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Strategies Healthcare Managers Use to Reduce Hospital-Acquired Infections

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This is to certify that the doctoral study by

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

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MBA, Walden University, 2007

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Doctoral Study Submitted in Partial Fulfillment

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Abstract

Every year, 2 million patients in the United States suffer with at least 1 hospital-acquired infection resulting in an estimated 99,000 deaths annually. The purpose of this exploratory single case study was to explore strategies healthcare managers in U.S. hospitals used to reduce hospital-acquired infections. The study included face-to-face, semistructured interviews with 5 healthcare managers from a hospital in Maryland who were successful in reducing these infections. The conceptual framework was human capital theory. Field notes, hospital documents, and transcribed interviews were analyzed to identify themes regarding strategies used by healthcare managers. The data analysis and coding process resulted in 5 major themes: use of HAI-related data; implementation of detailed cleaning method; implementation of define, measure, analyze, implement, and control; education and training of staff; and implementation of the Antimicrobial Stewardship Program. The findings from this study might benefit healthcare managers in implementing and sustaining successful strategies to reduce hospital-acquired infections. The implications for positive social change included reducing hospital-acquired infections, thereby leading to fewer hospitalization days for patients and a faster recovery time to return to normal life. Reducing hospital-acquired infections might reduce patient deaths related to the infections.

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Dedication

Primarily, I dedicate this study to our wonderful son, Kudus Yohannes; our wonderful daughter, Emnet Yohannes; and my dear wife, Nardos Teclemicael, who walked beside me each day through this journey. I would not have completed this journey without your love and understanding. I hope to have encouraged our children to pursue their dreams as I have, and I know whatever they want to achieve is within reach so long as they make a commitment and have the resilience to see it through to the end. My wife and I will do whatever it takes for our children to be capable, extraordinary, and strong individuals with far more to accomplish. I am hoping that my studies have helped to give our family a legacy of learning, enduring, and achieving.

I also dedicate this study to my dearest brother and wonderful friend, Yakob Habtesion, whom we lost last year at age 45. I wish you were here to share this moment with me. I aspire to live your values—a life of giving, life of simplicity, and life full of love.

Last but not least, I dedicate this doctoral study to my parents Debesai Habtezion and Fkadu Brhane. Being from Eritrea and going through the longest war in the world, they never had an opportunity to enjoy peace or receive an education. However, they still raised their kids with the skills of humility, integrity, and resilience, which gave me the ability to be a positive example for my children and our community.

Acknowledgements

First, I would like to thank God for humbling me through this process of achieving a doctoral degree with distinction and becoming a member of an international honor society, Delta Mu Delta. I also thank my doctoral study committee members: Dr. Edward Paluch, Dr. Charles Needham, and Dr. Ronald Jones. Thank you for your knowledge and unwavering support during this long study process, and the countless hours you spent reviewing and providing feedback on my study. Your collective input ensured that my study was of great quality and truly helped me become a better scholar.

I cannot mention names of the study participants to protect the confidentially of my data site. However, I would like to acknowledge the healthcare managers and directors with whom I had the privilege to conduct the interviews. The insights and expertise of these study participants were invaluable for my study.

Dr. Thomas Wong, your continued support, reassurance, and review of my study sections with your extensive expertise, especially in the Antimicrobial Stewardship Program section, deserve special thanks. Dr. Reginald Taylor, your input in shaping my prospectus was invaluable. I also extend special thanks to Dr. Desale Yacob, Dr. Timothy Bailey, Dr. Patrice Marcarelli, Mr. Habtezion Tecle, and Dr. Nancy Lee for your advice and continuous reassurance to see me through this study. Even though I cannot mention all, I sincerely acknowledge everyone who supported me and provided me with guidance and advice while I completed this study. Without the collective help of these special friends and faculty, this journey would have been far more difficult.

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Section 1: Foundation of the Study

Hospital-acquired infections (HAIs) are not present or incubating at the time of admission of the patients and derive from an adverse event (Dasgupta, Das, Chawan, & Hazra, 2015). U.S. hospital staff report 1.7 million HAIs yearly (Arefian, Vogel, Kwetkat, & Hartmann, 2016; Pyrek, 2014). The estimation of annual deaths because of HAIs is 75,000 patients (Pyrek, 2014), 98,000 patients (Cimiotti, Aiken, Sloane, & Wu, 2012), and 99,000 patients (Hessels & Larson, 2016). Marchetti and Rossiter (2013) estimated the total cost of HAIs to U.S. hospitals is $96 to $147 billion annually. Additionally, Pyrek (2014) found that HAIs were the most common complications, but effective prevention practices could lead to a 70% reduction in certain HAIs. HAIs are expensive to patients and hospitals, and these high costs are valid incentives for healthcare managers to invest in the necessary systems for reducing these infections (Zimlichman et al., 2013).

Background of the Problem

Healthcare facilities in the United States have 4% of inpatients infected with HAIs (Kuehn, 2014). Arefian et al. (2016) stated that the most common and costly HAIs include catheter-associated bloodstream infections (CABSI), ventilator-associated pneumonia (VAP), surgical site infections (SSI), and urinary tract infections (UTI). SSIs account for 290,000 cases of HAIs and 8,000 deaths annually in the United States (Tsai & Caterson, 2014). Anderson et al. (2014) found that SSI, costing $3.5 billion to $10 billion annually, accounted for 20% of all HAIs in hospitalized patients. Anderson et al.

used evidence-based guidelines to estimate that 60% of SSIs were preventable, and Kuehn (2014) estimated that one third of HAIs were preventable.

