021). White et al. (2019) implemented the Targeted Assessment for Prevention (TAP) Strategy to provide a focused approach to infection prevention through a retrospective study. The DNP project is supported by the above literature preventative strategies. The Nurse Driven C. difficile Protocol/ Algorithm provides a step-by-step process that guides the user through early detection, testing criteria, and isolation precaution criteria necessary to decrease HA-C. difficile infections.

Nurse Driven Protocol/Algorithm

Nurse-driven protocols are often utilized as quality improvement initiatives to address HAIs. Nurse-driven protocols improve safety, increase staff satisfaction, foster efficiency in care delivery, and promote a healthy work environment (Lockhart, 2020). Six research studies,

including qualitative, interventional, and quantitative studies, mentioned the nurse-driven C. difficile protocols and algorithms. The nurse-driven C. difficile protocols and algorithms have been developed to reduce HA-C. difficile rates through early detection of CA-C. difficile, reduced inappropriate testing for hospital-onset infections with C. difficile, and ordering criteria, thereby decreasing the misidentification and misclassification of asymptomatic carriers as HA-C. difficile (Hou et al., 2018; Kavazovic et al., 2020; Meseeha et al., 2018; Wanik et al., 2019; White et al., 2020).

In addition, LeRosa et al. (2018) and Hou et al. (2018) utilized the nurse-driven protocol/ algorithm to reduce inappropriate C. difficile testing by empowering nurses and optimizing testing stewardship. An algorithm for C. difficile testing appropriateness yielded a significant change in reducing HA-C. difficile rate. An Institute Review Board (IRB)-approved study on a nursing-driven algorithm for C. difficile Timeout (CDT) was utilized with the testing stewardship. The nurses utilized the CDT algorithm. The C. difficile polymerase chain reaction (PCR) was sent if criteria were met to optimize testing stewardship (Hou et al., 2018). Therefore, it is evident that literature supports the DNP project strategy of implementing the Nurse Driven C. difficile Protocol/ Algorithm can be impactful in decreasing HA-C. difficile.

Bundling/ Clinical Pathway

C. difficile bundles and clinical pathway guidelines are other strategies implemented to include appropriate testing criteria. Four studies were critically appraised with high quality in achieving bundling to decrease C. difficile (Louh et al., 2017; Neilsen et al., 2019; Schultz et al., 2018; Quan et al., 2018). For example, in clinician suspicion of C. difficile, an indication for testing and screening questionnaire is completed. The clinicians ordering C. difficile testing would have to open a bundle, in which they were required to list an indication for testing, as well

as answer questions regarding laxative use in the last 24 hours and previous C. difficile testing in the last seven days (Wang et al., 2021). In the study, Millard et al. (2020) utilized a clinical pathway to reduce hospital-acquired C. difficile by preventing misclassification of HA-C. difficile. Providers were only allowed to order a test when the criteria were met, based on (a) clinically significant diarrhea (more than three bowel movements within 24 hours), (b) the patient was not on laxatives over the preceding 48 hours, (c) the patient did not have a negative C. difficile stool test within the last week, and (d) the patient did not have a positive C. difficile stool test within the last month (Millard, 2020). The nurses were to print and complete the clinical pathway order and send the specimen to the lab. Another study by Quan et al. (2018) reduces CDI rate by using real-time automated clinical criterion to verify the appropriateness of testing. Based on the above supporting evidence the implementation of the Nurse Drive C. difficile Protocol/ Algorithm will be impactful in decreasing HA-C. difficile infection, as C. difficile testing will be based on specific criteria, along with the Bristol stool chart for identification of appropriate stool sample for testing.

Overall, the preventative methodology, nurse-driven protocols/ algorithms, bundling, and clinical pathways are recommended strategies for reducing HA-C. difficile infection rates. The literature review, analysis, and evaluation of the quality of evidence recommends and supports the themes of best practice. Therefore, each of these themes contributes to the PICO question and methods of the DNP project.

Methodological Framework

The review of studies on decreasing HA-C. difficile, that utilized a nurse-driven protocol, is deemed successful, except one. In the study Kavazovic et al. (2020), the failure that occurred resulted from over-testing and over-ordering of stool for C. difficile and testing fidelity. The

testing fidelity failure was due to the administration of laxatives (24%) and lack of clinically significant diarrhea (41%). However, the recommendation for future nurse-driven C. difficile protocol was discussed, to include (a) front-line nurses receiving education on appropriate testing, (b) a nursing communication process when tests are ordered outside of protocol, and (c) eliminating the ability for nurses to order C difficile tests after hospital day three. In addition, bundling and clinical pathways have successfully decreased C. difficile rates relating to preventions and treatment. However, algorithms and protocols will put everything in one place. In preventing HA-C. difficile studies show that early detection is an essential factor and empowering nurses through a nurse-driven protocol/ algorithm is vital. The strength in the nurse-driven protocol shows a high level of evidence with appropriateness, indication for testing, and early detection adherences. Therefore, creating a nurse-driven C. difficile protocol/ algorithm to include specifics that will drive compliance is essential.

Limitations of the Search Process

There is an enormous number of studies and research on C. difficile epidemiology, antibiotic stewardship, and treatment modalities during the search process. The most apparent limitation in the literature search was the lack of research studies, particularly regarding the nurse-driven C. difficile protocol/ algorithm. The particulars involve discontinuation of orders or more ownership of nursing on the ordering process, as seen in the various nurse-driven quality improvement protocols, such as catheter-associated urinary tract infection (CAUTI). Order automation is another area of limitation; yet testing for C. difficile testing by positive PCR should be guided by electronic medical record-based decision support to assist all providers with improved test fidelity (Kavazovic et al., 2020). However, the need for early detection and testing of stool for C. difficile has been established. A nurse-driven protocol/ algorithm is vital in

reducing HA- C difficile rates with nurses at the forefront. The relevance to the DNP project were established based on quality improvement.

Conclusion

An exhaustive literature review has been completed. The PICO question was utilized in the search process to discover relevant studies for the DNP project. Sixty-seven articles were reviewed for relevance and validity, utilizing search filters. For relevancy of the DNP project, the further refined articles were appraised, with the levels of evidence and quality rating. Although most of the research articles represent prevention and treatment of C. difficile, studies pertaining to the early detection and appropriate testing were ideal in decreasing HA-C. difficile. Studies also showed a decrease in HA-C. difficile rate through algorithms, bundles, and clinical pathways. Nurse-driven protocols/algorithm has proven to reduce HA-C. difficile, with early detection and appropriate testing methodology. Therefore, it is evident that the implementation of a Nurse-driven protocol can be impactful in reducing HA-C. difficile.

Chapter Three: Methodology

Reducing Clostridium difficile infection is an area widely studied. Identifying the disease accurately is essential for appropriate management, prevention, and treatment (Madden et al., 2020). Inappropriate testing of patients can result in (a) overdiagnosis, (b) overtreatment, (c) increased length of stay, and (d) unnecessary costs (Madden et al., 2020). Clinical practice pathways, bundling of interventions, and nurse-driven protocols/ algorithms recommends testing only in patients with clinical signs and symptoms, such as three loose stools within twenty-four hours, without receiving (a) laxative/ stool softeners in forty-eight, (b) new tube feed, (c) oral contrast or (d) bowel prep in the last 24 hours. In addition, inappropriate ordering and obtaining of a stool specimen for C. difficile have shown an increase incidental finding of hospital-acquired C. difficile (HA-C. difficile). Therefore, reducing inappropriate testing through evidence-based interventions can potentially decrease HA-C. difficile. The overarching aim of this DNP project is to decrease HA- C. difficile, utilizing and implementing a Nurse Driven C. difficile Protocol/ Algorithm. The quantitative, quality improvement project design, sample and setting, instrument, data collection, data analysis, and management method, along with ethical consideration, will be addressed.

Project Design

This scholarly DNP project utilized the quantitative research methodology to evaluate, innovate, and improve patient outcomes using a quality improvement approach. Quality improvement is described as systematic data-guided activities to monitor, evaluate, and improve quality and safety outcomes of health services and care processes (Department of Health and Human Services (DHHS), 2011, (as cited by Moran et al., 2020). The purpose of this DNP project is to implement a Nurse-Driven C. difficile Protocol/ Algorithm that will include an

algorithm for testing and ordering appropriateness (creating a computerized hard stop), a Bristol stool chart, and preventive measures for results of positive stool toxin. The project aims to decrease HA-C. difficile by empowering and educating nurses about the C. difficile testing guidelines to reduce unnecessary testing and preventative strategies to decrease HA-C. difficile.

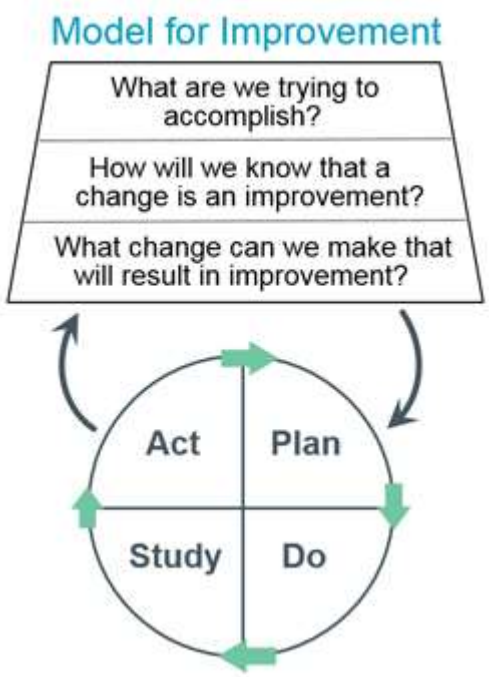
Pre- and post-intervention presentation utilizing bar graphs demonstrated the effectiveness of the project once the data was analyzed using a standard statistical software program. All data specific to HA-C. difficile were collected and analyzed through the chart auditing process, utilizing the Chart audit review tool and NHSN Gastrointestinal System Infection (GI) Checklist. Chart audits of HA-C. difficile, pre-, and post-intervention, and auditing the utilization of the nurse-driven protocol/algorithm post-implementation were performed. Thereby, determining the success and effectiveness of the quality improvement project.

The Plan-Do-Study-Act (PDSA) was the practical implementation model used to support and guide the implementation of the Nurse-Driven C. difficile Protocol/ Algorithm. The PDSA method focuses on process refinement to control variation and ultimately improve the designated outcome (Moran et al., 2020). The PDSA allows for a quick assessment as to whether an intervention works, along with continually needed adjustments of interventions, utilizing the same model (Reed & Card, 2016). However, the cycle must be completed for PDSA to be considered successful (Reed & Card, 2016). Although the PDSA model is simple, it is sophisticated enough to thoroughly evaluate the issue, provide implementation, and evaluate the outcomes of the intervention (Reed & Card, 2016). In addition, PDSA is a highly flexible method that can be adapted to support the scale-up of interventions and used in conjunction with monitoring activities to support sustainability (Reed & Card, 2016). The goal of this DNP project

is to achieve the desired outcome of decreasing HA-C. difficile, through planning and test of change, using the PDSA quality improvement framework.

Figure 1

Model of Improvement



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The PDSA model for improvement consists of four steps and begins with three questions. The first question asked, “What are we trying to accomplish? This DNP project aimed to decrease HA-C. difficile by addressing inappropriate testing, stool collection, and order. The second question addresses the how "How will we know that a change is an improvement? In the project evaluation phase, the quantitative data (# of HA-C. difficile) was analyzed, comparing the pre- post-implementation of the Nurse Driven C. difficile Protocol/ Algorithm, utilizing a histogram illustrating the frequency. The final question asked, “What change can we make that will result in improvement? The intervention for this DNP project was the implementation of a

Nurse Driven C. difficile Protocol/ Algorithm, which was non-existent within the organization. However, it has proven to decrease HA-C. difficile with testing criteria aiming to decrease inappropriate testing. Therefore, such change may result in quality improvement.

After completing the three questions, the four-step process improvement begins. The first step begins with planning. Planning begins with data collection, (a) state the objective of the change, (b) make predictions, and (c) develop a plan to test the change, which includes the who, what, when, where (IHI, 2016). Planning is an essential part of the project, as it evaluates the issue at hand, develops the question, and makes an appropriate prediction.

The second phase of the PDSA model is to carry out the project plan or the implementation process. In this phase, it is critical to document problems and unexpected outcomes and analyze data (IHI, 2016). The success of the second phase relies on the step-by-step planning of phase one.

The third phase of the PDSA improvement model is "Study." The analyzing and studying of the data occur in this phase. Complete the analysis, compare the data to the prediction, summarize and reflect on lessons learned (IHI, 2016). The result must be evaluated and compared to the prediction and the question in phase one.

The final phase in the cycle is "Act." In this phase, the project implementation is refined based on the lessons learned, which includes determining the modification and preparing for the next test of change (IHI, 2016). However, although phase four is considered the final phase, it may not be the last, as the PDSA model is cyclic and continuous. Successful implementation of the project or change idea requires adaptation and sustainability. Utilizing the PDSA model will guide the DNP project, ultimately resulting in the desired outcome of decreasing HA-C. difficile.

Sample and Setting

The setting for this DNP project is a 621- bed Trauma level-one tertiary acute care medical center. The population is all admitted adult patients in the in-patient setting at risk for acquiring C. difficile. In addition, all caregivers consisting of (a) Registered Nurses (RN), (b) Clinical Care Technicians (CCT), (c) Patient-care Unit's Leadership (Nurse Managers, Nursing Directors, Clinical Nurse Educators), (d) Nurse Executive committee members, (e) Infection Preventionist, and (f) Providers (MD, Residents, Nurse Practitioners (NP), Physician Assistant (PA), will be included in project's process to decrease HA-C. difficile. The nurses are primarily responsible for utilizing the nurse-driven protocol/ algorithm to (a) appropriately assess the clinical signs and symptoms, (b) determine appropriate stool specimen collection, (c) investigate whether the patient received laxative/stool softener, on tube feeding or medications that can cause diarrhea, (d) discuss with providers if stool specimen collection is appropriate or not, (e) monitor patient's condition, and (f) institute all appropriate preventative precaution/interventions. The CCTs are responsible for reporting any diarrhea activities, and stool collection delegated by the RN. The Providers are responsible for following the ordering protocol of C-difficile stool specimens based on the specific criteria. Unit leadership is responsible for the education of the staff, review of all at-risk patient populations, and unit specific C. difficile data review and accountability of staff to ensure the process has been followed.

Nurses

All nurses, on all shifts working in the organization of the adult in-patient care units, will participate in the project through the educational process of the nurse-driven protocol/ algorithm. All educational platforms will be utilized (Health Streams, CAPE, and Unit-based Safety Huddle), thus empowering nurses to decrease HA-C. difficile.

Clinical Care Technicians

All Clinical Care Technicians (CCT) working on all shifts within the organization will participate in the DNP project through the educational process on criteria for stool specimen collection, along with a Bristol stool chart, which must be sent with each collected specimen. The escalation of the patient's clinical symptoms, such as loose stools and number thereof, must be reported to the primary nurse.

In-patient Care Leadership

All Nurse Managers, Nursing Directors, and Clinical Nurse Educators will participate in the DNP project. The Leadership team is responsible for ensuring all areas of staff are educated on the nurse-driven protocol, perform chart review, report missed opportunities resulting in a HA-C. difficile, and drive the process through staff accountability.

Infection Preventionist

All hospital-based Infection Preventionist will be educated on the nurse-driven protocol and assist in the approval process. In addition, the Infection Preventionist will collaborate with all department leaders and C. difficile Taskforce to perform specific in-patient units chart review on all HA-C. difficile. The Infection Preventionist plays an active role in infection prevention strategies.

Providers

All providers responsible for ordering C. difficile stool samples will be educated on the nurse-driven process and ordering criteria through the Physician leadership platform. The Chief Medical Director (CMO) and the Physician Infection Prevention led will participate in providing feedback and the approval process of the C. difficile nurse-driven protocol.

Stakeholder (Nurse Executive Committee Team)

The Nurse Executive team will support and create the necessary platform for information dissemination and play the role of a stakeholder in driving the quality improvement process and raising awareness. The Assistant Vice President of Nursing (AVP), as an Executive sponsor, is responsible for the overall management of the C. difficile Task Force.

Sample Size

The sample size will be estimated utilizing the population of all admitted adult patients in the in-patient setting at risk for acquiring C. difficile. Within the DNP project setting, there is approximated average of 150 admitted patients daily. This includes both the adult and pediatric population. With the pediatric population excluded from this project, approximately 130 of the population meets the criteria for admitted patients who are at risk for acquiring C. difficile. Based on the average daily admitted adult patients, the monthly population size will be 3,640. Utilizing the population size of 3,640 at risk patients for acquiring C. difficile, the sample size will be calculated using the G*Power 3.1 sample size calculator. Utilizing a confidence level of 95%, with a 5% error probability, and Cohen's Effect size of 0.8 for a large group, the sample size estimation is 35 admitted adult patients at risk for acquiring C. difficile.

Setting

The DNP project setting is the adult in-patient units, including all medical-surgical units and ICU (critical care area) patients. All stated areas have the potential of admitting patients who are at risk of acquiring C. difficile due to (a) C. difficile colonization, (b) prolonged hospitalization, (c) antibiotic therapy, (d) old age, and (e) admission from a nursing home/ long-term care. According to Czepiel et al. (2019), the most important risk factors include antibiotic therapy, old age, and hospital or nursing home visits.