Morillo-García et al. (2015) expressed that the prevention of HAIs could contribute to economic efficiency of hospitals. Comprehensive infection prevention strategies, such as reprocessing reusable medical equipment (RME) appropriately, using proper sterilization techniques, practicing hand hygiene, completing education and training, isolating infectious. patients, and improving communication with patients, can optimize the fight against HAIs (McLaws, 2015). Therefore, applying the appropriate preventative strategies can avert HAI associated costs.

Problem Statement

Every year, 2 million U.S. patients suffer with at least one HAI, and these infections cause an estimated 99,000 deaths annually (Hessels & Larson, 2016). HAIs significantly increase health care cost, with an estimated $10 billion annual direct cost to U.S. hospitals (McCalla, Reilly, Thomas, & McSpedon-Rai, 2017). The general business problem was that HAIs negatively affect the profitability of healthcare facilities. The specific business problem was that some healthcare managers in U.S. hospitals lack strategies to reduce HAIs.

Purpose Statement

The purpose of this exploratory qualitative single case study was to explore strategies that healthcare managers in U.S. hospitals use to reduce HAIs. The target population comprised healthcare managers from a hospital in the state of Maryland who have been successful in reducing HAIs. The implications for positive social change

included reducing HAIs to have fewer hospitalization days for patients with a faster recovery time to return to normal life. Reduced HAIs also have the potential of reducing patient deaths related to HAIs.

Nature of the Study

A qualitative approach was more appropriate for this research study compared to either quantitative or mixed methods because the study involves identifying the lived experiences of participants. Crocker et al. (2014) indicated that researchers used a qualitative case study methodology to explore real-life behaviors to garner opinions and experiences from the research participants' viewpoints. Using a quantitative research method involves collecting numerical data to test hypotheses (Hoare & Hoe, 2013). In a mixed-method approach, researchers use statistical and qualitative data to understand phenomena (Yin, 2014). Quantitative and mixed-method approaches were not appropriate because this study did not involve a collection of numerical data to test hypothesis.

The exploratory case study approach was appropriate for this research study because the intent was to support a rational understanding of strategies to reduce HAIs from the research participants' experiences. An ethnographic approach was not appropriate because of its focus on cultural norms. In a qualitative phenomenological study, researchers focus on the meanings of lived experience of participants with no regard for time and boundaries (Bevan, 2014). Hence, a phenomenological design was not desirable for this study. Using a case study design to explore healthcare managers' lived experiences led to a greater understanding of effective strategies for reducing HAIs.

Research Question

What strategies do healthcare managers in U.S. hospitals use to reduce HAIs?

Interview Questions

Interview questions for addressing the targeted research question are:

1. What strategies do you use to reduce HAIs?
2. Which of those strategies are working well in the reduction of HAIs and why?
3. Which strategies worked best, based upon your experiences and data, and why?
4. How do you achieve improvements in the strategies for reducing HAIs?
5. How have you implemented strategies for reducing HAIs?
6. What feedback are you experiencing from staff to improve the strategies?
7. How do you incorporate feedback into strategies for reducing HAIs?
8. Please share information that I did not ask about your successful strategies that you implemented that reduced HAIs in the hospital.

Conceptual Framework

The conceptual framework for this research study was human capital theory (HTC). Schultz (1961) first introduced the HCT with a premise that education empowered employees with useful knowledge and skills. Investment in human capital, through training and education of human beings, results in enhanced performance (Hayek, Thomas, Novicevic, & Montalvo, 2016). All aspects of infection control, reprocessing of reusable medical equipment, sterilization techniques, hand washing, and other techniques of reducing HAIs involve education and training of staff. Bornay-

Barrachina, López-Cabrales, and Valle-Cabrera (2017) found that managers improved efficiency of strategies and enhanced organizational performance through investment in human capital. Therefore, healthcare managers can reduce HAIs by applying HCT and investing in human capital. Healthcare managers can attain sustained performance in reducing HAIs by transforming human capital to produce a collective value over time.

Operational Definitions

The following terms, used throughout this doctoral study, may help readers understand the study better.

Healthcare Manager: The use of the word *healthcare manager* in this study refers to a healthcare professional with a manager or director position and with a capacity of managing a department or a group of providers/staff. The *healthcare manager* should have an experience of reducing HAIs by taking part in meetings, implementing strategies, enforcing strategies, providing education to staff, conducting annual competencies, monitoring performance, and providing feedback and resources.

Hospital-acquired Infection (HAI): HAI refers to an infection that is not present or incubating at the time of admission of the patient, which derives from an adverse event (Dasgupta et al., 2015).

Human capital: Human capital refers to the knowledge, skills, and experience of employees that affect organizational performance and profitability (Rukumnuaykit & Pholphirul, 2016).

Human capital theory: Human capital theory is the education and training provided to employees to increase skills and enhance performance (Schultz, 1961).

Nursing shortage: The nursing shortage entails a healthcare facility's struggle to expand capacity to meet patient needs through the supply and demand for nursing workforce nationally (Mee, 2014).

Assumptions, Limitations, and Delimitations

Assumptions

O'Boyle, Rutherford, and Banks (2014) noted that assumptions include basic facts that should exist and that the research problem could not exist without those assumptions. I assumed participants of this study had a thorough knowledge of hospital-acquired infections and responded to open-ended questions honestly. I assumed that an exploratory case study was appropriate for this study, and the open-ended interview questions were detailed enough to garner all possible strategies for reducing HAIs.