Organizational/Environmental Assessment of Readiness for Change

Decreasing HA-C. difficile is a national quality improvement goal, as it poses significant challenges in healthcare systems. CDIs are an increasingly prevalent healthcare-associated infection (HAI) that lead to patient harm, ranging from painful diarrhea to death (JC, n.d.). In addition, the related health care C. difficile cost is significantly attributing to approximately 6.3 billion /annually in the United States (JC, n.d.). Government entities and quality improvement agencies regulate patient safety, requiring health care facilities to reduce patient harm or risk financial implication. Therefore, health care organizations must use best-practice innovative plans to decrease C. difficile. Reducing HA-C. difficile is one of the organization's corporate and hospital-based goals. Therefore, the health system senior leadership team is tasked to create innovative best practice plans to decrease HA-C. difficile. Creating and sustaining a culture of safety improves quality patient outcomes and decreases financial implications/ penalties.

Gap Analysis

There are several C. difficile preventative strategies utilized within the organization. However, these interventions are sporadically introduced to the staff with no concrete steps implemented to ensure compliance. Registered Nurses play an integral role in the clinical assessment of patients and incorporating related interventions in patient care. Nevertheless, the autonomy and empowerment of driving patient outcomes are lacking. Nurse-driven protocols are shown to effectively improve patient safety outcomes, nurse empowerment, and job satisfaction (Lockhart, 2020). The decision to implement the Nurse Driven C- Difficile Protocol/ Algorithm for HA-C. difficile reduction was made in conjunction with the Chief Nursing Officer (CNO), AVP of nursing, along with the approval of the Infection Prevention department. Thereby, a signed project site authorization was obtained (see Appendix K). The goal of this DNP project is

to implement a successful Nurse Driven C. difficile Protocol/ Algorithm that will decrease the organization's HA-C difficile rate.

In the review of the organization’s gap in CDI prevention strategies, several interventions were initiated over the years to include (a) antibiotic indicator requirements, (b) hand hygiene champions, (c) GOJO electronic hand hygiene monitoring, (d) lab education of appropriate stool specimens and (e) TRU-D Ultraviolet disinfection of all CDI rooms. The most recent 2019 strategies include re-education of environmental services on oxicide room cleaning, Vancomycin prophylaxis for all transplant patients, and updated CDI EMR order set to include no laxatives in 48hrs. Despite the many implemented strategies, the organization’s C. difficile rates continue to rise above the national benchmark. The organization utilized the National Healthcare Safety Network (NHSN) Standardized Infection Ratios (SIRs) for monitoring HAIs. The organization’s 2021 August year-to-date C. difficile SIR was 0.86 compared to 0.52 across acute care hospitals in 2020 (CDC, n.d.). In addition, the organization’s C. difficile rate was the highest among the system’s hospitals at a rate of 5.04 per 10,000 patient days, as compared to 2.56 per 10,000 patient days. Therefore, the national performance will serve as a comparison for pre- baseline and post-implementation rates.

The gap identified through analyzing patients' charts reveals several opportunities for improvement (see Appendix D). The opportunities identified are (a) obtaining specimens in a timely fashion (collection on day 4), (b) in-appropriate order (patients on laxative, tube feeds, PPIs), (c) medication that can cause diarrhea (antibiotic), and (d) other factors (nursing asking for C. difficile order for patients with foul-smelling stool). Therefore, the DNP student will plan a quality improvement project to address the current organization’s practices gaps. In collaboration with Infection Preventionist, Clinical Nurse Educators, Physician liaison, and the

C. difficile Task Force, the DNP student will tackle the identified gaps in current practices. The following are identified objectives: (a) research best practice nurse-driven protocol related to C. difficile, (b) develop a nurse-driven protocol based on the researched evidence, (c) implement the Nurse Driven C. difficile Protocol/ Algorithm on the adult in-patient units, including the ICUs and (d) evaluate the impact of the implemented nurse-driven protocol on HA-C. difficile rate and patient outcomes.

SWOT Analysis

This quality improvement project's strengths, weaknesses, opportunities, and threats (SWOT) was conducted. Decreasing HAIs is significant within the healthcare organization, as patient safety and reimbursement are tied to these conditions. Therefore, organizations must implement measures to decrease HAIs strategically. One of the identified strengths of the Nurse Driven C. difficile Protocol/Algorithm is the ability to decrease HA-C. difficile through appropriate testing. There is strong support in decreasing HA-C. difficile from the organization's senior leadership and Infection Prevention team and evidence on nurse-driven protocols have proven to be successful. The success of this project will improve the organization’s patient safety outcome and patient satisfaction. The budgetary factor is another identified strength, as the DNP project requires minimal financial support. Most of the time spent on this DNP project will be conducted during regular working hours, including practicum hours, thereby decreasing extraneous costs. Nurse-driven protocols are proven to empower nursing practice. Therefore, job satisfaction is an identified area of strength. With the potential success of this project resulting in positive patient outcomes, the front-line staff can feel empowered in implementing future quality improvement changes.

HA-C. difficile is an organizational issue on most in-patient units, with few isolated problematic areas identified. Therefore, a pilot study is not conducive to this project, which is an identified weakness. Consequently, this DNP project will be implemented hospital-wide on all adult in-patient units. The identified opportunity for this DNP project is patient satisfaction and patient outcomes in addition to timely C. difficile identification and treatment. Positive patient safety outcomes result in increased patient satisfaction. If a patient receives exceptionally high-quality care, the likelihood of recommending the hospital to others, along with returning when additional care is required, is seamless. The increase in services will result in increased hospital admission, thus improving the organization's financial outcomes.

The identified external threats are related to hospital reimbursement. As federal agencies such as Centers for Medicare and Medicaid Services (CMS) (2019) place penalties on all HACs, hospital reimbursement becomes a threat. The Hospital-Acquired Condition Reduction Program ties performance on patient safety issues such as infections to payment (American Hospital Association [AHA], n.d.). Under the program, the CMS penalizes the lowest performing 25% of all hospitals each year, 1% of their Medicare hospital payments. In addition to these penalties, the law requires CMS to publicly post hospitals' performance on HAC quality measures (AHA, n.d.). As such, acute care settings are mandated to decrease HAC such as C. difficile to avoid financial penalties. Therefore, strategies to mitigate potential penalties include programs to decrease HAC, such as quality improvement reduction initiatives, inclusive of education on protocols and guidelines (see Appendix. H).

Proposed Budget

The monetary cost for this DNP quality improvement project will be minimal. All anticipated resources are within the organization. The C. difficile Task Force meetings will occur

within regular business hours. In addition, email will be utilized as a method of communication for the project approval process. The dissemination of information to the front-line staff will occur through the (a) organization's educational platform (HealthStream), (b) Unit-based huddles, (c) CNO/ Director's meeting, (d) Weekend CAPE (Clinical Assistance and Professional Education), and (e) Nurse Executive Committee (NEC), within regular business hours. All staff educational expenses are built into staff development and unit-specific annual budgets. The total project expenditure is broken down as the salary of front-line staff such as registered nurses (RN), Clinical Care Technicians (CCT) and nursing leadership. The project for education time is 30 minutes. The average salary for the staff nurse is $60/hour. There are an estimate of 1500 front-line nurses that will receive the education. Therefore, the total expenditure for the front-line RN education is $45,000. The average salary for the CCT is $15/hour, with an estimate of 400 receiving education, thereby totaling an expense of $3000.

The nursing leadership includes (a) Nursing Directors, (b) Nurse Managers, (c) Clinical Nurse Educators, (d) Infection Preventionist, (e) AVP of Nursing, and the (f) CNO. The average nurse leader's salary is $120/hour. The anticipated time spent with nursing leadership is a maximum of 1 hour, with an estimated 100 personnel, totaling $12, 000 in expenses. Physician communications will occur from the top down. An out-of-pocket expense will total $500, which will be utilized to incentivize front-line staff willing to become Unit-based C. difficile champions, handouts cost, and reward and recognition of units with are percent compliance in following the process. (See Appendix G).

Interdisciplinary Collaboration/Team Development

Collaborating with other professionals within the organization is critical. The medical staff such as the Hospitalist team, Medical Teaching group, and Nurse Practitioners are critical to

the success of the DNP project. Therefore, collaborating with the Chief Medical Officer (CMO) and Infection Disease Physician lead is vital in the approval process for the nurse-driven protocol, education, and disseminating the information among team members. In addition, creating a C. difficile Taskforce to include collaboration is fundamental. The C. difficile Taskforce consists of an (a) Infection Prevention Physician, (b) the Nursing Director for Infection Prevention, (c) Nurse Infection Preventionist, (d) Nursing Directors, (e) Clinical Nurse Educators, (f) Staff Nurses, and (g) Assistant Vice President of Nursing (Executive sponsor). In creating the team, an initial email was generated to discuss the essentials of a C. difficile Task Force in decreasing HA-C. difficile, a quality improvement initiative.

Chart Audit

All the organization's HA-C. difficile charts audits will be reviewed. The review of all HA-C. difficile from January 2021 will be completed for a pre-implementation phase data. The post-implemented data will also utilize the chart auditing process. The DNP student will utilize the chart audit review tool for information and data gathering of all HA-C. difficile with opportunities identified for (a) inappropriate testing (b) specimen collected outside the three-day timeframe of admission, (c) specimen sent based on a foul-smelling stool, (d) specimen sent not meeting the Bristol stool chart, and (e) inappropriate ordering (practitioners who order testing on a patient with prolonging constipation followed by loose stool and patient who received laxative/ stool softener within 48 hours). Exclusion criteria are CA-C. difficile. Chart audit approval was granted from the Director of Infection Prevention, which includes all current and previously positive patient's C. difficile data. All patient information will be protected under the Health Insurance Portability and Accountability Act (HIPAA).

Organization Approval Process

The DNP project requires organizational approval. The organization approval process includes a full review of all projects through the Research Utilization Group (RUG). The RUG approval is completed prior to submission to the facility Institutional Review Board (IRB). This approval process ensures the DNP project follows all ethical practices. In addition, a letter of authorization allowing the DNP student access to conduct project related activities must be obtained (Appendix K). An application to the Aspen University IRB is also required, and approval must be granted prior to applying to the organization's IRB. Approval from both IRB's must be granted prior to the implementation of the DNP project (see Appendix M).

Instrumentation

The Nurse Driven C. Difficile Protocol/ Algorithm

The purpose of the Nurse Driven C. difficile Protocol/ Algorithm is to provide clear step-by-step guidance in appropriate stool specimen collection and ordering criteria, followed by precautionary interventions. The Nurse Driven C. difficile Protocol/Algorithm (see Appendix C) will be examined and evaluated by subject matter experts to determine validity and reliability, along with the Medical Staff and Nurse Executive approval prior to implementation. Upon approval, the nurse-driven protocol will be utilized as an educational tool in the project's implementation phase.

Chart Audits – The chart audit review checklist (see Appendix E) tool was designed to determine if standards or protocols for C. difficile testing and stool collection were followed. The chart audit checklist consists of specific areas of the nurse-driven protocol. The chart audit tool was utilized as a data collection form, and data collection forms are used in quality improvement activities to record compliance with standards (Mateo & Foreman, 2014, p. 215).

2021 NHSN Gastrointestinal System Infection (GI) Checklist

The DNP student will utilize the 2021 NHSN Gastrointestinal System Infection (GI) Checklist as an identification tool for C. difficile as part of the chart auditing process (see Appendix F). As a documentation review checklist, the tool identifies criteria for meeting the definition of a C. difficile infection. The NHSN Healthcare-Associated Infections (HAI) checklist was developed by the National Healthcare Safety Network (NHSN) subject matter experts as a tool to aid Infection Preventionists and other users when deciding about a healthcare-associated infection (CDC, 2020a).

Data Collection

The data for HA-C. difficile will be collected by (a) performing chart audits of all HA-C. difficile within 2021, and (b) identification of criteria for meeting the definition of HA- C. difficile, and (c) C. difficile positive laboratory specimen results and associated patient treatment.

Chart Audit

The DNP student will complete the chart auditing through the hospital's electronic patient medical records (EMR). All HA-C. difficile patient data will be provided to the student from the Director of Infection Prevention, Quality reviewer, or the Infection Preventionist. Utilizing the chart review checklist, the DNP student will gather all information from the EMR using the hospital-based computer located in the DNP student office and place it into categories aligned with the elements of the hospital protocols. The primary goal of the chart audit is to gather data specific to failed opportunities associated with HA-C. difficile, thereby validating the need for a Nurse Driven C. difficile Protocol/ Algorithm. The goal is to audit all 2021 hospital-acquired C. difficile patient charts (58) pre-implementation, and all charts post-implementation phase.

Data Analysis Method

The Nurse Driven C. difficile Protocol/ Algorithm is assumed to decrease HA-C. difficile. The data retrieved from the chart audit will be analyzed with statistical analytical software. The IBM SPSS software platform will determine the statistical significance due to its vast library of machine learning algorithms. The result of the analysis is expected to find a statistical significance in the reduction of HA-C. difficile post-implementation of the nurse-driven protocol. However, the data can be described and communicated with ease when organized and summarized (Mateo & Foreman, 2014). The data will be entered and assigned in a nominal format within the SPSS software. It is expected that the t-test will be used with a 0.05 confidence level. In addition, calculating the HA-C. difficile rate will use the mean to complete a paired t-test for average HA-C. difficile rate pre- and post-intervention to determine any statistical significance. In this manner, variables will be assigned as numerical values, yielding standard deviation and percentages. In addition, pre-and post-implementation will be illustrated using a histogram or bar graph. However, a statistician will validate all the resulting analyses.

In addition, the organization utilizes the CDC's National Healthcare Safety Network tracking system to measure progress on HA-C. difficile counts. The rate is calculated based on the number of hospital-acquired cases of C. difficile per patient days monthly times one thousand (# of hospital-acquired C. difficile cases/ total # patient days monthly) x 1000. The monthly rate of HA-C. difficile is reported to the NHSN. However, CDI SIR rates are calculated and reported quarterly. The NHSN utilizes the SIR for HA-C. difficile as an outcome measure. The SIR equals the number of observed infections/ the predicted number of infections (CDC, 2020a). SIRs for C. difficile laboratory identification (LabID) events in an acute care hospital are calculated on the facility-wide in-patient (FacWideIN) level for each quarter (CDC, 2020a). In

this DNP project, the focus areas include all adult in-patient medical surgical units, and the ICUs. Therefore, the SIR measurement is relevant to the project.

Data Management Method

The data management plan primarily includes a comprehensive systematic approach in ensuring all patient information retrieved during the data collection process is protected under HIPAA. All data collected for review will be stored on the facility-based computerized system in an H-drive. The computer located within the DNP student office is wholly secured, protected, and monitored through the organization's patient health information securely encrypted system. The computer is password protected with specific alpha-numeric code that is unique and known only to the DNP student. Permission will be granted for review from the Director of Infection Prevention, sent through the organization's secured email system.

The de-identification of the health care records process will be used to utilize all patient information. To use the information for anything other than treatment, payment, or healthcare operations (TPO) without patient authorization/permission, one must remove all patient identifiers (Briefing on HIPAA, 2019). During the chart review process, all patient identifiers (name, date of birth, medical record number) will not be extracted from the EMR. In addition, all data collection files will remain on the DNP student password-protected computer for the project's entirety.

Ethical Considerations

Sound knowledge of the ethical principles that guide nursing practice and research is essential for any researcher (Ingham-Broomfield, 2017). Patient privacy, protection, and confidentiality must be the primary focus of all research studies, including DNP projects. To ensure these ethical principles were maintained within this DNP project, the Collaborative

Institutional Training Initiative (CITI program) has been completed (see Appendix J.) The CITI training program is designed to improve the researcher's knowledge and professionalism in conducting research. The CITI training program ensures that all researchers' ethical integrity and compliance are maintained.

In considering the ethical principles of the DNP project, patient confidentiality is critical. Therefore, patient confidentiality and the safety of all patient health information will be maintained. The project consists of chart reviews that require unauthorized use of patient information, as inquiry and data collection. Thus, mitigating all risks associated with patient privacy through identifiers are essential. However, the Department of Health and Human Services has listed eighteen elements that must be removed from the record to consider it de-identified and, therefore, used without patient authorization (De-identification of protected health information, 2019). All documents that may be related to chart audits will be kept in a secure location with access only authorized by the DNP student. Once the project is completed all documentation will be destroyed.

On the other hand, the DNP student has full access privilege to view and complete chart audits. The chart review information is entirely secured and protected. In addition, as a quality improvement project, the expected result of the Institute Review Boards (IRB) committee will be an exemption from review. This scholarly project poses no risks to subjects or has no means by which the subjects can be identified (Mateo & Foreman, 2014).

Internal and External Validity

The potential internal threat related to the implementation of the Nurse Driven C. difficile Protocol/ Algorithm is the lack of treatment fidelity. The implementation education will be provided to RNs, CCTs, Nurse leaders and Providers. Therefore, the education provided must be

clear, with guidelines and references that will enhance performance and consistency (Mateo & Foreman, 2014). Research showed that low testing fidelity, over-testing, and the lack of early detection are internal threats of the nurse-driven protocol (Kavazovic et al., 2020). Recommendations included (a) ensuring front-line nurses receive education regarding appropriate testing, (b) include a nursing communication process when tests are ordered outside of protocol; and (c) eliminating the ability for nurses to order C. difficile test after hospital day three (Kavazovic et al., 2020). The stated recommendations will be added to the algorithm and implementation process of the nurse-driven protocol. Post-implementation interviews will be conducted, as part of the PDSA methodology, to ensure internal validity.

Conclusion

The implementation of this quality improvement Nurse Driven C. difficile Protocol/ Algorithm DNP project will accurately identify C. difficile for appropriate management, prevention, and treatment. The project design will be guided by the PDSA model for quality improvement framework, which outlines the systematic process of implementing and evaluating the change. Data collection, analysis, and management and chart review will ensure the nurse-driven protocol's validity and reliability. In addition, taking into consideration the internal and external validity, the overarching aim of the Nurse Driven C. difficile Protocol/ Algorithm to decrease hospital-acquired C. difficile has the potential to succeed.