Limitations

Limitations were potential weaknesses of a research study that were beyond the researcher's control (Helmich, Boerebach, Arah, & Lingard, 2015). The participants' knowledge concerning hospital-acquired infections and their years of experience in their respective departments had limitations in best strategies to fight HAIs. The study location was in the state of Maryland; therefore, results may not be transferable to other geographic regions. The healthcare managers who took part in this study were from five departments in the hospital, and results have limitations in generalizing to the entire hospital. The study was about the healthcare industry and may not be applied to other industries.

Delimitations

The delimitations of a study were the research boundaries that the researcher used to limit the scope, as based on the framework, population, and methodology (Marshall & Rossman, 2016). The following delimitations defined the boundaries of this study. First, the healthcare managers who participated in this study were the ones who had experiences in reducing HAIs. The study did not include a discussion of other kinds of infections due to delimitation to HAIs only. Delimitation also existed because the study was on one healthcare facility in the state of Maryland and five healthcare managers from five different departments of the facility.

Significance of the Study

Contribution to Business Practice

Findings from this study can equip healthcare managers with strategies that effectively reduce HAIs and help healthcare facilities realize cost savings associated with HAIs. Hessels and Larson (2016) found that reduced HAIs corresponded to less patient mortality, improved reimbursement for the hospitals, and enhanced cost saving for hospitals. Knowledge gained from this study may help healthcare managers realize that health care managers can use strategies to reduce HAIs effectively and realize cost savings from reduced HAIs. The findings of this study may also help medical and nursing schools in developing curricula that place high emphasis on HAIs and means of reducing HAIs. Health care managers can benefit from these doctors and nurses who are knowledgeable about HAIs to develop strategies to reduce HAIs.

Implications for Social Change

Any knowledge gained from this study can help healthcare facilities to develop strategies that effectively reduce HAIs. Moreover, infection control departments might alter techniques to facilitate teaching infection control strategies. Identifying and exploring strategies to reduce HAIs might help create awareness on the effects of the infections on the safety of patients, healthcare workers (HCWs), and visitors. Knowledge gained from this study might have a ripple effect beyond the direct influence. Reduced HAIs leads to less hospitalization days for patients, faster time to return to work or normal life, improved health of communities, increased business productivity due to early return of patients to work, and improved school attendance, if the patient is a student.

A Review of the Professional and Academic Literature

This section of the literature review included an inclusive overview of research studies related to the HAIs. The literature review consisted of scholarly articles from the following sources: CINAHL & MEDLINE Simultaneous Search, CINAHL Plus with Full Text, MEDLINE with Full Text, ProQuest Health & Medical Collection, ProQuest Nursing & Allied Health Source, PsycINFO, PubMed, Business Source Complete, Emerald Insight, Sage Journals, Ovid Nursing Journals Full Text, and Google Scholar. Most of the articles were from peer-reviewed journals and published within the past 5 years. The inclusion of older articles helped to provide historical background of the HAIs.

I searched the databases using a combination of terms, such as *hospital-acquired infections, HAIs, surgical site infections, urinary tract infections, blood stream infections,*

and *ventilator associated pneumonia.* Additional search terms include *economics of HAIs, cost and HAIs, impact of HAIs, hand hygiene, antimicrobial stewardship, environmental cleaning, reusable medical equipment, nurse staffing, human capital theory,* and *corporate social responsibility*. After evaluating over 900 references from past researchers, the total number of references in this study is 171. The total number of references in peer-reviewed journals is 149 (87%). The total number of references published from 2014 to 2018, which is within 5 years from my anticipated doctoral completion date, is 157 (92%).

Human Capital Theory (HCT)

The HCT served as the conceptual framework for this study. Within this framework, organizational leaders recognize employees as a form of capital and that a lack of training for employees may result in organizational failure (Schultz, 1961). Investment in human capital, through education and training of staff, helps firm leaders influence organizational effectiveness and gain competitive advantage (Delery & Roumpi, 2017; Hayek et al., 2016). Healthcare managers use credentialing and privileging as tools to confirm that doctors, nurses, and other clinicians have the correct education. In addition, providing on-the-job training and confirming annual competencies are investments in human capital, which may help improve organizational performance.

Previous researchers used HCT as a framework for their studies. For example, Dillard (2017) used HCT as a framework for a study on healthcare organizations to explore succession-planning strategies used by healthcare leaders. As an organization's human capital, Mehta and Mehta (2017) found that knowledge integration of teams

across organization enhanced team effectiveness and enforced sustainable competitive advantage. Healthcare managers can attain sustained performance in reducing HAIs by transforming human capital to produce a collective value over time. HCT is an appropriate theory to improve performances of healthcare facilities in reducing HAIs.

The Centers for Disease Control and Prevention (CDC) and U.S. Food and Drug Administration (FDA) have long advocated for effective training of staff in infection controls. The CDC, in conjunction with the FDA, issued a health advisory that focused on ensuring adequate training for personnel involved in reprocessing medical devices to prevent HAIs (Duro, 2016). Duro (2016) found that the CDC and FDA recommended that training should occur upon hire and at least once a year after the initial hiring date.

Developing training programs for employees and hiring of vendors trained in HAI prevention are important strategies for reducing HAIs. Wellington (2016) stated training employees and vendors was not only a technique, but also a mandate by the CDC and the Center for Medicare and Medicaid Services (CMS). Hiring vendors with knowledge of infection control can help alleviate HAIs because vendors who are unaware of infection prevention techniques can escalate infection rates.