Chapter 4: Results and Discussion of Findings

Clostridium difficile (C. difficile) infection (CDI) is a growing problem worldwide and a significant health threat in the healthcare environment. CDI leads to negative outcomes for patients, healthcare providers, and healthcare institutions due to an association with mortality, morbidity, prolonged hospital stay, and financial implications. Therefore, the health care setting must ensure appropriate measures are taken to decrease hospital-acquired infection and improve patient safety outcomes. In addition, reducing CDI had become a national priority. This DNP project was to determine if a Nurse Driven C. difficile Protocol/ Algorithm improves the early identification of community-acquired C. difficile (CA-C. difficile), thereby decreasing HA-C. difficile. The Nurse Driven C. difficile Protocol/Algorithm includes an algorithm for testing and ordering appropriateness (creating a computerized hard stop), a Bristol stool chart, and preventive measures for results of positive stool toxin. In addition, the DNP project aimed to decrease HA-C. difficile by empowering and educating nurses about the C. difficile testing guidelines to reduce unnecessary testing and preventative strategies to decrease HA-C. difficile. The following results will show the analyzed data pre-and post-implementation of Nurse Driven C. difficile Protocol/Algorithm, along with the many variables that impacted the process.

Summary of Methods and Procedures

The initial steps of implementing the Nurse Driven C. Difficile Protocol/ Algorithm began with creating PowerPoint presentation for the nursing staff. The staff C. difficile education presentation clearly explains the project's significance, including the goal and description of the Nurse Driven C. difficile Protocol/Algorithm. The educational presentation was placed in Health Stream, the facility's education platform. It was distributed to 1182 registered nurses to be

completed within six weeks. Secondly, the Clinical Nurse Educator disseminated the Nurse Driven C. difficile Protocol information during the weekend Cape. In-patient unit education was also completed. In addition, the DNP project and educational plan were presented to the Nursing leadership team at the CNO/Director meeting to drive expectation, compliance, buy-in, and answer/clarify any questions. The copy of the Nurse Driven C. difficile protocol/algorithm was laminated, and two copies were given to each in-patient unit Nursing Director to be posted at the unit level to provide guidance/reference as needed. The project aim was to decrease HA-C. difficile by empowering and educating nurses about the C. difficile testing guidelines to reduce unnecessary testing and preventative strategies to decrease HA-C. difficile. Therefore, staff education was critical to the DNP project's success.

Summary Impact of Education Data

During the six-weeks' timeframe for staff education, a weekly report was generated to allow a more focused education plan and a timely completion rate of eighty percent. However, the facility's new electronic medical record (EMR), EPIC, impacted the education completion rate. As such, the facility's focus shifted from all other assigned/planned projects to the EPIC rollout, significantly impacting the staff education and implementation of the Nurse Driven C. difficile Protocol/Algorithm. Education plays a critical role when implementing change and is the beginning of obtaining the buy-in of staff (McAllen et al., 2018). Therefore, a great effort was made to achieve the staff educational plan of an eighty-percent completion rate through in-patient unit education, however, only a fifty percent completion rate was achieved. One thousand one hundred and eighty-two Registered Nurse were assigned the Nurse Driven C. difficile Protocol/Algorithm staff education in Health Stream. Of the 1,182 Registered Nurses, 367

completed the assigned education. Ninety-four staff were educated during weekend CAPE education, and 123 were educated during the in-patient unit's education.

Table 1

DNP Project Education Completion Rate

Education Plans	Number of Staff Educated
Health Stream Education	367
Clinical Assistance and Professional Education (CAPE)	94
In-Patient Unit-Based Education	123
Total Number of Staff Educated	587/1182= 50%
Infection Preventionist Education	5/5= 100%

Due to the changes in EPIC workflow, the data retrieval process was affected, resulting in the delayed retrieval/collection of HA-C. difficile data by the Infection Prevention department. In addition, the implementation of EPIC also impacted the post-implemented data collection process. The project data collection was based on a total review of all hospital-acquired C-difficile infections post-implementation of the Nurse Driven C. difficile and compared to the pre-implementation data utilizing the chart audit review tool.

Summary of Sample and Setting Characteristics

The data analysis of the DNP project can be diverse and includes a broad array of outcome measures (Moran et al., 2020). The DNP data collection includes information from the chart audit of all hospital-acquired C. difficile (HA-C. difficile) pre-and- post-implementation of the Nurse Driven C. difficile Protocol/Algorithm. This project aims at assessing whether there is a statistically significant difference in attributable HA-C. difficile rate before and after implementation of Nurse-Driven C. difficile Protocol/ Algorithm, which compares pre-and post-implementation rates. The alternative hypothesis stated that the

attributable HA-C. difficile rate decreases significantly after implementation (post-implementation) from the standard provider-led algorithm (pre-implementation). However, the alternative hypothesis maintains the status quo that there is no significant difference in the attributable hospital-acquired C. difficile rates before and after implementation of the Nurse-Driven C. difficile Protocol/Algorithm that (a) an algorithm utilizes testing and ordering appropriateness (creating a computerized hard stop), (b) a Bristol stool chart, and (c) preventive measures for results of positive stool toxin. The research question stated, will the implementation of a Nurse Driven C. difficile Protocol/Algorithm compared to a standard provider-led algorithm decrease the attributable hospital-acquired C. difficile rate?

To understand the differences, the chart audit review tool was utilized for information and data gathering of all HA-C. difficile with opportunities identified for (a) inappropriate testing, (b) specimen collected outside the three-day timeframe of admission, (c) specimen sent based on a foul-smelling stool, (d) specimen sent not meeting the Bristol stool chart, and (e) inappropriate ordering (practitioners who order testing on a patient with prolonging constipation followed by loose stool and patient who received laxative/ stool softener within 48 hours).

The data was generated from all patients that met the at-risk HA-C. difficile definition of acute diarrhea (defined as three or more unformed bowel movements in 24 hours), within three days of hospital admission, and (a) has not taken any laxatives/ stool softeners in the last 48 hours, (b) has not started on new tube feeds, and (c) has not received oral contrast or bowel prep within the last 24 hours. Unless abnormal white blood count (WBC) and abdominal pain accompany diarrhea occur.

The analysis was conducted on SPSS version 26 to investigate the differences in the C. difficile rates before and after the implementation of the Nurse Driven C. difficile

Protocol/Algorithm. The data was retrieved from the chart audit. The main analysis conducted involved using an independent two-sample t-test at a 0.05 level of significance (95% confidence level) to investigate the chances of differences at a 95% confidence interval. In addition, calculating the HA-C. difficile rate used the mean to complete the independent two-sample t-test for average HA-C. difficile rate pre-and post-intervention to determine any statistical significance. Pre- and post-implementation was conducted using months that were used to develop and implement the new C. difficile protocol/algorithm. The data were therefore collected between January and June. To define the intervention intervals between January and March, the standard provider-led algorithm was used, hence pre-implementing the Nurse Driven C. difficile Protocol/Algorithm. April and May were used for the implementation, and June was used as a post-implementation of the Nurse Driven C. difficile implementation. The ten questions chart audit review tool was used to investigate 29 attributable HA- C. difficile.

Other analyses were conducted to investigate further the differences, including one-way ANOVA and multiple linear regression analyses. The one-way ANOVA was used to investigate significant differences in the C. difficile rate across implementation phases (pre-implementation, implementation, and post-implementation)-a Tukey's Honest Significant Difference (Tukey's HSD) post-hoc test was further conducted to investigate the significant differences in the rate and specifically focused on the pre-and post-implementation's C. difficile rate conducted. Multiple linear regression was also conducted by first creating dummy variables of implementation variable and then using pre-implementation as baseline variable (reference) hence the constant in the regression results.

Results

Graphical Analysis

Graphical analyses were conducted to investigate the results from the 10-questions chart audit review tool used to investigate the HA-C. difficile rates. All 29 chart audits indicated 100.00% HA-C. difficile, 26 (89.66%) of the chart audits indicated that patients had risks factors for C. difficile infections against 3 (10.34%) of the audits, 2 (6.90%) of the audits showed patients developing loose stool within three days of admission or in their previous admission against 27 (93.10%) of the chart audit otherwise.

Figure 2

Number of HA-C. difficile

Figure 3

Number of Patients With Risk Factors for HA-C. difficile

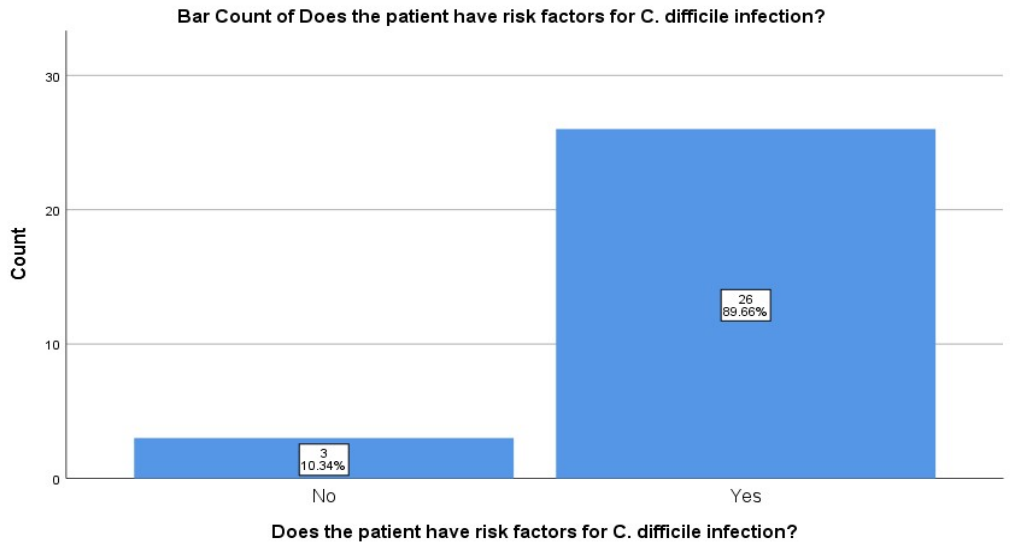
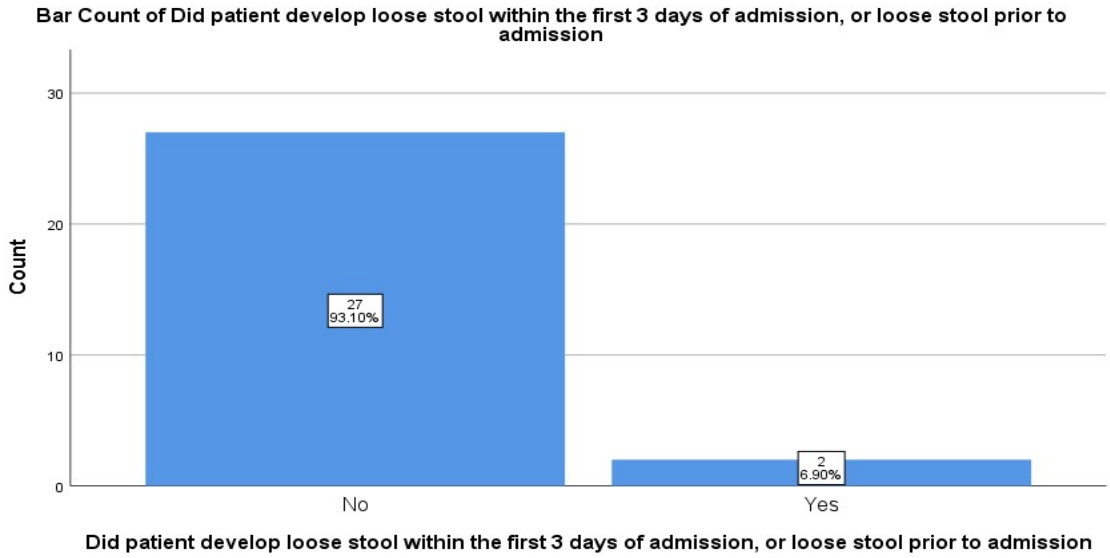


Figure 4

Number of Patients Developed Loose Stool First Three Days



Out of 29 chart audits, 1 (3.45%) against 28 (96.55%) stool samples were sent within the first three days of admission; 1 (3.35%) against 28 (96.55%) met the definition of CA-C. difficile.

Figure 5

Stool Sample Sent in the First Three Days

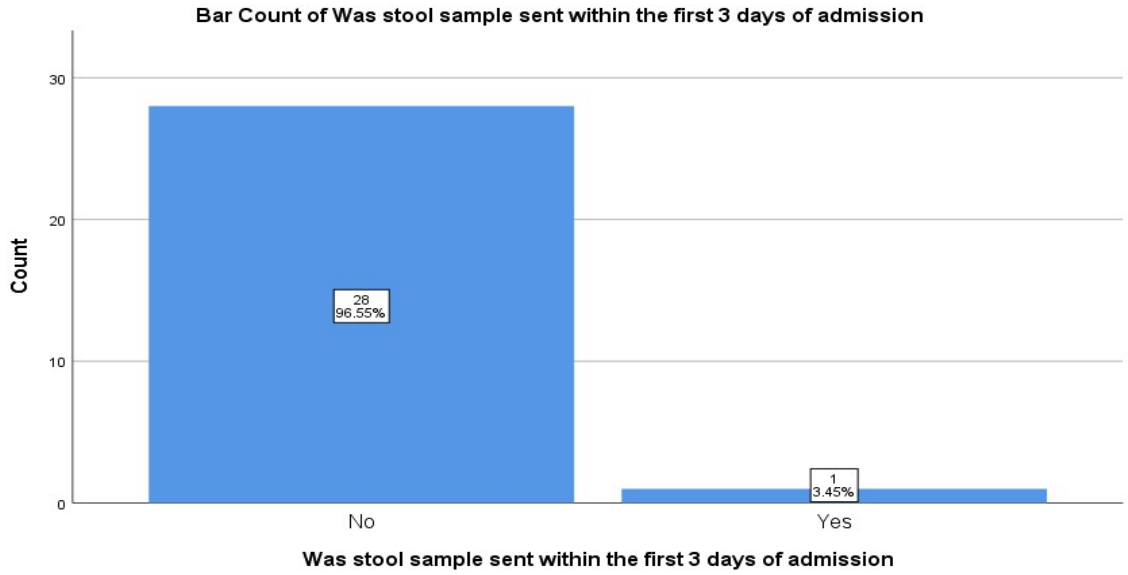
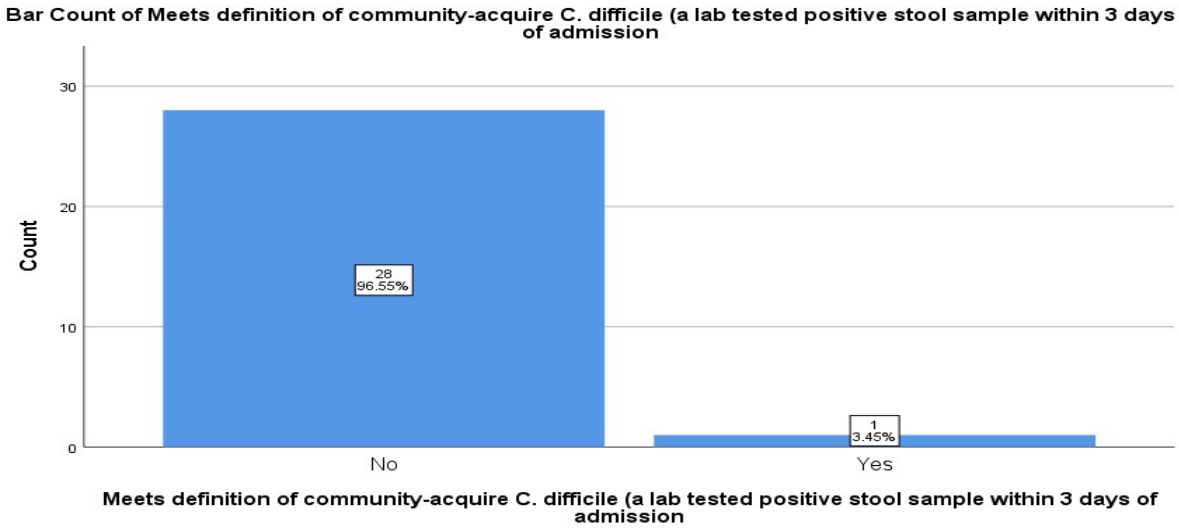


Figure 6

Meets Definition of CA-C. difficile



The results also show that out of 29 chart audits, 24 (82.76%) against 5 (17.24%) showed that patients met the criteria for appropriate stool testing, 27 (93.10%) against 2 (6.90%) showed

that patients were on medication that causes diarrhea. Others can be observed using the pie charts below.

Figure 7

Did the Patient Meet Criteria for Appropriate Testing?