Effective training of hospital staff and coordination of infection control measures by infection preventionists can improve quality of care and reduce HAIs. Wellington (2016) summarized research findings by the CDC that showed a 70% reduction in HAIs when employees and providers were aware of infections and had adequate training in infection prevention. Creating awareness of the influence of HAIs on patients and staff can help healthcare managers facilitate the process of staff training about the prevention

of HAIs. Investing in human capital is important in a healthcare setting, as in any organization across different industries. HCT plays a role in preventing HAIs, while another important field in HAI prevention is corporate social responsibility (CSR).

Corporate Social Responsibility

Embraced worldwide, CSR is a process of organizing ethically responsible actions of an organization or taking societal responsibilities within the organization to affect a positive influence on society, environment, employees, and other stakeholders (Tai & Chuang, 2014). In the 1970s, the creation of the Environmental Protection Agency, Consumer Product Safety Commission, Occupational Health and Safety Administration, and Equal Employment Opportunity Commission has contributed to the significance of CSR (Carroll, 2015). The ethical scandals of the early 2000s involved Enron and the passage of the Sarbanes-Oxley Act of 2002 (Carroll, 2015). These scandals have revealed the business ethics of CSR and the need to implement CSR into business practices (Carroll, 2015). Current business leaders look beyond making a profit and incorporate CSR into to their business practices (Carroll, 2015). The need for CSR is evident in healthcare's infection prevention efforts because of the impact of HAIs on patients—including death and longer hospitalization days.

The implementation process of CSR may vary according to organizational composition, but CSR has become increasingly important to business practices. Organizations' financial performances and CSR have a positive relationship, as demonstrated by winning new businesses, increasing customer retention, improving customer relationship, improving the relationship with suppliers, attracting a new

workforce, retaining satisfied employees, decreasing operating costs, boasting opportunities for investment and funding, generating a positive public image, and building a competitive advantage (Carroll, 2015). Therefore, applying CSR may help firms to benefit society, minimize the influence on the environment, and increase competitive advantage by raising the firms' bottom-line. Lawler and Conger (2014) found that sustainable business practices emanated from strategic decisions that an organization leader acted on regarding their impact on profit, society, and the environment. Healthcare managers can build a competitive advantage by implementing strategies to reduce HAIs and emphasizing its impact on society.

Motivating employees through CSR is trending as a new way of improving performance (Korschun, Bhattacharya, & Swain, 2014). Failing to implement CSR strategies may result in hurting organizations because stakeholders, employees, society, and scholars hold the organization leaders accountable for their responsibilities toward society (Ofori, Nyuur, & S-Darko, 2014). Therefore, CSR might help organizations to protect society from negative impacts. A hospital with a CSR that incorporates strategies for reducing HAIs can gain the trust of patients, employees, stakeholders, and the community because reduced HAIs could result in fewer patients having HAIs complications. To better understand the effect of a CSR that incorporates strategies for reducing HAIs on all stakeholders, it important to examine the impact and cost of HAIs.

Impact and Cost of HAIs

When a healthcare industry causes HAIs, it causes harm to patients (Lacanna, 2014). Increased mortality, prolonged length of stay, increased use of antibiotics,

prolonged recovery time, and greater risk for readmission help quantify HAI related harm (Marchetti & Rossiter, 2013). Therefore, reducing HAIs deserves a high priority from HCWs and hospital managers.

HAIs are causing approximately 99,000 deaths per year in the United States (Cimiotti et al., 2012; Hessels & Larson, 2016; Lacanna, 2014). Umscheid et al. (2011) documented observations of four major HAIs and found that (a) 30,665 deaths associated with 248,678 bloodstream infections (BSIs), (b) 35,967 deaths associated with 250,205 VAP infections, (c) 13,088 deaths associated with 561,667 urinary tract infections (UTIs), and (d) 8,205 deaths associated with 290,485 SSIs. Attributing deaths to HAIs are difficult, but some scholars have estimated preventable portions of HAIs. Umscheid et al. calculated that a minimum 34% of the infections associated with BSIs were preventable, and a minimum of 10,426 deaths out of the 30,665 (34%) deaths associated with BSIs were preventable. Umscheid et al. found that 28,451 of the total 87,925 (32.4%). HAI related deaths were preventable. Besides causing harm or death to patients, HAIs also increase healthcare cost.

HAIs inflict cost to the patient, hospital, and community (Zimlichman et al., 2013). Marchetti and Rossiter (2013) estimated the direct and indirect costs of HAIs in the United States ranged from $96 to $147 billion a year and the cost per infection ranged between $16,359 and $25,903. Hessels and Larson (2016) noted that approximately 2 million U.S. patients and 3.2 million European patients per year suffered from at least one HAI, inflicting a $9.8 billion a year in direct costs in the United States. Having strategies to reduce HAIs can help healthcare facilities realize cost savings associated

with HAIs. Hessels and Larson found that reduced HAIs corresponded to less patient mortality, improved reimbursement for the hospitals, and enhanced cost saving for hospitals.

Greco et al. (2015) evaluated costs associated with patients who contracted HAIs within 2 months after cardiac surgery. Of the study population of 4,320 cardiac patients that Greco et al. considered, 119 (3%) contracted major HAIs inflicting costs of $38,000 because of services related to intensive care units. Greco et al. found that HAIs contributed to 8.7% of total readmissions and that the cost of readmissions because HAIs were three times more expensive compared to the cost of other readmissions. It is evident from these research studies that HAIs inflict cost to hospitals.