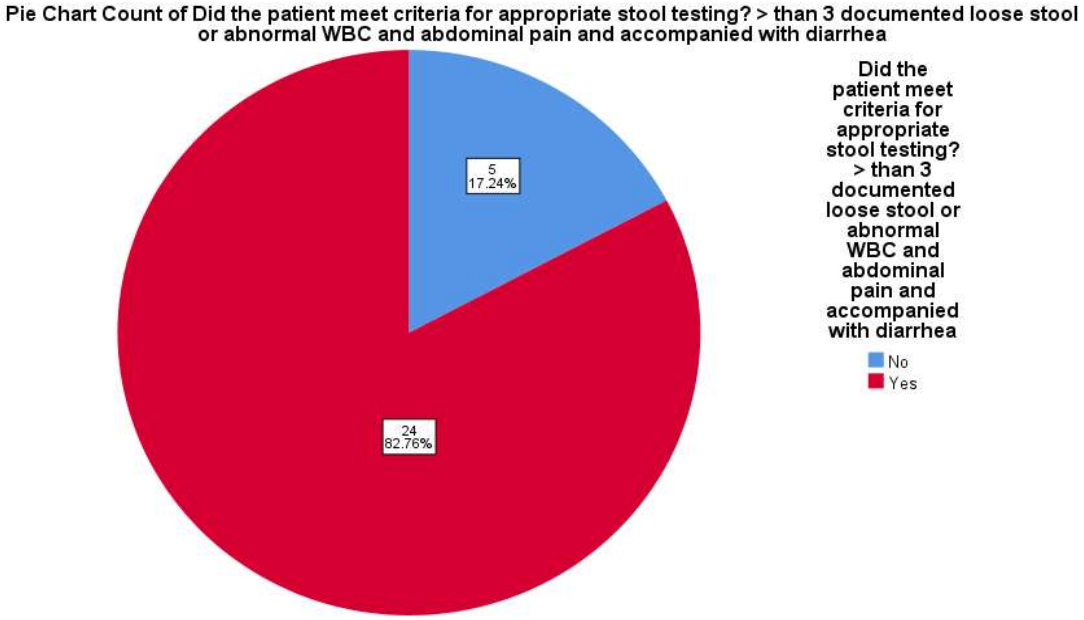


Figure 8

Was the Patient on Medication that Causes Diarrhea?

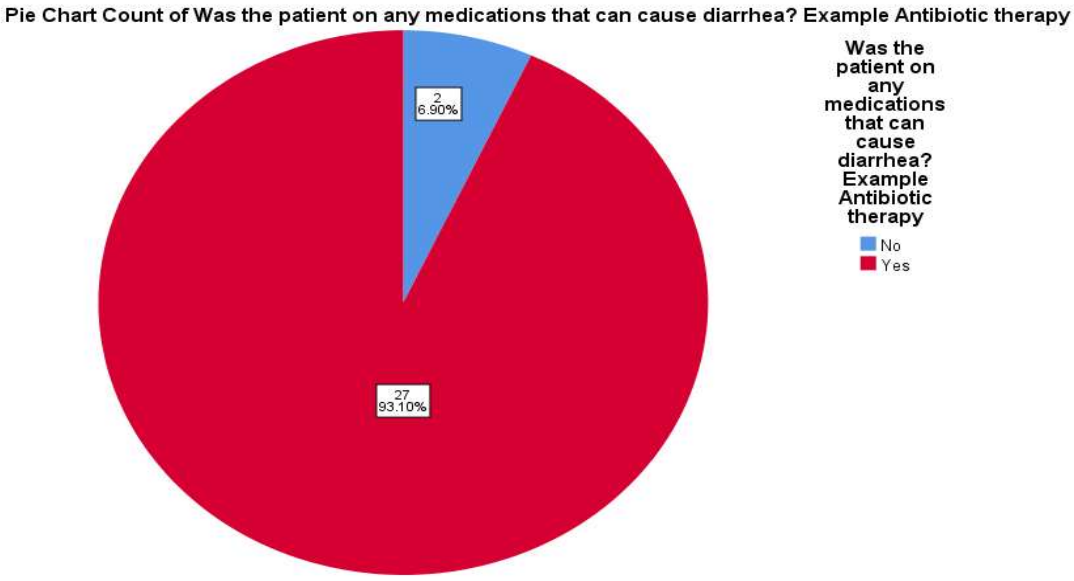


Figure 9

Appropriate Stool Specimen Sent to the Lab

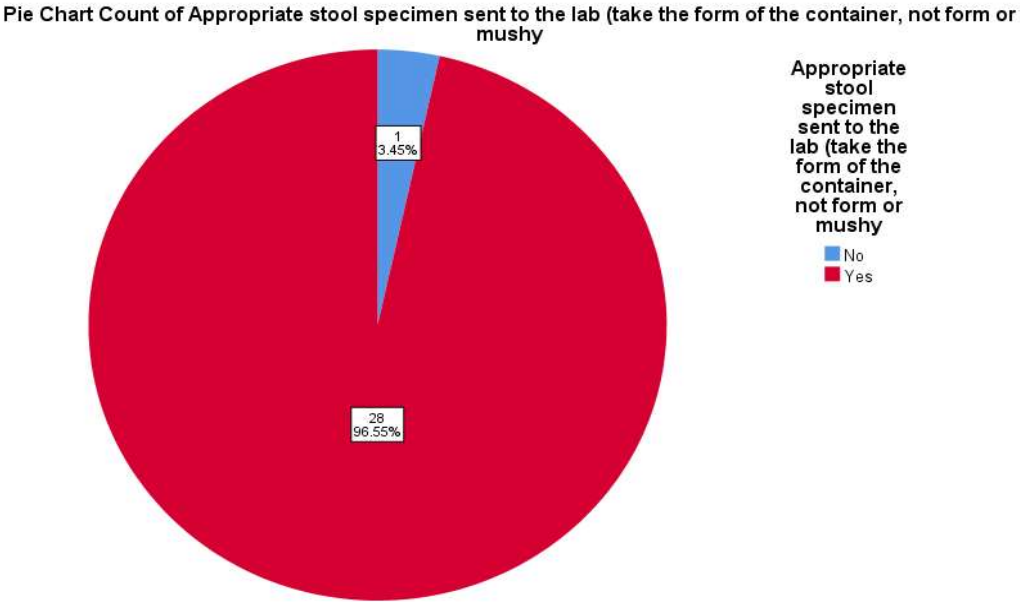


Figure 10

Was the Bristol Chart sent to the Lab with Stool Specimen

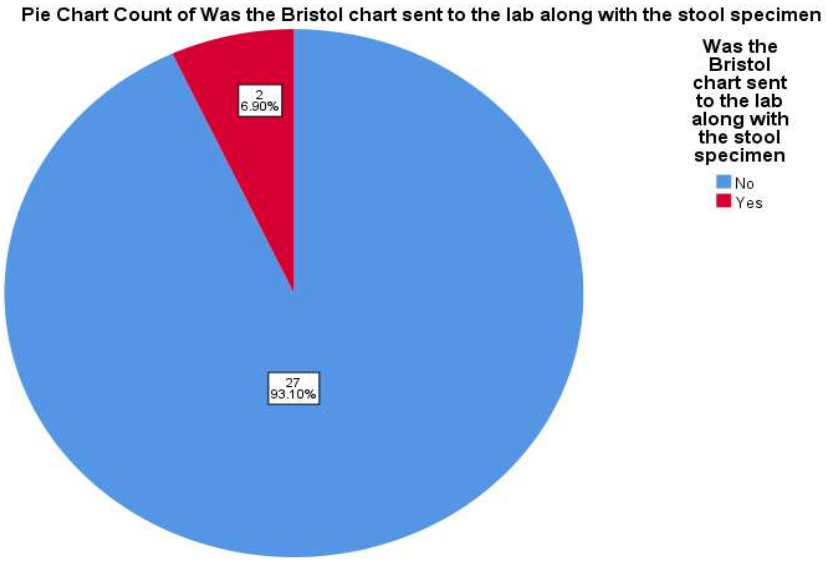
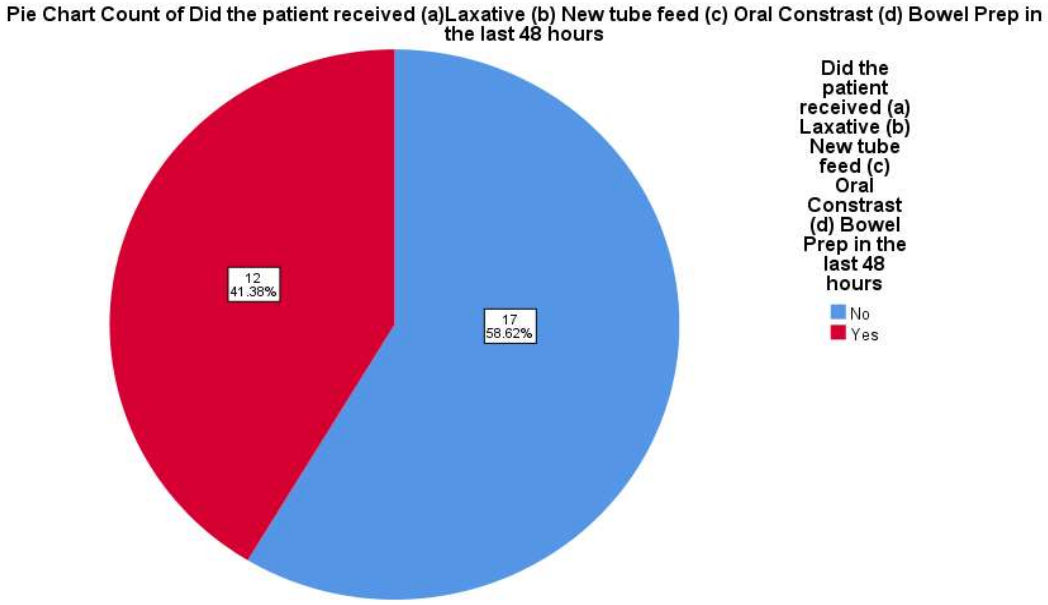


Figure 11

Did the Patient Receive Laxative, New Tube Feed, Oral Contrast, Bowel Prep?



Exploratory Data Analysis

Exploratory data analysis was conducted to investigate how C. difficile rates differed across groups of implementation phases. The results show that both C. difficile rate at pre-implementation (W (16) =.796, p=.002) and post-implementation (W (11) =.833, p=.025) were all not normally distributed. The Rate of C. Difficile rate was 16 (55.17%) at pre-implementation, 11 (37.93%) during implementation, and 2 (6.90%) at post-implementation. Histograms for each stage and boxplots were also used to assess distributions as below.

Table 2

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Intervention Phases	Statistic	df	Sig.	Statistic	df	Sig.
Attribute	Pre-Implementation	.268	16	.003	.796	16	.002
	Implementation	.227	11	.117	.833	11	.025
	Post-Implementation	.260	2				

a. Lilliefors Significance Correction

Table 3

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Intervention Phases	Statistic	df	Sig.	Statistic	df	Sig.
Hospital-acquired C. difficile rate	Pre-Implementation	.268	16	.003	.796	16	.002
	Post-Implementation	.260	2				

a. Lilliefors Significance Correction

Figure 12

Intervention-Implementation

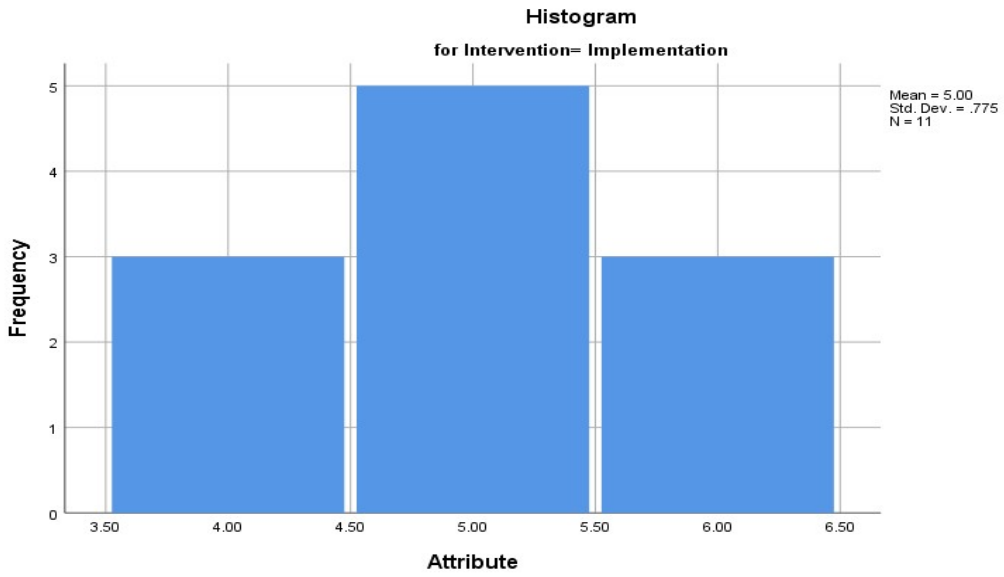


Figure 13

Intervention-Post-Implementation

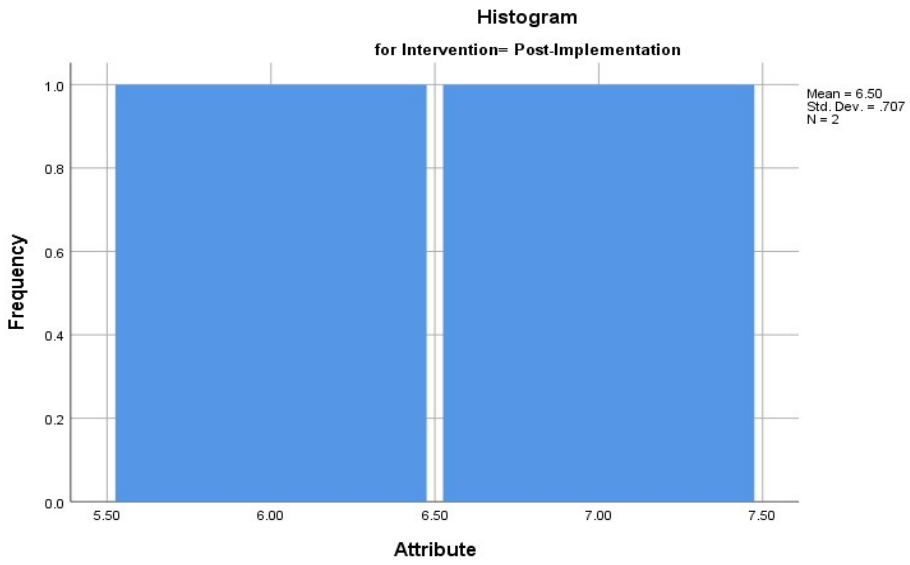


Figure 14

Intervention Phase

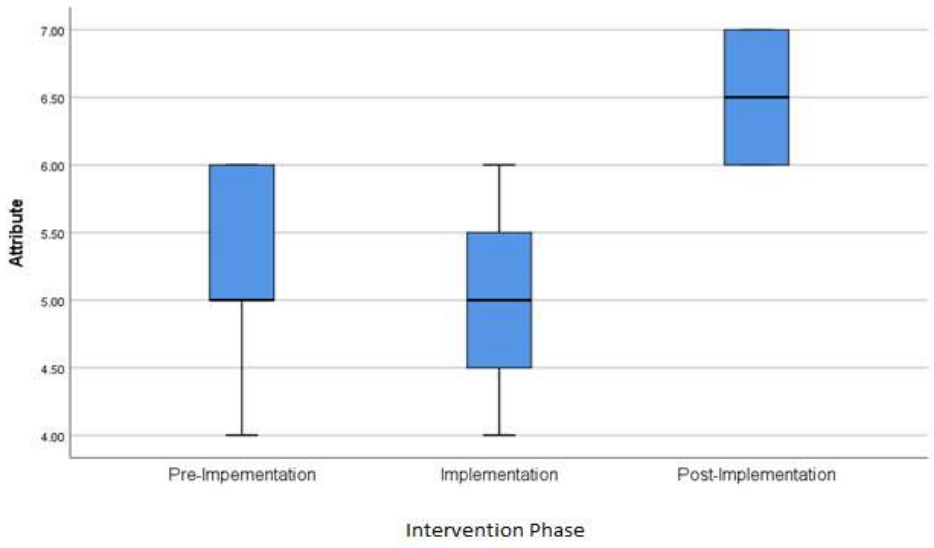


Figure 15

Intervention Phase (Attributed HA-C. difficile)

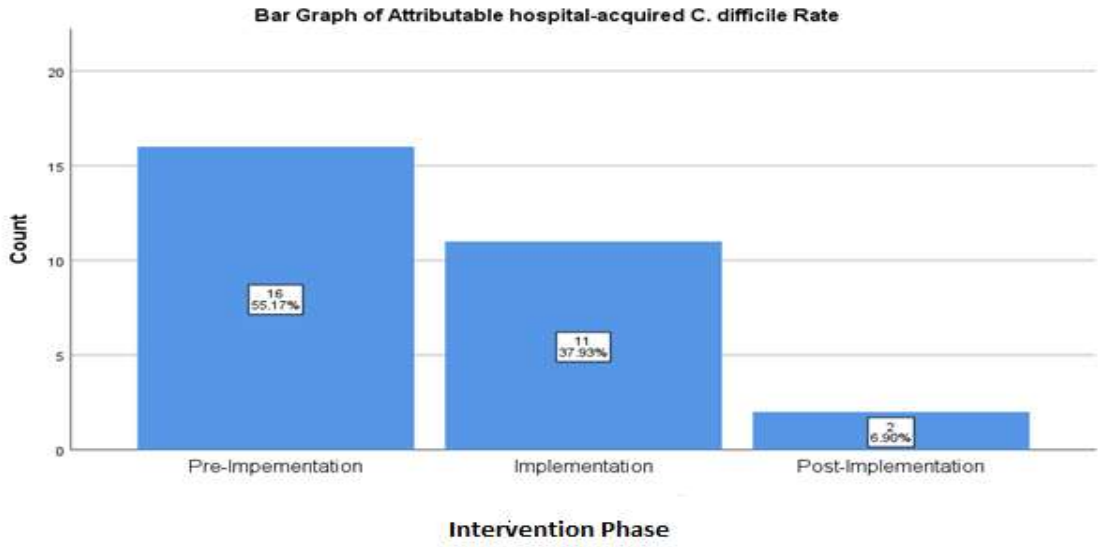
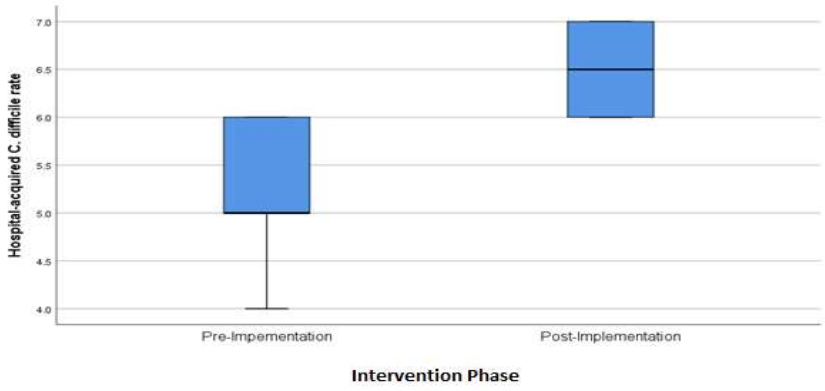


Figure 16

Intervention Phases (HA-C. difficile Rate)



Independent Two-sample *t*-Test Analysis

An independent two-sample was conducted to investigate the significant difference in the HA-C. difficile rate among patients in hospital pre-and post-implementation. Results were

significant, *t* (16) =2.434, p=.027. There was a significant rate in C. difficile rate during pre-and post-implementation of the Nurse Driven C. difficile Protocol/Algorithm, with the rate being higher post-implementation (M=6.50, SD=.707) than the rate at pre-implementation (M=5.25, SD=.683). The result was significant at the p<.05 level of significance.

Table 4

Group Statistics

		Intervention Phases	N	Mean	Std. Deviation	Std. Error Mean
Hospital-acquired C. difficile rate		Post-Implementation	2	6.50	.707	.500
		Pre-Implementation	16	5.25	.683	.171

Table 5

Independent Sample Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Hospital-acquired C. difficile rate	Equal variances assumed	.057	.814	2.434	16	.027	1.250	.513	.161	2.339
	Equal variances not assumed			2.366	1.246	.213	1.250	.528	-3.017	5.517

Comparing results of the independent two-sample *t*-test to that of the Mann-Whitney test since the normality assumption was violated through the homogeneity test was validated, results are non-significant for the exact test but significant for an asymptotic test. This shows that there was a statistically significant difference between the HA-C. difficile rate between pre-and post-

implementation, W (18) =29.00, .048. At a 5% level of significance, there is a statistically significant difference between HA-C. difficile rate with post-implementation (M=6.50, SD=.707) was higher than the rate at pre-implementation (M=5.25, SD=.683). The result was significant at the p<.05 level of significance.

Table 6

Hypothesis Test Summary

Null Hypothesis	Test	Sig.	Decision
The distribution of Hospital-acquired C. difficile rate is the same across categories of Intervention Phases.	Independent-Samples Mann-Whitney U Test	.078[a]	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .050.
a. Exact significance is displayed for this test.

Independent-Samples Mann-Whitney U Test

Table 7

Independent-Samples Mann-Whitney U Test Summary

Total N	18
Mann-Whitney U	29.000
Wilcoxon W	32.000
Test Statistic	29.000
Standard Error	6.580
Standardized Test Statistic	1.976
Asymptotic Sig.(2-sided test)	.048
Exact Sig.(2-sided test)	.078

Figure 17

Independent-Sample Mann-Whitney U Test

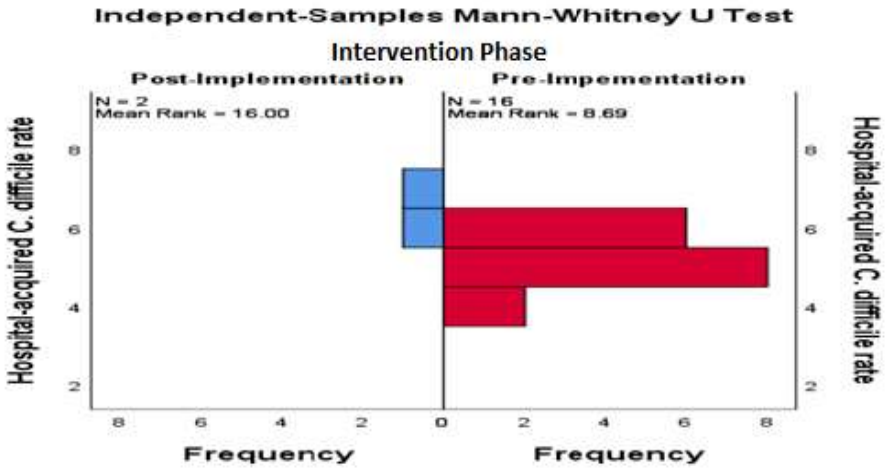


Figure 18

Continuous Field Information

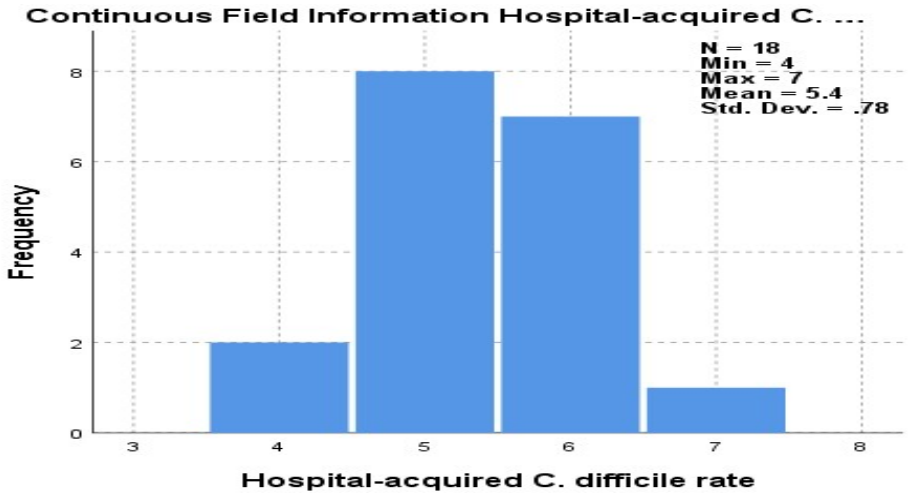
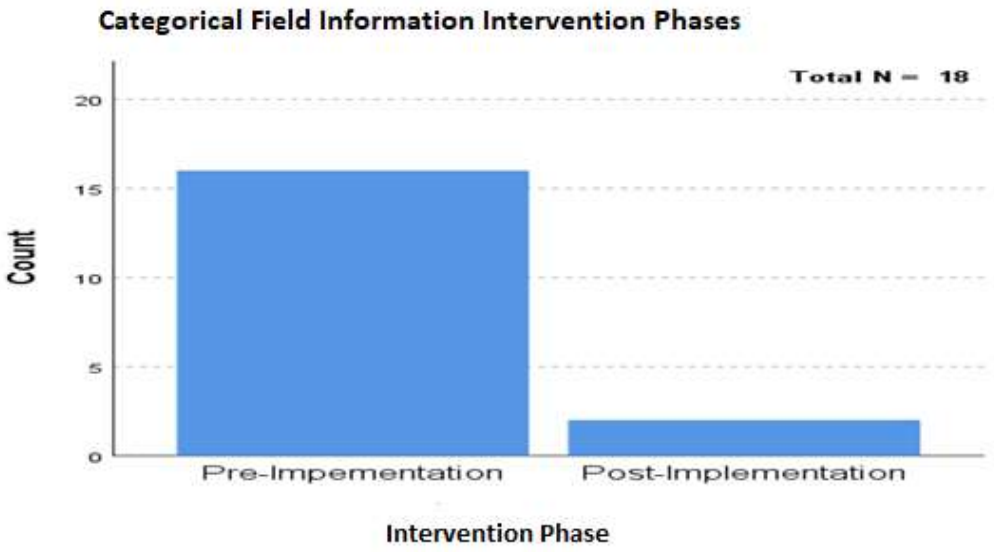


Figure 19

Categorial Field Information Intervention Phases



One-way ANOVA

A one-way ANOVA conducted through Tukey's HSD post-hoc test shows that there was a significant difference in the post-implementation and pre-implementation of Nurse-Driven C. difficile Protocol/ Algorithm, F (2,26) =3.669, p=.039. Results were significant at the p<.05 level. This shows that, indeed, there is a significant difference between the C. difficile rate post-implementation and pre-implementation.

Table 8

Descriptive HA-C. difficile rate

Descriptive
Hospital-acquired C. difficile rate

					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Pre-Implementation	16	5.25	.683	.171	4.89	5.61	4	6
Implementation	11	5.00	.775	.234	4.48	5.52	4	6
Post-Implementation	2	6.50	.707	.500	.15	12.85	6	7
Total	29	5.24	.786	.146	4.94	5.54	4	7

Table 9

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Hospital-acquired difficile rate	C. Based on Mean	.021	2	26	.979
	Based on Median	.027	2	26	.973
	Based on Median and with adjusted df	.027	2	24.997	.973
	Based on trimmed mean	.030	2	26	.971

Table 10

ANOVA

Hospital-acquired C. difficile rate

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.810	2	1.905	3.669	.039
Within Groups	13.500	26	.519		
Total	17.310	28			

Post Hoc Tests

Table 11

Multiple Comparisons

Dependent Variable: Hospital-acquired C. difficile rate

Tukey HSD

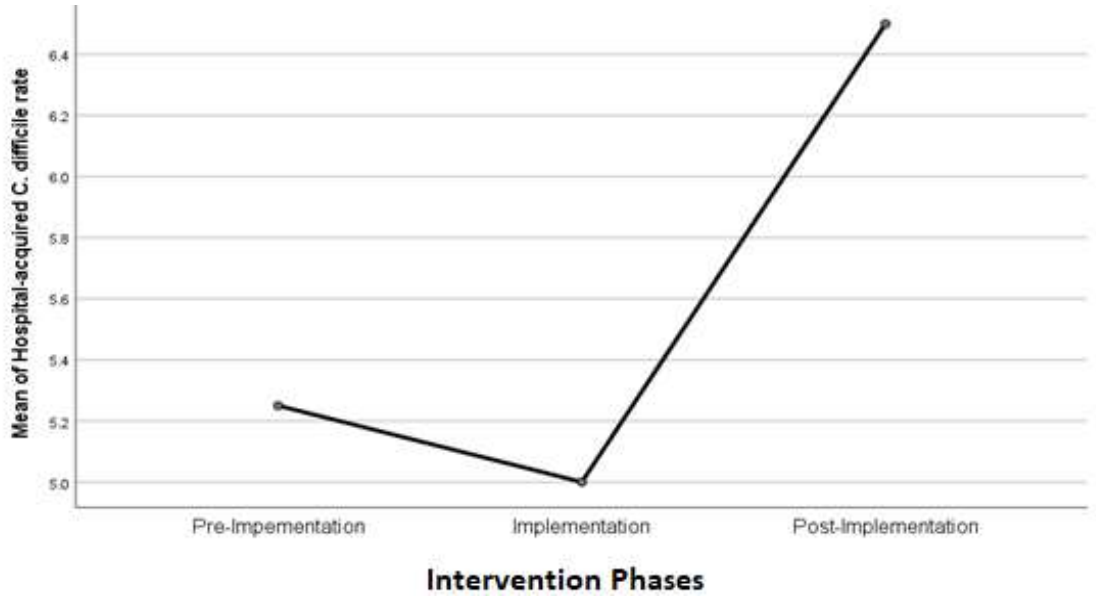
(I) Intervention Phases	(J) Intervention Phases	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Pre-Implementation	Implementation	.250	.282	.654	-.45	.95
	Post-Implementation	-1.250	.540	.072	-2.59	.09
Implementation	Pre-Implementation	-.250	.282	.654	-.95	.45
	Post-Implementation	-1.500*	.554	.031	-2.88	-.12
Post-Implementation	Pre-Implementation	1.250	.540	.072	-.09	2.59

Implementation	1.500*	.554	.031	.12	2.88

*. The mean difference is significant at the 0.05 level.

Figure 20

Means Plots



Regression

The last analysis conducted was the use of regression analysis to investigate significant differences between HA-C. difficile rate between pre-implementation and post-implementation. Results were significant, F (2,26) =3.669, p=.039. Results showed that the post-implementation rate was 1.250 higher than before implementation. The results were significant at the p<.05 level of significance. This shows that the Nurse-Driven C. difficile Protocol/Algorithm was performing lower compared to the standard provider-led standards. The error might be because of the small sample size for the post-implementation.

Table 12

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.469[a]	.220	.160	.721	.220	3.669	2	26	.039	2.458

a. Predictors: (Constant), Post-Implementation, Implementation

b. Dependent Variable: Hospital-acquired C. difficile rate

Table 13

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.810	2	1.905	3.669	.039[b]
	Residual	13.500	26	.519		
	Total	17.310	28			

a. Dependent Variable: Hospital-acquired C. difficile rate

b. Predictors: (Constant), Post-Implementation, Implementation

Table 14

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)pre-implementation	5.250	.180		29.143	.000		
	Implementation	-.250	.282	-.157	-.886	.384	.955	1.047
	Post-Implementation	1.250	.540	.410	2.313	.029	.955	1.047

a. Dependent Variable: Hospital-acquired C. difficile rate

Table 15

Collinearity Diagnostic

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Variance Proportions Implementation	Variance Proportions Post-Implementation
1	1	1.670	1.000	.17	.15	.04
	2	1.000	1.292	.00	.09	.75
	3	.330	2.248	.83	.76	.21

a. Dependent Variable: Hospital-acquired C. difficile rate

Figure 21

Regression Standardized Residual

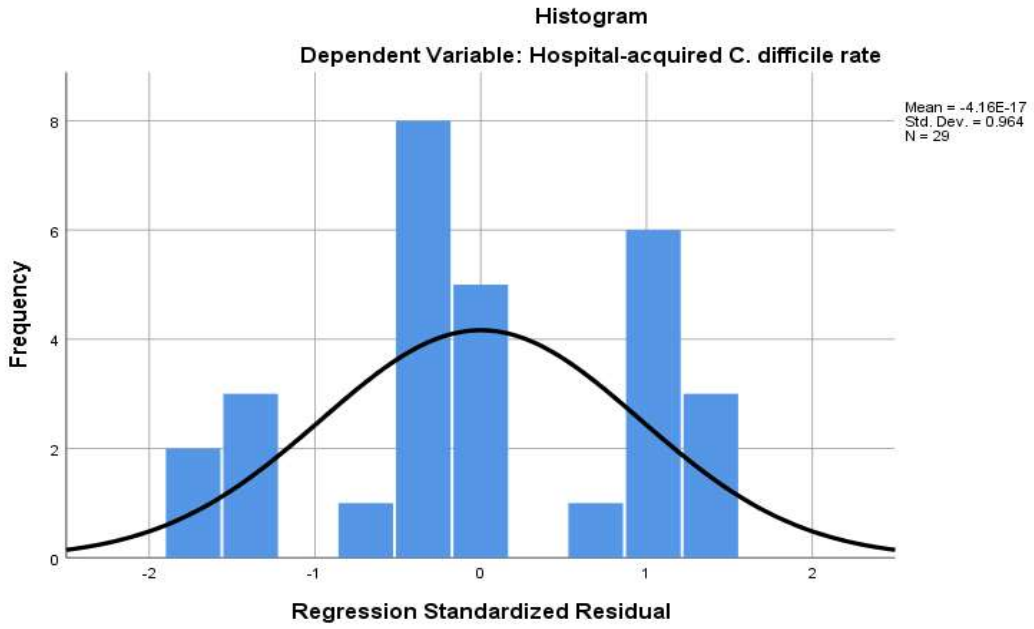
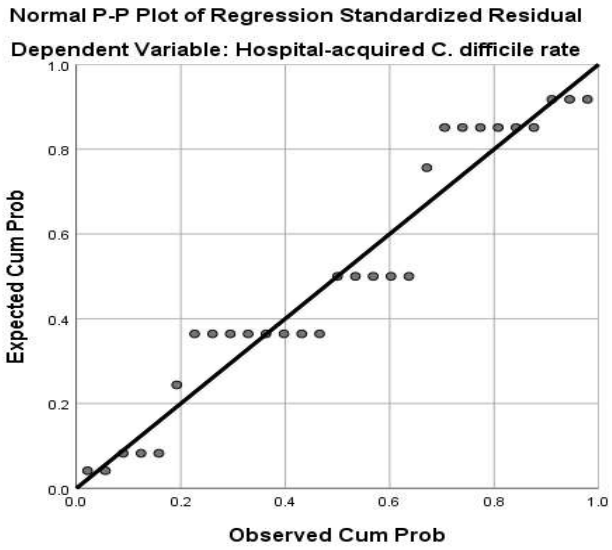


Figure 22

Normal PP Plot of Regression Standardized Residual



Hospital-acquired C. difficile Standard Infection Rate

In addition to the analysis of data from chart audit, the SIR rate was calculated to measure the progress of the HA-C. difficile count. The rate is calculated based on the number of hospital-acquired cases of C. difficile per patient days monthly times one thousand (# of hospital-acquired C. difficile cases/ total # patient days monthly) x 1000. To mirror the chart audit review, the first quarter HA- C. difficile SIR was used as the pre-implementation data point (January- March), intervention phase (April- May), and June as the post-implementation data. The pre-implementation HA-C. difficile count of 17= SIR of 0.545; the intervention monthly calculated SIR (April 0.33 and May- 0.50), and post-intervention rate June (0.29). Therefore, there was a decrease in the HA-C. difficile SIR, showing a positive impact of the implemented Nurse Driven C. difficile Protocol/Algorithm.