Hospitals lose revenue because of reduced reimbursements for patients with HAIs from Medicare (Lee et al., 2012). Lee et al. (2012) discussed financial penalties of healthcare facilities by CMS by not providing additional payments for HAIs. The Affordable Care Act (ACA) also expands the policy of nonpayment for preventable complications (Lee et al., 2012). The intent of the ACA, as mandated by Congress at the end of 2008, is to remove a willful incentive by which hospitals receive greater reimbursements for care complicated by preventable adverse events—including certain HAIs (Lee et al., 2012). In 2008, the CMS assigned hospital-acquired UTI as one of several reasonably preventable events for which CMS no longer reimburses hospitals (Papageorge & Kennedy, 2016). Furthermore, Cimiotti et al. (2012) noted that insurance companies nationwide have denied payments for HAIs associated costs. This means that hospitals would lose income from beds occupied by HAI infected patients from CMS and

private insurance companies. Reducing HAIs would free beds for new patients who could generate income for the hospitals.

Peasah, McKay, Harman, Al-Amin, and Cook (2013) examined the effect of Medicare nonpayment policy for some hospital-acquired infections by comparing discharge data of before and after implementation of the Medicare nonpayment policy. Peasah et al. found a statistically significant decrease in vascular catheter-associated infections and a statistically insignificant decrease in catheter-associated UTI. Peasah et al. added that concurrent infection control interventions might overestimate the effect of the policy but implied a positive effect of the policy on reduction of HAIs.

Lee et al. (2012) found no statistically significant impact of CMS policy on rates of HAIs because of hospital adaptation of billing codes to counteract the CMS nonpayment policy. Lee et al. also attribute the insignificant relationship to CMS policy mirrored an already existing area of focus on preventing HAIs and the limited incremental effect of adjusting payments. Waters et al. (2015) conducted a study on 1,381 U.S. hospitals participating in the National Database of Nursing Quality Indicators from January 1, 2008 through December 31, 2010. Waters et al. found that Medicare's nonpayment policy was associated with an 11% reduction in CLABSIs and 10% reduction in UTIs. Better hospital processes yielded better outcomes for both conditions. This means that hospitals are strengthening strategies to reduce HAIs to counteract the CMS non-payment policy for HAI related conditions.

Kawai et al. (2015) also examined CLABSIs and UTIs and found that the CMS hospital-acquired conditions policy correlated with immediate reductions in billing rates.

Kahn et al. (2015) evaluated the effect of Hospital Readmissions Reduction Program, the Value-Based Purchasing Program, and the Hospital-Acquired Condition Reduction Program (HACRP) on reducing Medicare reimbursement for inpatient services. Kahn et al. focused their analysis on nonfederal acute care hospitals and found that all three pay-for-performance programs might cost U.S. hospitals up to 6% of base operating payments in 2017. CMS applied the HACRP to reduce Medicare payments by 1% to the bottom quartile of underperforming hospitals related to HAIs and realized a cost saving of $330 million in 2015 (Fuller, Goldfield, Averill, & Hughes, 2016). The 25% of U.S. hospitals with the highest rates of HAIs lost $330 million of possible revenue per year in 2015. The findings from this study might help healthcare managers from these hospitals to invest in prevention strategies for reducing HAIs and realize cost savings associated with HAIs.

Strategies for Reducing HAIs

Applying some proven strategies to prevent HAIs will be important for healthcare managers to realize cost savings related to HAIs. Umscheid et al. (2011) highlighted that 100% preventability of HAIs might not be achievable, but evidence-based infection control strategies could help save tens of thousands of lives and hundreds of thousands of HAI related costs. Papageorge and Kennedy (2016) found that employing sterile catheter insertion techniques, reducing catheter use, or applying as short durations could prevent UTIs. Arefian et al. (2016) acknowledged that several interventions for HAI prevention in recent years showed success in reducing HAIs and with significant cost savings associated with prevention programs for HAIs.

Nelson et al. (2016) studied interventions, such as improved adherence to hand hygiene, improved environmental cleaning, and contact precautions. Nelson et al. concluded that a combination of interventions to prevent infections were costeffective. Additionally, Álvarez-Moreno et al. (2016) studied 2,564 adults and 424 pediatric patients in ICU units. Álvarez-Moreno et al. reported a significant reduction in CLABSI rates from 12.9 CLABSIs per 1,000 before intervention to 3.5 CLABSIs per 1,000 after implementing multidimensional infection control guidelines. The multidimensional approach to infection control is a good strategy for hospitals to reduce HAIs effectively.

Hessels and Larson (2016) found a statistically significant relationship between better patient safety climate and greater adherence to standard precautions. Leaper, Tanner, Kiernan, Assadian, and Edmiston (2015) found that consistent compliance resulted in a reduction of HAIs. However, compliance with infection prevention has been an issue with both checklists and bundle implementation ranging from 20% to 60% in both U.K. and U.S. studies, and surgeons are the main entities for noncompliance (Leaper et al., 2015). Therefore, greater adherence to infection prevention strategies should be given high priority because of its relationship to reduction of HAIs.

Infection preventionists work with hospital department staff to realize cost savings related to HAIs. Hospital departments, such as the surgery department, can generate revenue (Duro, 2016). However, infection prevention departments do not generate money but can help hospitals to save millions of dollars a year through efforts to reduce HAIs (Duro, 2016). Infection preventionists play a role in assessing the adequacy of policies that leaders have placed to address potential processing failures, and

collaboration between infection prevention and hospital department personnel can ensure a thorough and consistent process of infection control (Duro, 2016). The ACA also penalizes healthcare facilities for having high infection rates with a cut in reimbursement revenue (Wellington, 2016).

Korniewicz (2014) discussed that the roles of healthcare providers and infection preventionists (IPs) have evolved to respond better to new federal mandates on HAIs. Korniewicz elaborated that IP practice tasks doubled. IPs tasks included overseeing compliance with hand hygiene, monitoring environmental conditions, providing infection control education, and reporting of data on infections with a need to expand knowledge about data mining, analysis, and interpretation (Korniewicz, 2014). Therefore, building interdisciplinary teams from perioperative clinicians and IPs is imperative for reducing HAIs, improving the quality of care, and ensuring patient safety (Korniewicz, 2014). Perioperative personnel and IPs cooperation to analyze published HAIs data can help design ways of reducing HAIs (Korniewicz, 2014). In general, the strategies for reducing HAIs include adhering to hand hygiene, providing antimicrobial stewardship programs, cleaning the environment, having reusable medical equipment, involving patients as a strategy to reduce HAIs, and applying multidimensional approach. Most importantly and applying Korniewicz (2014) finding that using team approaches to solve infection control problems can boost individual accountability, enhance interaction among team members, and change operating room culture for better outcome.

Hand Hygiene Adherence

Hand hygiene adherence (HHA) is the single most effective method of reducing HAIs (Davis, Parand, Pinto, & Buetow, 2015; Tartari et al., 2017; White et al., 2015). High touch surfaces are risk areas for transmission of HAIs in hospital setting. HCWs use shared equipment with high touch surfaces, such as computers, phones, paper health records, x-ray machines, x-ray gowns, beds, bed linens, masks, blood pressure cuffs, thermometers, and stethoscopes. Patients, HCWs, and visitors face potential infections from these high touch surfaces harboring microorganisms. Tajeddin et al. (2016) found contamination with microorganisms in 34.5% of samples taken from HCWs in intensive care unit (ICU) environments. These microorganisms have a high risk for HAIs.

Bacteria or disease-causing organisms transfer occurs from HCWs to patients, patients to HCWs, patients to patients, visitors to HCWs, HCWs to visitors, visitors to patients, and patients to visitors. With many touch opportunities during patient care, the most common way of transfer occurs by hand. Even though HCWs and visitors can become sick, patients with compromised immune systems are the most vulnerable because of their inability to fight infections effectively.

Researchers have found low HHA rates among HCWs in many different studies. Through a systematic review, Kingston, O'Connell, and Dunne (2016) demonstrated HHA rate of 34% before interventions and 57% of HHA rate after interventions. Researchers have found that a median HHA rate of HCWs was only 40% (Azim, Juergens, & McLaws, 2016; Johnson et al., 2014; J. A. Watson, 2016). Thus, a dichotomy exists where the providers and HCWs who work to save lives have also

contributed to more complications for the patient. Contrary to the national and international guidelines on hand hygiene (HH), such as by the World Health Organization (WHO), the CDC, and the Joint Commission, Mahida (2016) found low rates of HHA. Dai, Milkman, Hofmann, and Staats (2015) reviewed 13,772,022 HH opportunities at 35 different U.S. hospitals and found an overall rate of 38% HHA. These low rates of adherence to HH are good incentives for healthcare managers to enact interventions to raise HHA rates and reduce HAIs.

HCWs interact with patients many times throughout their hospital stays. Therefore, the ability to correlate a specific HCW to a patient's HAI is challenging. This challenge results in difficulty to enact any punitive actions to a specific individual HCW (Cusini et al., 2015; Graf et al., 2013; Kapil, Bhavsar, & Madan, 2015). However, identifying the possible reasons for low adherence and designing ways to improve adherence may help reduce HAIs. Possible reasons for nonadherence include a heavy workload, laziness, glove use, attitude, lack of time, and disregard of its general preventive abilities (Cusini et al., 2015; Graf et al., 2013; Kapil et al., 2015).

HH is one of the main strategies used to reduce HAIs. Graves et al. (2016) studied the cost-effectiveness of a national HH initiative implemented between 2009 and 2012 versus hospital-acquired staphylococcus aureus infections. The researchers evaluated 1,294,656 admissions from 50 largest Australian hospitals. Graves et al. found that the national hand hygiene initiative was cost-effective and led to fewer infections.

Semmelweis introduced the use of antiseptic chlorine solution for hand wash in a healthcare setting in 1847 (Markel, 2015); since then, researchers and organization

leaders have published numerous articles on HH of HCWs. One such publication on guidelines is by the WHO, which wrote the *My Five Moments of Hand Hygiene*. These occur before patient contact, before an aseptic task, after exposure to bodily fluid, after patient contact, and after contact with the patient's environment. Researchers have also validated that increased HHA resulted in significant reductions in HAIs (Alp et al., 2014; Johnson et al., 2014).

Antimicrobial Stewardship Programs

In 2013, the CDC estimated that U.S. hospitals had 2 million antibiotic-resistant illnesses and 23,000 deaths per year (Fleming-Dutra et al., 2016; Marston et al., 2016; Hicks et al., 2015). About 20% to 50% of antimicrobial use in U.S. hospitals is either unnecessary or inappropriate (CDC, 2015; Chen, Lee, Su, Wang, & Liu, 2016; Schuts et al., 2016). Overuse and indiscriminate use of antibiotics can result in increased mortality, prolonged length of hospitalization, and increased costs, while contributing to the resistance of the pathogens (Schuts et al., 2016). Therefore, an appropriate use of antibiotics is important to reduce antibiotic resistance, HAIs, and deaths associated with the HAIs.