Figure 23

First and Second Quarter SIR

National Healthcare Safety Network
SIR for CDI FacwideIN for CMS Hospital IQR (2015 baseline)
As of: July 19, 2022 at 9:35 AM
Date Range: BS2_LABID_RATESCDIF_CMS summaryYr After and Including 2015
f (((cdifLabIDPlan = "Y")))

orgID=11572 medType=M

orgID	ccn	location	summaryYQ	months	CDIF_facIncHOCount	numPred	numpatdays	SIR	SIR_pval	sir95ci
11572	310038	FACWIDEIN	2022Q1	3	17	31.197	52104	0.545	0.0062	0.328, 0.855
11572	310038	FACWIDEIN	2022Q2	3	15	30.078	50400	0.499	0.0028	0.290, 0.804

The anticipated outcomes/goal of the Nurse Driven C. difficile Protocol/Algorithm was to reduce HA-C. difficile rate. Creating nurse autonomy with the nurse-driven protocol and increasing educational awareness with the evidence-based tool in reducing hospital infection was crucial to the implementation. The literature supports the utilization of the nurse-driven protocol/ algorithm to reduce inappropriate C. difficile testing by empowering nurses and optimizing testing stewardship (Hou et al., 2018). The implementation of the Nurse Driven C. difficile Protocol/Algorithm support such finding, as chart review show a significant improvement in the appropriateness for testing to include criteria for testing (82.7%) and appropriate stool specimen collection (96.5%), thereby achieving significant results in decreasing inappropriate C. difficile testing.

In addition, staff education is a critical component of the successful implementation of the DNP project. Previous studies' recommendations for the future nurse-driven C. difficile protocol discussed front-line nurses receiving education on appropriate testing and a nursing communication process when tests are ordered outside of protocol (Kavazovic et al., 2020). Although the staff education facility-wide did not meet the 80% completion rate, a tabulated finding showed two in-patient units with a completion rate between 70-78%. The two in-patient units with the highest completion rate had zero HA-C. difficile during both the intervention phase and post-implementation phase. Therefore, a high educational completion rate positively

influences the successful implementation of the Nurse Driven C. difficile Protocol in reducing HA-C. difficile. The DNP project's findings supported the previous literature reviews in testing the appropriateness, staff education, and effectiveness of the implemented Nurse Driven C. difficile Protocol/Algorithm.

Implications for Nursing Practice

There are several implications for the nursing practice and the management of CDI to reduce hospital-acquired infections (HAIs) from this DNP project. Although there was no statistical significance in pre-and post-implementation of the Nurse Driven C. difficile protocol, there was a significant decrease in the mean pre-and post-implementation. The results demonstrated the importance of staff education in the early detection, prevention, management, and testing appropriateness of C. difficile. Therefore, nursing leaders must seek additional strategies with full leadership buy-in to ensure staff education and empowerment in reducing HA-C. difficile infection. In addition, developing and implementing interventions to reduce and prevent CDI rates exemplifies the nursing process of putting current evidence-based practice into action to provide excellent nursing care (Nielson et al., 2019).

Given that, previous research studies showed a correlation between nurse empowerment and staff education in reducing HA-C. difficile, the organization can benefit from improvement in quality and safety and cost reduction. The findings of this DNP project can be utilized to add to existing studies and further research studies on the various attributed variables of the Nurse Driven C. difficile Protocol/Algorithm.

Limitations

There were several limitations to this quality improvement DNP project. Although the sample size of the organization-wide HA-C. difficile rate was appropriate, the in-patient unit-

based HA-C. difficile rate sample size ruled out the idea of a pilot study. Thereby, decreasing the ability to conduct a more focused education and implementation of the DNP project. In addition, the post-implementation timeframe (one month) limited the accurate sample size in comparison to the pre-implementation data (three months). Thus, it presented the inability to draw a more robust/ effective statistical analysis, and the project may not have accurately depicted the impact of the nurse-driven protocol on decreasing HA- C. difficile.

Another limitation was the inability of the project manager to control the competing organization-wide priorities thus, reduces the focus on the DNP. The mandatory staff Health Stream education was impacted due to the inability to ensure all Registered Nurses completed the online module within the six-week timeframe. However, due to the mandatory status of the Nurse Driven C. difficile staff education module in Health Stream, there is a possibility that a 100% completion rate will be achieved by the year ending 2022. To complete the project at the pace required for the course completion and within the project timeframe, staff education and a more accurate data collection timeframe were affected.

Conclusion

The result of this quality improvement DNP project demonstrated that staff education could impact reducing attributed HA-C. difficile infection was evident in the statistical analysis of the implemented Nurse Driven C. difficile Protocol/Algorithm. However, the proven results of the mean score of attributed HA-C. difficile post-implementation and the significant improvement in testing appropriateness show the impact of the nurse-driven protocol in reducing the CDI rate. Therefore, there is enough evidence for future studies of the Nurse Driven C. difficile Protocol as an intervention to decrease HA-C. difficile.

Chapter Five: Discussions and Conclusion

The DNP project has well-established the facts that CDI negatively impacts patient outcomes, healthcare providers, and healthcare institutions due to an association with mortality, morbidity, prolonged hospital stay, and financial implications. There have been several research studies that support prevention and treatment methodologies in decreasing HACs, such as C. difficile, utilizing nurse-driven protocols/ algorithms, bundling, and clinical pathway. With the nationally increase in prevalence, the severity of C. difficile, along with the required government reduction program mandates, this DNP project seeks to identify the impact of the Nurse Driven C. difficile Protocol/Algorithm in reducing HA-C. difficile. Incorporating the Nurse Driven C. difficile Protocol/Algorithm through staff education have an impacted HA-C. difficile. In addition, the nurse-driven protocol has contributed to a decrease in the organization's strategic C. difficile count and SIR by CMS definition of best quartile.

Discussion of Findings and Best Practices

C. difficile is a common cause of HAI's and was responsible for approximately half a million infections in the United States in 2011, with approximately 29,300 patients who developed CDIs died within 30 days of being diagnosed (Roser, 2018). Research shows that the number of estimated cases requiring hospitalization between 2012 to 2017 ranges from 223,900 to 272,300. Advance age, antibiotic exposure, and previous hospital stay are a few high-risk factors in developing CDIs within the acute care hospitals and long-term care settings (Roser, 2028). As HA-C. difficile become a global burden, healthcare organizations must institute hospital-based improvement model in reducing HACs. Nursing practice plays a critical role in providing healthcare deliveries, such as improving patient safety outcomes-utilizing evidence-based practice, clinical practice guidelines and best practice models. Therefore, the

implementation of the Nurse Driven C. difficile Protocol/Algorithm outcome was significant in decreasing HA-C. difficile.

It is well-established that nurse-driven protocols have been successfully utilized to decrease HAIs. According to Lockhart (2020), nurse-driven protocols have shown to improve safety, increase staff satisfaction, foster efficiency in care delivery, and promote a healthy work environment. Several research studies mentioned nurse-driven C. difficile protocols and algorithms in the reduction of HA-C. difficile. For example, Hou et al., (2018) utilized a nurse-driven protocol to optimize testing stewarding. In addition, the nurse-driven protocols and algorithms main objectives were to reduce HA-C. difficile rates through early detection of CA-C. difficile, reduced inappropriate testing for hospital-onset infections with C. difficile, and ordering criteria, thereby decreasing the misidentification (Hou et al., 2018; Kavazovic et al., 2020; Meseeha et al., 2018; Wanik et al., 2019; White et al., 2020).

This DNP project utilized a Nurse Driven C. difficile Protocol/Algorithm providing a systematic process that guides the user through early detection, testing criteria, and isolation precaution criteria necessary to decrease HA-C. difficile infections. The specifics of the Nurse Driven C. difficile protocol included recommendation for testing only in patients with clinical signs and symptoms, such as three loose stools within twenty-four hours, without receiving (a) laxative/ stool softeners in forty-eight, (b) new tube feed, (c) oral contrast or (d) bowel prep in the last 24 hours. In addition, inappropriate ordering and obtaining of a stool specimen for C. difficile have shown an increase incidental finding of hospital-acquired C. difficile (HA-C. difficile).

The implemented Nurse Driven C. difficile Protocol/Algorithm was impactful in testing appropriateness (82.7%) and specimen collection (96.5%), based on clinical signs and

symptoms. Therefore, the nurse-driven protocol was successfully used to reduce inappropriate testing through evidence-based interventions, and thereby, decreases HA-C. difficile. However, 41.38% fell within the category of testing fidelity failure due to the administration of laxatives. Thereby, showed similarities to Kavazovic et al. (2020), with failure that occurred from over-testing, over-ordering of stool for C. difficile and testing fidelity. One recommendation for future nurse-driven C. difficile protocol was discussed, to include front-line nurses receiving education on appropriate testing,

Staff education as an intervention to decrease HA-C. difficile were discussed in several of the research studies. Recommendations through regulatory standards and research include staff education and training in stool collection criteria for testing and standardizing assessment tools. For example, to address early detection and isolation of CDI patients, healthcare system provides education to personnel, (a) update the CDI testing policy, (b) implement a CDI testing algorithm for nurses, (c) improves C. difficile testing practices, and (d) established a C. difficile testing audit tool for laboratory personnel (White et al., 2021). The successful implementation of nurse-driven protocol to reduce CDI included staff education. An important limitation of this intervention was the inability to achieve the targeted educational completion rate of 80% due to competing organization-wide initiatives. The 50% completion rate significantly impacted the implementation of Nurse Driven C. difficile Protocol/Algorithm as shown in the HA-C. difficile rate during the implementation phase of the project.

Overall, in comparison to the six research studies, including qualitative, interventional, and quantitative studies, which mentioned the nurse-driven C. difficile protocols and algorithms, five (Hou et al., 2018; Kavazovic et al., 2020; LeRosa et al. 2018; Meseeha et al., 2018; Wanik et al., 2019; White et al., 2020) showed improvement in reducing HA-C. difficile. Along with the

previous studies, this DNP project is significant in providing data needed to add to current nursing practice. In addition, this DNP project can significantly provide data needed for future educational studies in reducing HA-C. difficile.

Implications for Practice and Future Projects

Although the Nurse Driven C. difficile Protocol/Algorithm adds value to the nursing practice, more research is needed on the different variables and risk factors to reduce CDI rates. For example, key findings regarding the administration of laxative within 24- 48hrs requires, and antibiotic stewardship. Mandatory staff education on all topics or contributing factors related to HA-C. difficile is critical in understanding zero harm, and CDI reduction plans. Therefore, increasing awareness of HA-C. difficile prevention strategies, as well as the nurse-driven protocol is critical in identifying problem areas with needs for further reeducation, to influence the number of CDI in 2022.

The DNP project manager plans to discuss the findings of the project with the identified stakeholders, to include all Nursing Leaders (Chief Nursing Officer, Assistance Vice Presidents, Nursing Directors), and the C. difficile Taskforce. The future recommendation for the project will include a more effective education and dissemination of the Nurse Driven C. difficile Protocol/Algorithm. The education distribution ideas will include annual education on (a) Health Stream, (b) annual Nursing Skills Fair, (c) Nursing newsletter, and (d) a more robust C. difficile Taskforce to include frontline staff. In addition, optimization of the EMR (EPIC)) by creating "hard stop" to the step-by-step process of the Nurse Driven C. difficile Protocol and creating a policy to prevent the retesting for C. difficile in patients after the seventh day of an initial testing.

Plan for Dissemination

Dissemination of the findings from evidence-based practice and research to improve quality outcomes is essential, as noted in DNP Essential lll, Clinical Scholarship and Analytical Methods for Evidence-Based Practice (Moran et al., 2020). The DNP project result was shared with the key stakeholders of acute care organizations including the (a) CNO, (b) Assistant Vice President of Nursing, (c) Director of Nursing, (d) Director of Infection Prevention, and the (e) C. difficile Taskforce, utilizing a Power Point presentation with the key findings of the project. In addition, a poster presentation will be performed at the organization's Annual Research Day in the fall of 2022. The poster will create a visual and concise communication of the impact of the nurse-driven protocol in reducing HA-C. difficile. Results will also be summited for publication within the appropriate journal sector, such as the *American Journal of Infection Control (AJIC)*, which primarily covers topics and issues related to infection prevention and epidemiology, as well as *BMC Nursing*. Abstract submission to nursing conferences such as the American Nurses Association (ANA) 2023, and American Organization for Nursing Leadership (AONL) 2023.

Sustaining Change

The DNP project utilized the PDSA quality improvement model in the implementation of the Nurse Driven C. difficile protocol. With the project reaching the final stage of the model (Act), the implementation phase has been refined based on the lessons learned. To sustain the change and ensure adaptation, the educational process must continue to achieve the project goal of at least 80%, along with yearly educational mandates on various platforms. In addition, continuation of chart review of all HA-C. difficile must be conducted to ensure the systematic process of the Nurse Driven C. difficile Protocol/Algorithm is followed. Thereby, reinforcing expectations on appropriate testing for C. difficile, reducing HA-C. difficile, and early detection of CA-C. difficile.

Recommendations for Future Projects and Practice

The result of this DNP project reveals several areas for future research projects and practices. One of the areas of discovered, which also aligns with previous research studies is antibiotic stewardship. During the auditing process of the inpatient charts, 93% of patients that developed diarrhea were on medication that could cause diarrhea (antibiotics), resulting in HA-C. difficile. According to Wanik et al. (2019), most cases of diarrhea are associated with medications, enteral feeding, or underlying critical illness. The unnecessary administration of antibiotics for treatment of C. difficile disrupts the normal flora of the intestine (Block et al., 2018). Antibiotic stewardship is key in reducing inappropriate testing result in decreased HA-C. difficile infection rate. Understanding the antibiotic treatment modalities, including specificity of antibiotic treatment plan for C. difficile/ infection can further advance scientific knowledge.

Diagnostic stewardship is another area of recommendation for future projects and practice. The rates of CDI have risen nationally, partly due to inappropriate testing in patients with a low probability of infection, and the use of the PCR (polymerase chain reaction) assay for the toxin B gene (Block et al., 2018). The result of this DNP project showed 100% of all stools tested met the criteria for HA-C. difficile infection. The PCR is a sensitive diagnostic modality that can detect a small amount of genetic material (Block et al., 2018), however it, cannot distinguish between an active infection or colonization (Block et al., 2018). Thus, leading to the inaccuracy of an infection. The organization could benefit from future studies related to choosing the right diagnostic assay for the right reason at the right time for the right patient (Block et al., 2018), thereby, adding to future scientific knowledge.

Actual DNP Essentials Met

The DNP project reflects the culmination of the attainment of the DNP essentials (Moran et al., 2020, pg. 404). The Actualized DNP Model begins with the importance of the core content of advanced nursing knowledge in DNP education to develop the unique skill set of the practice doctorate (Moran et al., 2020). There are eight DNP Essentials. DNP Essentials 1 through 8 are the foundational outcome competencies deemed essential for all graduates of a DNP program regardless of specialty or functional focus (American Association of Colleges of Nursing [AACN], 2006). Although this DNP project reflects all essentials, the focus will be on the met core essentials. Therefore, this section will elaborate on the DNP essentials of this DNP project.

Essential I: Scientific Underpinnings for Practice

This project evaluated the impact of a Nurse Driven C. difficile Protocol/Algorithm in reducing HA-C. difficile rates, thereby, meeting the essential for scientific underpinning. One of the key objectives of the essential for scientific underpinning is to use science-based theories and concepts to determine the nature and significance of health and health care delivery phenomena and evaluate outcomes (AACN, 2006). This DNP project studied and evaluated the historical findings related to C. difficile, determined the nature and significance of health and healthcare delivery to address the benefits to the patient outcomes. Some of the issues identified was an increased morbidity and mortality, disease-specific complications, increased length of stay, hospital readmission, and colectomies. Through the array of existing scientific knowledge, the evidence-based Nurse-Driven Protocol/Algorithm were developed, integrated, and translated into practice.

Essential ll: Organizational and Systems Leadership for Quality Improvement and Systems Thinking

According to the AACN (2006), Organizational and systems leadership are critical for DNP graduates to improve patient and healthcare outcomes. This DNP project met the essential ll objectives such as the developed Nurse Driven C. difficile Protocol/Algorithm were utilized to evaluate the care delivery approach in reducing HA-C. difficile infections, met the current and future needs of all at-risk hospitalized patient based on scientific findings in nursing and other clinical sciences, as well as organizational, political, and economic sciences (AACN, 2006). In addition, the economic burden of a recurrent/HA-C. difficile and loss of productivity were analyzed, to determine the attributed cost of CDI to the healthcare system.

The DNP project also met advanced communication skills/processes to lead quality improvement and patient safety initiatives in health care systems (AACN, 2006). The project manager utilized system thinking leadership skills during the project proposal to gain buy-in from the organizational leadership- focusing on the organizations' strategic goals and patient safety outcome in conceptualizing the new care model. A structured C. difficile Task Force was also created to include an interdisciplinary approach in the management of HA-C. difficile. Thereby, addressing the accountability objectives in care delivery for the future of the C. difficile at-risk patient population.

Essential lll: Clinical Scholarship and Analytical Methods for EBP

The key activities within this essential of DNP include application of knowledge to solve problems through the translation of research into practice and the dissemination and integration of new knowledge (Anderson et al., 2015). In addition, graduates must also use analytic methods to critically appraise existing literature and other evidence to determine and implement the best evidence for practice (AACN, 2006). In this DNP project, the project manager recognized the rising CDI infection rate within the acute hospital facilities, and the attributed HA-C. difficile

rate. This was evidenced by the C. difficile hospital-associated rates been the highest within this New Jersey level 1 trauma system hospital, with a rate 5.04 per 10,000 patient's days. With the DHHS established a 2020 reduction goal of 30% for hospital-onset CDI from the 2015 national baseline, this DNP project manager began researching methods to be utilized in reducing HA-C. difficile infection rates.