The cost of infections with antibiotic-resistant organism to U.S. hospitals is $21 to $34 billion each year (VHA directive 1031). The issue of antimicrobial resistance is not restricted to U.S. hospitals only. A growing antimicrobial resistance is a global threat affecting health facilities around the world (Gould & Lawes, 2016; C. F. Lee et al., 2018). By 2050, antibiotic resistance will claim about 300 million deaths and $100 trillion cost from the world's gross domestic product (Thaden et al., 2017). In addition to

positive health outcomes, an appropriate use of antibiotics has a potential for cost savings.

Antimicrobial stewardship programs (ASP) within hospitals increase cost savings, while providing better clinical care through oversight, direction, and education for providers to use antibiotics appropriately. Processes enacted within ASP provide a systematic approach to use antimicrobial agents prudently by promoting the selection of the right antibiotics, appropriate dosage, duration of therapy, and route of administration to achieve an optimal outcome (Leuthner & Doern, 2013). Because of ASP efforts to control antibiotic use, complications from antibiotic use and overuse are similarly limited, resulting in shorter hospitalizations and less mortality for patients.

National efforts to combat antimicrobial-resistant bacteria through ASP involved the White House. On September 18, 2014, President Obama issued an Executive Order to establish a task force for facilitating and monitoring the implementation of the national strategy for combating antibiotic-resistant bacteria (VHA directive 1031). The White House action demonstrated the significance of the issue of ASP and the importance of reducing HAIs at U.S. hospitals.

Perez et al. (2014) studied 153 patients infected with antibiotic resistance organism prior intervention with ASP program versus 122 patients post intervention and found that ASP efforts reduced 30-day mortality from 21% to 8.9%. ASP that addressed a specific HAI—C. Difficile that occurs with increased antibiotic use—provided evidence that enacting specific measures to control antibiotic use were associated with cost savings of 7% and a reduction of hospitalization from 1.2 to 0.5/1000 patient days (Kline et al.,

2016). Because of antimicrobial resistant bacteria, Nelson et al. (2017) found that HAIs elevated 30-day risks of mortality, and 5.9 % of patients with methicillin-resistant staphylococcus aureus (MRSA) infections died within 30 days after diagnosis with the antibiotic resistant organism. C. F. Lee et al. (2018) conducted a systematic review of literature and found that 12 out of 13 studies (92%) reported a lower rate of HAIs with implementation of ASP. Fleming-Dutra et al. (2016) used ambulatory medical care surveys for 2010 to 2011 and estimated that 34 million (50%) of antibiotic prescriptions for acute respiratory tract infections were unnecessary.

Evidence-based strategies to enhance appropriate and efficient use of antimicrobials are of significant importance to healthcare facilities. Researchers have addressed incorrect antimicrobial use and the appropriateness of ASP interventions to improve efficient use of antimicrobials. The CDC developed seven core elements of ASP to help healthcare facilities succeed in the program. One of these seven elements involves educating clinicians about antibiotic resistance and ensuring optimal prescribing. With its national initiative in 2014, the Department of Veterans Affairs developed a VHA Directive 1031 (guidance for implementation and maintenance of ASP), including an annual evaluation of the ASP's activities. This directive addresses education, and medical center directors and chief pharmacists should ensure that clinical providers, nurse, and clinical pharmacists are educated on the importance of antimicrobial utilization and management, as well as the principles of antimicrobial stewardship. Education of clinical providers, nurses, and pharmacists is a key in the fight against antibiotic-resistant bacteria. When leaders of healthcare facilities implement ASP and educate staff about the

ASP, reduction of the infections and realization of the associated cost savings are possible.

Healthcare managers and decision makers at healthcare facilities may benefit from economic evaluation of interventions to draft sound policies and guidelines. The financial evaluations of ASPs are an underdeveloped area of research, and the available research remains variable in methods of financial evaluations and in measures of patient outcomes (Dik et al., 2015). From hospital leaders' perspectives, the lack of solid financial evaluations of ASP may be difficult due to rising healthcare costs. However, hospital leaders are aware of the positive clinical effects of ASP, and they have implemented the program (Dik et al., 2015). Patients may also have a reduced length of stay, better quality of care, and live longer because of ASP interventions.

Environmental Cleaning

The CDC noted that researchers in the 1970s and 1980s treated hospital environmental surfaces as insignificant in the transmission of HAIs (Carling, 2016; CDC, 2015). However, cleaning and disinfecting of environmental surfaces became important components of HAIs prevention over the past decade (Carling, 2016; Han et al., 2015). Now, evidence shows the important role that environmental contamination plays in transmitting HAIs, including MRSA, Vancomycin-resistant Enterococci (VRE), and C. difficile (Cadnum et al., 2015; Ray et al., 2017; Rutala & Weber, 2016a).

Healthcare environments facilitate transmission of microorganisms, which can survive in the environment for weeks, thereby posing risk for HAIs (Mitchell, Dancer, Anderson, & Dehn, 2015). Hospital floors, high touch surfaces of patient environments,

and portable medical equipment can risk the transmission of pathogens. Contaminated surfaces can spread infections through aerial dissemination or the hands of HCWs from environmental surfaces to patients. Mitchell et al. (2015) found that the ICU room that has infected patient posed a higher risk for future patients who occupied the room, but improving cleaning approaches, identifying high-risk areas, involving patients as part of interventions, and using cleaning technologies could mitigate risks of infections.