After a thorough search of various methods and evaluation of the organization's current practice, the literature was utilized in creating best practice in decreasing HA-C. difficile. The Nurse Driven C. difficile Protocol/ Algorithm was created and implemented as an evidenced-based guide appropriate testing and specimen collection to decrease HA-C. difficile. The literature supported the immediate need in decreasing HA-C. difficile, with a shown gap in early identification, opportunities for obtaining specimen in a timely fashion (within the first three days it is considered community-acquired), and criteria for stool collection.

The essential objective to use information technology and research methods to appropriately collect suitable and accurate data to generate evidence for nursing practice, were also met. The EMR was utilized in the chart review auditing process of an attributed HA-C. difficile. Pre-and post-implementation data were gathered analyzed and evaluated utilizing informational technology to generate meaningful evidence for the nursing practice. In addition, information technology was utilized to examine patterns of behavior and outcomes pre-and post-implementation of the DNP project, along with identify gaps in evidence for practice pre-implementation.

Conclusion

Although the implementation of the Nurse Driven C. difficile Protocol/Algorithm through staff education resulted in a decrease HA-C. difficile, education remains to be a factor

in the future of the DNP project. Mandatory staff education on all topics or contributing factors related to HA-C. difficile is critical in understanding zero harm in patient safety, and CDI reduction plans. The future recommendation for the project will include a more effective education and dissemination of the Nurse Driven C. difficile Protocol/Algorithm. However, in this DNP project adds value to the practice of nursing. Therefore, with future research studies and new interventions, the continued decrease in HA-C. difficile infection rate remains promising.

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Appendix A

Summary of Primary Research Evidence

Citation- First Author/ Year	Design Method	Sample/ Setting	Intervention	Theoretical Foundation	Outcome Definition	Useful Results Key Findings	JHNEBP
Millard, J. W. et al., (2020)	Retrospective observational study Qualitative Design Interventional	1)Single center 41 bed academic hospital 2)All admitted patients 18 years and older that developed diarrhea within 48hours of admission	Implementation of a mandatory clinical pathway	Decreasing the number of asymptomatic CD carriers misclassified as HO-CDI would reflect a more accurate rate of HO-CDI and would decrease the number of patients inappropriately treated for CDI	To decrease the number of identified asymptomatic C.diff carriers that were misclassified as healthcare facility Clostridium Difficile Infection (HO-CDI)	A significant reduction of the rate of HO-CDI occurred after implementing a mandatory clinical pathway	Level III Evidence A-High Quality
Wanik, J. et al., (2019)	Convenient Sample	Convenient sample of all patients 18 years and older admitted in an ICU within a year. Total of 43 patients	To evaluate the effectiveness of an implementation of a protocol (algorithm of best practices) to decrease constipation, diarrhea, and inappropriate testing of hospital onset of C. difficile, thus improve enteral nutrition	Preventing and treating constipation and diarrhea, and appropriately identifying active C difficile infection, are essential to maintaining patients' overall health and recovery.	Utilizing a bowel protocol to proactively improve enteral volume and decrease inappropriate testing of HO-CDI	By disseminating a C. difficile testing algorithm to nurse and providers, inappropriate C. diff samples reduces by 54%	Level II evidence A-High quality
Schultz, K. et al., (2018)	Retrospective study	A 933 bed Academic Medical Center	Utilizing a multidisciplinary team design to implement evidence-based intervention to prevent patient harm from C. difficile.	Reducing CDI rate by implementing a bundle of infection prevention approaches	Demonstrated that engaging a wide group of stakeholders and implementing a variety of evidence-based interventions was an effective way to significantly lower our HO-CDI.	By forming a multi-disciplinary group to implement and monitor eight key categories of infection prevention interventions, a statistically significant reduction of HO-CDI rate was achieved (42.7)	Level III-evidence A-Good Quality

White, K. A. et al., (2020)	A Retrospective Analysis	Three Hospital Healthcare system 580 staff participated	Implementation of the Targeted Assessment for Prevention (TAP) Strategy in a healthcare system	A quality improvement framework providing a focused approach to infection prevention	The process and outcomes of CDI TAP Strategy implementation in this healthcare system	Result highlights the potential benefit of directing prevention efforts to facilities will more efficiently reduce the CDI rates at the system, group, state, and national levels	Level III of Evidence B- Good Quality
Kavazovic, A. et al., (2020)	Retrospective and Quantitative	Academic Tertiary hospital Total of 3,474 C difficile tests	Implementation of Nurse-driven protocol	A quality improvement framework	To improve the detection of community-onset (CO) infections and implement early isolation to prevent transmission.	Result highlights limitation in the use of PCR testing Ensure front-line nurses receive education regarding appropriate testing. Include a nursing communication process when tests are ordered outside of protocol Eliminate the ability for nurses to order C difficile test after hospital day 3	Level IV of Evidence B- Good quality
Neilsen, C. S. R., et al., (2019)	Qualitative Systematic reviews	Hospital setting One 15-bed surgical transplantation unit, and three 26-bed medical-surgical oncology units	Implementation of best practice to decrease the incidence of C. difficile infection		To determine best practice in the decreasing the incidence of C. difficile.	statistically significant reduction in C. difficile infections. Nursing staff perceived that the education was easy to remember and supported efficient implementation	Level III Evidence A-High Quality
Louh, I. K., et al., (2017)	Qualitative, Systemic Review	Acute Care Setting	Multi-strategy intervention to reduce CDI	QI-Minimum Quality Criteria Set	Prevention of Clostridium Infection	Bundled interventions showed promise	Level III Evidence

		234 hospitals		(QI-MQCS) to assess the quality		for reducing CDI rates	B- Good quality
Wang, E. W. et al., (2021)	Quasi-experimental Interventinal	5- Healthcare hospitals	Impact of a new bundle on the rate of hospital-acquired CD		To understand the impact of the intervention on hospital-acquired CDIs.	Implementation of the new bundle, the rate of hospital-acquired CDI dropped significantly Hospital-acquired C. difficile SIR, our primary outcome, decreased from 1.02 to 0.43 ($P < 0.0001$).	Level II Evidence A-High quality
Quan, K. A., et. al., (2018)	Pre/ Post Intervention Cohort Study	417- bed academic hospital	Reducing Clostridium difficile infection rate by using a real-time automated clinical criterion to verify the appropriateness of testing.		Utilizing an electronic solution to enforce clinically appropriate CDI testing	Significant reduction in CDI testing in the hospital-onset (HO) period decreased 56% post intervention, from 155 to 84 tests/10,000 patient days ($p<0.001$).	Level IV Evidence A -High quality
Meseeha, M. et al., (2018)	Retrospective	Community Hospital setting	Implementation of Clostridium difficile Algorithm for Reduction of Inappropriate Testing in a Community Hospital	Systems Engineering Initiative for Patient Safety (SEIPS) model	The reduction in collection of orders pending for 24 hours or more	Significantly decreases stool ordering (P value of 0.002)- the interventions of implementing the collection algorithm led to more appropriate ordering	Level IV Evidence A-High quality
Hou, C. et al., (2018)	Quasi-experimental Interventional	87 patients tested	Implementation of a nursing driven algorithm for C. difficile Timeout (CDT)		The primary objective was to assess the positive and negative predictive values (PPV and NPV) associated with CDT	With CDT utilization, there was a decline in total number of C. difficile tests ordered. Resulting in overall decline in HO-CDI/10,000PD after	Level IV A High Quality

						implementation of this algorithm.	
LaRose et al., (2018)	Interventional	Tertiary Hospital	Implementation of a nurse-driven algorithm to		Reducing Inappropriate Clostridium Difficile Testing by Empowering Nurses	After the intervention was established, the rate decreased to 4.6 HO-CDI per 10,000 patient days. This represents a statistically significant decrease in HO-CDI (P = 0.037)	Level IV A High quality

Note. Theoretical framework not filled because data is unavailable.

Appendix B

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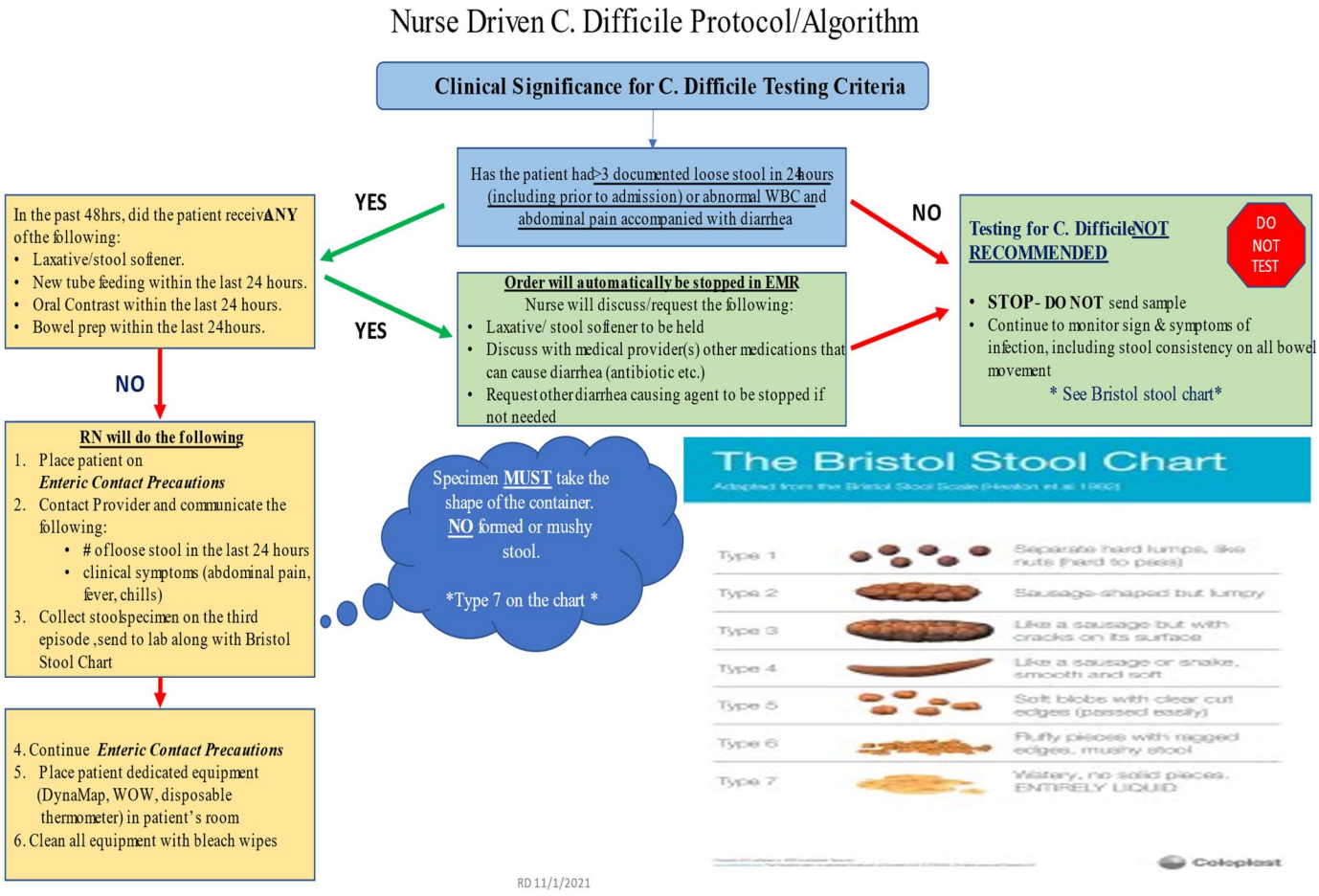
Institution name	Robert Wood Johnson University Hospital
Expected presentation date	Nov 2021
Portions	The Plan Do Study Act model of improvement figure

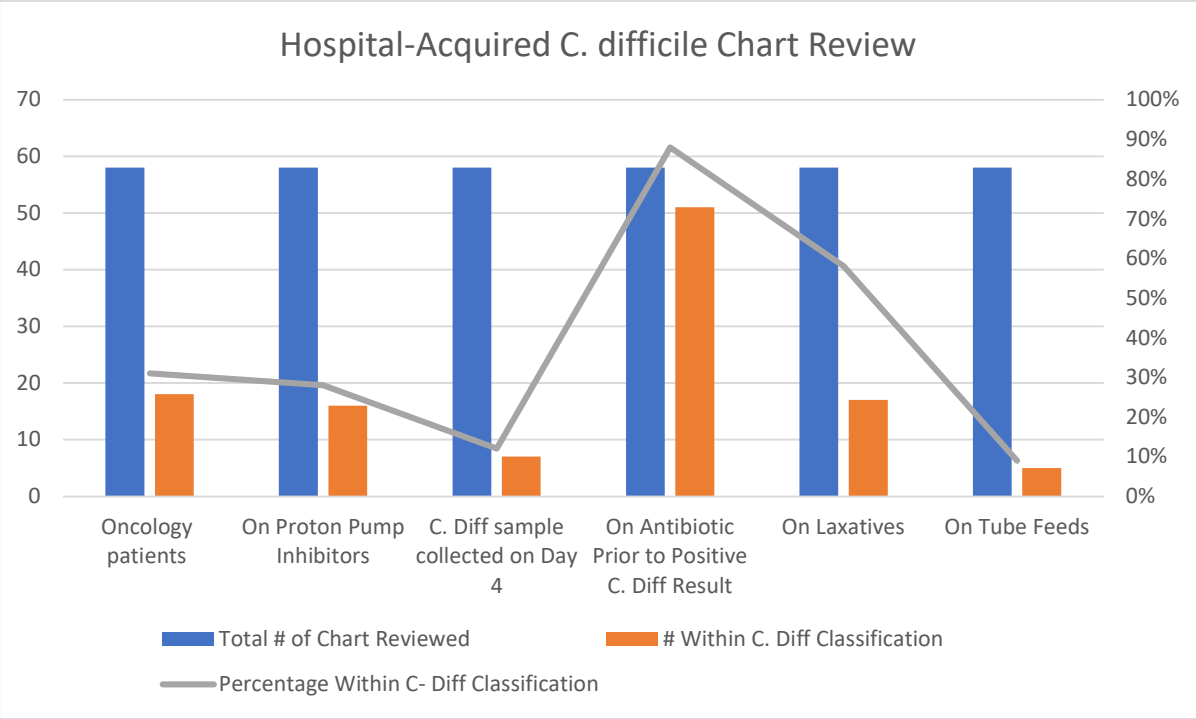
Appendix C

Nurse Driven C. difficile Protocol/ Algorithm



Appendix D

Chart Audit (Gap Analysis)



Appendix E

C. difficile Chart Audit Review Tool

C. difficile Case #: **Room #:** **Admission Date:** **Event Date**:

Questions	**YES**	**NO**
Does the patient have risk factors for C. difficile infection?		
(a) Recent hospitalization		
(b)Recent antibiotic therapy		
(c)Recent intraabdominal surgery		
(d)Age > 60		
(e)Proton Pump Inhibitors (PPI)		
Did patient develop loose stool within the first 3 days of admission, or loose stool prior to admission		
Was the stool sample sent within the first 3 days of admission		
Meets definition of community-acquire C. difficile (a lab tested positive stool sample within 3 days of admission)		
Did the patient meet criteria for appropriate stool testing? >3 documented episode of loose stool Unless abnormal WBC and abdominal pain and accompanied with diarrhea		
(a) Did the patient receive Laxative or stool softener in the last 24 hours		
(b) Was the patient on new tube feeding in the last 24 hours		
(c) Did the patient receive oral contrast in the last 24 hours		
(d) Did the patient receive bowel prep in the last 24 hours		
Was the patient on any medications that can cause diarrhea? Example Antibiotic therapy		
Appropriate stool specimen sent to the lab (taking the form of the container, not form or mushy)		
Was the Bristol chart sent to the lab along with the stool specimen		
Is this a hospital-acquire C. difficile (a lab tested positive stool sample after the 3 days of admission)		

Appendix F

2021 NHSN Gastrointestinal System Infection (GI) Checklist

Documentation Review Checklist		
GI - GASTROINTESTINAL SYSTEM INFECTION		
CDI-*Clostridioides difficile* Infection		
Element	**Element Met**	**Date**
Clostridioides difficile infection must meet at least ***one*** of the following criteria:		
1. Positive test for toxin-producing *C. difficile* on an unformed stool specimen (conforms to the shape of the container).	☐	
2. Patient has evidence of pseudomembranous colitis on gross anatomic (includes endoscopic exams) or histopathologic exam.	☐	
Comments: • When using a multi-testing methodology for CD identification, the result of the final test performed, which is placed onto the patient medical record, will determine if GI-CDI criterion 1 is met. • The date of event for CDI criterion 1 will always be the specimen collection date of the unformed stool, specifically, not the date of onset of unformed stool. A positive test for toxin-producing *C. difficile* and an unformed stool specimen is a single element, and both are required to meet the criterion.		
Reporting Instructions: • Report the CDI and the GE or GIT if additional enteric organism(s) are identified and criteria are met for GE or GIT. • Report each new GI-CDI according to the Repeat Infection Timeframe (RIT) rule for HAIs (see NHSN HAI definitions in Chapter 2 for further details and guidance). • CDI laboratory-identified event (LabID Event) categorizations (for example, recurrent CDI assay, incident CDI assay, healthcare facility-onset, community-onset, community-onset healthcare facility-associated) do **not** apply to HAIs, including *C. difficile* associated gastrointestinal infections (GI-CDI).		

Note. Copyright from *National Healthcare Safety Network (NHSN),* by the Center for Disease Control and Prevention, 2020 (https://www.cdc.gov/nhsn/hai-checklists/index.html). In a public domain

Appendix G

Budget and Return on Investment

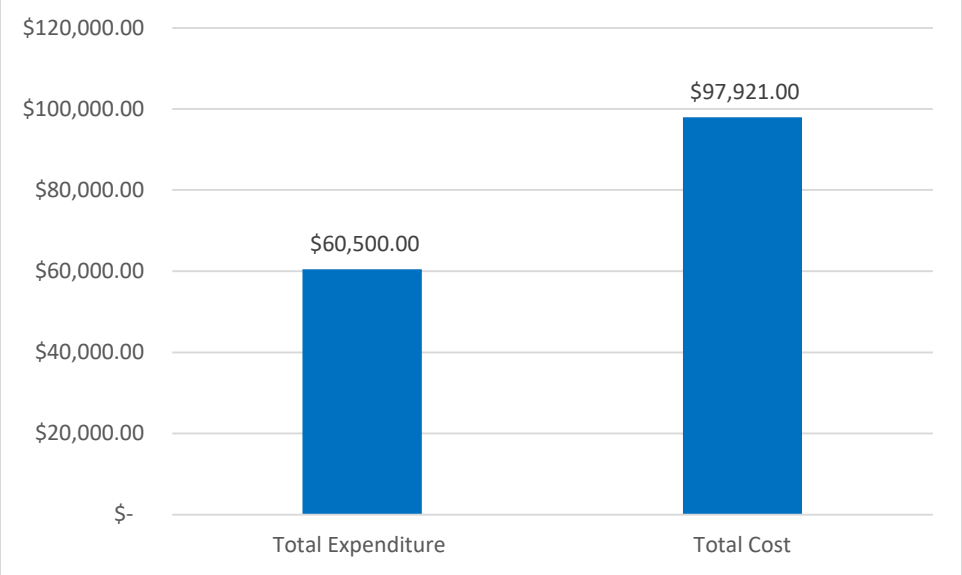
Expenditure	
Front-line Nurses & Clinical Care T	$48,000
Nurse Leader	$12,000
Other	$500
Total Expenditure	$60,500
Cost Savings	
Avg cost per case of hospital-acquired C. difficile	$34, 157
Avg. case management	$42, 316
Avg. attributable cost per case	$21, 448
Total Savings	$97,921

Return on Investment (ROI)

Total Cost Savings – Total Expenditures Total Expenditures

$97,921- $60,500 = 61.8% ROI
$60,500

Nurse Driven C. difficile Budget



Appendix H

SWOT Analysis

STRENGTHS	WEAKNESSES
Organization's Senior Leadership support Improved patient safety outcomes Budgetary Factors Nurse empowerment leads to Job satisfaction.	Lack opportunity for pilot- study
OPPORTUNITIES	**THREAT**
Improve patient satisfaction and patient outcomes, thereby, increase the hospital admission rate.	Financial implications related to potential CMS reimbursement penalties

Appendix I

Project Timeline

Week/Date	Event/Activity
Week 1 September 28- October 4, 2021	• Develop question to be answered for the DNP project • Create PICOT question • Gather organization's C. difficile data • Discussed DNP project idea with Organization Senior Leadership
Week 2 October 4- 11, 2021	• Integration of C. difficile literature review • Pre- protocol data gathering • Assessed organization's C. difficile prevention strategies (Gap analysis)
Week 3 October 11- 18, 2021	• Developed Problem Statement • Met with Department of Infection Prevention • Discussion on initiation of the C. difficile Taskforce
Week 4 October 18-25, 2021	• Create Chart Audit/ RCA tool • Accessed 2021 NHSN Gastrointestinal System Infection (GI) Checklist • Chart audit initiated for pre-implementation data collection • Attend C. difficile RCA for pre-data pre-implementation data collection
Week 5 October 25- November 1, 2021	• Nurse Driven C. difficile Protocol/Algorithm draft
Week 6 November 1- 9, 2021	• Nurse Driven C. difficile Protocol/Algorithm version 1 review by C. difficile Taskforce, Infection Prevention Team and DNP student preceptor.
Week 7 November 9- 16, 2021	• Nurse Driven C. difficile Protocol/Algorithm presented for approval at Nurse Executive Committee (NEC) and Chief Nursing Officer (CNO) • Attend C. difficile RCA
Week 8 November 16- 22	• Nurse Driven C. difficile Protocol/Algorithm presented for approval at Nurse Executive Committee (NEC) and Chief Nursing Officer (CNO)
November 22- December 21, 2021	• Nurse Driven C. difficile Protocol/Algorithm approval throughout the Organization • Become a member of the organization's Evidence-based Practice Committee
December 21, 2021- January 18, 2022	• Nurse Driven C. difficile Protocol/Algorithm presented at various hospital-wide committee (Shared Governance, Hospital Operation Committee, Medical Executive Committee)

	• DNP IRB Approval (Aspen University and Immersion site)
January 23, 2022- February 27, 2022	• Nurse Driven C. difficile Protocol/Algorithm placed in organization's education platform (HealthStream) • Health Stream education mandatory • Education and dissemination of information throughout the organization (CAPE Education, Unit-based daily huddles
February 27, 2022	• Go live on Nurse Driven C. difficile Protocol/Algorithm and DNP project intervention implementation
February 27, 2022- May 29, 2022	• Post- Implementation information gathering (study phase) • Post-implementation C. difficile data
May 29, 2022- August 1, 2022	• Data Analysis (IBM SPSS) • Report of finding

Appendix J

CITI Training

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Rosemarie Daley (ID: 10740791)
- **Institution Affiliation:** Aspen University (ID: 3218)
- **Institution Email:** rosemarie.daley@gmail.com
- **Institution Unit:** Nursing
- **Phone:** 9176649184

- **Curriculum Group:** Social Behavioral Educational Researchers
- **Course Learner Group:** Same as Curriculum Group
- **Stage:** Stage 1 - Basic Course
- **Description:** Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in Social/Behavioral Research with human subjects.

- **Record ID:** 46271350
- **Completion Date:** 20-Dec-2021
- **Expiration Date:** 19-Dec-2024
- **Minimum Passing:** 80
- **Reported Score*:** 88

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Belmont Report and Its Principles (ID: 1127)	05-Dec-2021	3/3 (100%)
International Studies (ID: 971)	07-Dec-2021	3/3 (100%)
Cultural Competence in Research (ID: 15166)	08-Dec-2021	4/5 (80%)
Students in Research (ID: 1321)	09-Dec-2021	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	09-Dec-2021	4/5 (80%)
Assessing Risk - SBE (ID: 503)	09-Dec-2021	4/5 (80%)
History and Ethical Principles - SBE (ID: 490)	12-Dec-2021	4/5 (80%)
The Federal Regulations - SBE (ID: 502)	14-Dec-2021	4/5 (80%)
Informed Consent - SBE (ID: 504)	14-Dec-2021	5/5 (100%)
Internet-Based Research - SBE (ID: 510)	15-Dec-2021	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	15-Dec-2021	4/5 (80%)
Research with Prisoners - SBE (ID: 506)	15-Dec-2021	5/5 (100%)
Research with Children - SBE (ID: 507)	18-Dec-2021	4/5 (80%)
Research in Public Elementary and Secondary Schools - SBE (ID: 508)	19-Dec-2021	5/5 (100%)
International Research - SBE (ID: 509)	19-Dec-2021	4/5 (80%)
Vulnerable Subjects - Research Involving Workers/Employees (ID: 483)	19-Dec-2021	4/4 (100%)
Hot Topics (ID: 487)	19-Dec-2021	No Quiz
Conflicts of Interest in Human Subjects Research (ID: 17464)	19-Dec-2021	5/5 (100%)
Unanticipated Problems and Reporting Requirements in Social and Behavioral Research (ID: 14928)	20-Dec-2021	3/5 (60%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k80981964-79e4-44ce-98d6-ccb5f78c0f32-46271350

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Rosemarie Daley (ID: 10740791)
- **Institution Affiliation:** Aspen University (ID: 3218)
- **Institution Email:** rosemarie.daley@gmail.com
- **Institution Unit:** Nursing
- **Phone:** 9176649184

- **Curriculum Group:** Social Behavioral Educational Researchers
- **Course Learner Group:** Same as Curriculum Group
- **Stage:** Stage 1 - Basic Course
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- **Record ID:** 46271350
- **Report Date:** 20-Dec-2021
- **Current Score**:** 88

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1321)	09-Dec-2021	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	09-Dec-2021	4/5 (80%)
The Federal Regulations - SBE (ID: 502)	14-Dec-2021	4/5 (80%)
Belmont Report and Its Principles (ID: 1127)	05-Dec-2021	3/3 (100%)
Assessing Risk - SBE (ID: 503)	09-Dec-2021	4/5 (80%)
Informed Consent - SBE (ID: 504)	14-Dec-2021	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	15-Dec-2021	4/5 (80%)
Research with Prisoners - SBE (ID: 506)	15-Dec-2021	5/5 (100%)
Research with Children - SBE (ID: 507)	18-Dec-2021	4/5 (80%)
Research in Public Elementary and Secondary Schools - SBE (ID: 508)	19-Dec-2021	5/5 (100%)
International Research - SBE (ID: 509)	19-Dec-2021	4/5 (80%)
Internet-Based Research - SBE (ID: 510)	15-Dec-2021	5/5 (100%)
Unanticipated Problems and Reporting Requirements in Social and Behavioral Research (ID: 14928)	20-Dec-2021	3/5 (60%)
History and Ethical Principles - SBE (ID: 490)	12-Dec-2021	4/5 (80%)
Hot Topics (ID: 487)	19-Dec-2021	No Quiz
International Studies (ID: 971)	07-Dec-2021	3/3 (100%)
Vulnerable Subjects - Research Involving Workers/Employees (ID: 483)	19-Dec-2021	4/4 (100%)
Conflicts of Interest in Human Subjects Research (ID: 17464)	19-Dec-2021	5/5 (100%)
Cultural Competence in Research (ID: 15166)	08-Dec-2021	4/5 (80%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Rosemarie Daley (ID: 10740791)
- **Institution Affiliation:** Aspen University (ID: 3218)
- **Institution Email:** rosemarie.daley@gmail.com
- **Institution Unit:** Nursing
- **Phone:** 9176649184

- **Curriculum Group:** Responsible Conduct of Research (RCR)
- **Course Learner Group:** Social, Behavioral, and Education Sciences (RCR)
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 46271351
- **Completion Date:** 24-Dec-2021
- **Expiration Date:** 23-Dec-2024
- **Minimum Passing:** 80
- **Reported Score*:** 94

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Authorship (RCR-Basic) (ID: 16597)	20-Dec-2021	5/5 (100%)
Collaborative Research (RCR-Basic) (ID: 16598)	20-Dec-2021	4/5 (80%)
Conflicts of Interest (RCR-Basic) (ID: 16599)	20-Dec-2021	5/5 (100%)
Data Management (RCR-Basic) (ID: 16600)	22-Dec-2021	5/5 (100%)
Mentoring (RCR-Basic) (ID: 16602)	22-Dec-2021	4/5 (80%)
Peer Review (RCR-Basic) (ID: 16603)	23-Dec-2021	5/5 (100%)
Research Misconduct (RCR-Basic) (ID: 16604)	23-Dec-2021	5/5 (100%)
Plagiarism (RCR-Basic) (ID: 15156)	23-Dec-2021	4/5 (80%)
Research, Ethics, and Society (ID: 15198)	24-Dec-2021	5/5 (100%)
Research Involving Human Subjects (RCR-Basic) (ID: 13566)	24-Dec-2021	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Rosemarie Daley (ID: 10740791)
- **Institution Affiliation:** Aspen University (ID: 3218)
- **Institution Email:** rosemarie.daley@gmail.com
- **Institution Unit:** Nursing
- **Phone:** 9176649184

- **Curriculum Group:** Responsible Conduct of Research (RCR)
- **Course Learner Group:** Social, Behavioral, and Education Sciences (RCR)
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 46271351
- **Report Date:** 24-Dec-2021
- **Current Score**:** 94

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Research Involving Human Subjects (RCR-Basic) (ID: 13566)	24-Dec-2021	5/5 (100%)
Plagiarism (RCR-Basic) (ID: 15156)	23-Dec-2021	4/5 (80%)
Research, Ethics, and Society (ID: 15198)	24-Dec-2021	5/5 (100%)
Authorship (RCR-Basic) (ID: 16597)	20-Dec-2021	5/5 (100%)
Collaborative Research (RCR-Basic) (ID: 16598)	20-Dec-2021	4/5 (80%)
Conflicts of Interest (RCR-Basic) (ID: 16599)	20-Dec-2021	5/5 (100%)
Data Management (RCR-Basic) (ID: 16600)	22-Dec-2021	5/5 (100%)
Mentoring (RCR-Basic) (ID: 16602)	22-Dec-2021	4/5 (80%)
Peer Review (RCR-Basic) (ID: 16603)	23-Dec-2021	5/5 (100%)
Research Misconduct (RCR-Basic) (ID: 16604)	23-Dec-2021	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k419987f4-1b4c-42fb-9f77-80845538ab3d-46271351

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Appendix K

Project Site Authorization

Robert Wood Johnson University Hospital | RWJBarnabas HEALTH

January 25, 2022

Re: Letter of Authorization from Robert Wood Johnson University Hospital

Dear Aspen University:

This letter confirms that I, as an authorized representative of Robert Wood Johnson University Hospital, allow the DNP student access to conduct project related activities at the listed site, which may commence when the DNP student provides evidence of IRB approval for the proposed project.

DNP Project Site: Robert Wood Johnson University Hospital, One Robert Wood Johnson Place, New Brunswick, NJ 08903

Project Purpose: The purpose of the scholarly project is to determine if a Nurse Driven C. difficile Protocol/ Algorithm improves the early identification of community-acquired C. difficile (CA-C. difficile), thereby decreasing hospital-acquired C. difficile (HA-C. difficile).

Project Activities: The activities include developing the Nurse Driven C. difficile Protocol/Algorithm, and conducting chart audit on all in-patient HA-C. difficile pre- and post-implementation. Once approval is granted from the C. difficile Task Force and the hospital Nurse Executive committee, mandatory education will be performed via the hospital-based Health Stream learning management system, Clinical Assistance and Professional Education (CAPE) program, and in-person education at the In-patient Unit level. Post- implementation feedback regarding the tool, barriers to its use, and ideas regarding the change will be conducted.

Participant Enrollment: The sample size target is all 2021 hospital-acquired C. difficile patient charts (58) pre-implementation.

Site Support: Claudia Pagani, MSN, RN, NPD-BC, PI

Mary Beth Russell, PhD, MA, RN, NPD-BC, NEA-BC, Co-PI

Data Management: The data management plan includes a comprehensive step-by-step approach in ensuring all patient information retrieved during the data collection process is protected under HIPAA. All data collected for review will be stored on the facility-based computerized system in an H-drive, after

Anticipated End Date: The anticipated end date is August 2021

We understand that this site's participation will only take place during the project's active IRB approval period. All project related activities must cease if IRB approval expires or is suspended. I understand that any activities involving Personal Private Information or Protected Health Information may require compliance with HIPAA Laws and Aspen University Policy. Our organization agrees to the terms and conditions stated above. If we have any concerns related to this project, we will contact the DNP student. For concerns regarding IRB policy or human subject welfare, we may also contact the Aspen University IRB.

Regards,

Courtney B.

Signature of Practice Site Authorized Representative

SVP/CNO

Job Title

Courtney B. Nose

Full Name/ Print

1/28/22

Date

Appendix L

Approval of DNP Proposal

Appendix A: Approval of the DNP Proposal

Doctoral Student: Rosemarie Daley

The DNP Project Team of the above-named Doctoral Student has met and reviewed the DNP Proposal entitled:

Title: Utilizing a Nurse Driven C. Difficile Protocol/Algorithm to Project in Reducing Hospital Acquired Clostridium Difficile

The DNP Project Team has determined that the proposed DNP is likely to:

1. Make a significant contribution to the field of knowledge;
2. Demonstrate the student's ability to perform independent research;
3. Contain material worthy of publication in a form appropriate to the discipline.

We recommend acceptance of this proposal. It contains all appropriate content and forms.

DNP Project Team Member's Signatures:

Faculty Mentor: Robin Kruse (Printed Name)

Faculty Reviewer: DocuSigned by: LeAnne S Provost D4D70A915284B5... (Printed Name) 2/10/2022

Independent Reviewer: Theresa Kruse, MSN / Dr. Theresa Kruse, AP-BC (Printed Name)

Program Director Signature:

Tracy Lookingbill DNP, MSN, RN
Printed Name of Program Director or Program Representative)

02/24/2024
Date

Completed form should be submitted to ProjectConcert after all signatures are attained. Directions can be found in the DNP Handbook under "Instructions Uploading Documents to ProjectConcert."
***The Program Representative will be the Assistant Dean or Dean in the case that the Program Director is serving on the DNP Project Team.**

Appendix M

Aspen IRB Approval

IRB Review Form: DNP

IRB Case Number: 1RD3-3F4
Name of Candidate: Rosemarie Daley
Title: Utilizing a Nurse Driven Protocol in the Reduction of Hospital Acquired Clostridium Difficile
Approval Expires on: 3/3/23
Application Type:

_X_Exempt Review
__ Expedited Review
__Full Review

Application Status:

_X_ Approved
___ Not Approved
___Approved with Amendment

The student/researcher understands and agrees to maintain the confidentiality of any entity agreeing to assist with providing data; to obtain informed consent from any human participants in the study; and to retain and safeguard written consents and the data for a period of five years from all entities, presenting copies to Aspen University, to the participants, and to authoritative bodies when appropriate.

DATE 3/3/22

Heather Frederick, IRB Chair

All questions or concerns should be directed to IRB@aspen.edu. This includes immediately reporting any unexpected adverse events or alterations in risk levels for participants within 48 hours of occurrence of such events.

Aspen University
1660 South Albion Street, Suite 225
Denver, CO 80222