Portable medical equipment or noninvasive portable clinical items (NPIs) are potential sources of HAIs because of the use of these NPIs on multiple patients, and HCWs assume the items are clean unless visibly soiled (Livshiz-Riven et al., 2015; Suwantarat, Supple, Cadnum, Sankar, & Donskey, 2017). Examples of NPIs include medication carts, infusion pumps, electrocardiogram machines, x-ray machines, apron lead gowns, wheel chairs, transport beds, and vital signs equipment. Monitoring of environmental cleaning often does not include NPIs, and staff of healthcare facilities needs to reevaluate cleaning and decontamination practices for NPIs (Livshiz-Riven et al., 2015). Beggs, Knibbs, Johnson, and Morawska (2015) also noted that cleaning attention in healthcare facilities focused more on common high-touch surfaces compared to near-patient surfaces, such as bed rails and infusion pumps.

Hospital floors, underappreciated sources of dissemination of HAIs, are heavily contaminated and often contact objects subsequently touched by hands (Ali, Muzslay, & Wilson, 2015; Deshpande et al., 2017; Wong et al., 2016). Linen, medical devices, HCWs' personal items, pens, patient charts, and medical supplies may fell in to dirty hospital floors and HCWs may spread disease-causing microorganisms from these dirty

items. Koganti et al. (2016) found that the microorganisms from the floors could rapidly disseminate into patient hands and high touch surfaces. Deshpande et al. (2017) studied 318 floor sites from five hospitals and found that hospitals did not use sporicidal disinfectants on floors—posing a higher risk from C. difficile spores in these hospitals compared to hospitals using sporicidal agents on floors.

Beggs et al. (2015) focused on the effects of environmental contamination on the transmission of HAIs and found difficulty in quantifying the contribution of environmental contamination to the spread of HAIs. However, researchers have demonstrated a correlation between cleaning and reduction of HAIs. Watson, Watson, and Torress-Cook (2016) studied MRSA infections from 1 January 2005 to 30 September 2009 at one acute care teaching hospital in California. Watson et al. found that the implementation of a hospital-wide environmental cleaning protocol resulted reducing MRSA infections rates by 96% from 3.04 per 1,000 patient-days before to 0.11 per 1,000 patient-days—statistically significant ($p < 0.0001$). Rupp et al. (2014) studied interventions, such as 43-point cleaning checklist, educational programs for ESWs, training videos, objective measurement of cleaning, and feedback to ESWs, in 90 ICUs. Rupp et al. found a cleaning compliance rate increase from 47% to 75% in just three months after the intervention. These researchers demonstrated that implementing cleaning protocols and adhering to cleaning checklists as a strategy for reducing HAIs actually reduced HAIs and increased cleaning compliance rates.

A limited number of research articles include product choices for low-level disinfection of environmental surfaces. However, disinfectants should target the most

resistant pathogens, such as MRSA, VRE, and C. difficile. In addition to selecting cleaning-disinfecting products, good cleaning practices, proper training of hospital staff and environmental services workers (ESWs), and monitoring of the process remain important (Rutala & Weber, 2016b). Visual inspection, microbiologic tests, and no-touch technology systems are useful in monitoring environmental cleaning and disinfection. Monitoring cleaning and disinfection through visual inspection is the most common method in U.S. hospitals (Rutala & Weber, 2016b), but visual cleanings or inspections are not reliable indicators of contamination because pathogens are invisible to the naked eye. Adenosine triphosphate (ATP) measures organic debris in relative light units; even though it is more effective than visual inspection, it is also not a reliable indicator of microbial contamination (Nante, Ceriale, Messina, Lenzi, & Manzi, 2017; Rutala & Weber, 2016b). Florescent marking, a transparent marking solution that shines when exposed to UV light and is undetectable by ESWs, help in monitoring thoroughness of cleanings (Rutala & Weber, 2016b). HP vapor can also decontaminate patient rooms. The application of different cleaning products and technologies as a strategy to reduce HAIs are effective and the researchers demonstrated positive outcomes in cleanness of the environments of care.

Current researchers have included evidence of using UV and HP systems for environmental decontamination, but healthcare managers can benefit from more study to understand the efficacy of the technological systems and their implementations in hospital settings. HP systems are more effective in destroying spores or spore forming organisms (Rutala & Weber, 2016b), and Ultraviolet-C room decontamination are

effective to reduce floor contamination (Wong et al., 2016). Beggs et al. (2015) also noted that environmental technologies, such as using ultraviolet germicidal irradiation, negative air ionization, and hydrogen peroxide disinfection were important interventions for reducing HAIs. Healthcare Managers might disinfect environments of care and medical equipment effectively using disinfecting products, evidence-based processes, and no-touch technologies. The use of disinfecting products, evidence based processes and use of no-touch technologies are strategies for improving cleanliness of environments of care and thereby for reducing HAIs.

Rupp et al. (2014) indicated that sustaining performance improvements in infection prevention practices are sporadic. Mitchell et al. (2015) also found that current practices for cleaning hospital environments are ineffective in reducing risks of HAIs. These research studies indicated that hospital leaders could do more in their cleaning practices of environmental surfaces. Hospitals could benefit from more research exploring the efficacy of cleaning and disinfecting strategies for hospital floors—including sporicidal disinfectants to reduce burden of spores on floors (Deshpande et al., 2017). However, multimodal interventions—including education and training, checklists, objective measure of performance, communication of IP and ESWs, and clear delineation of cleaning responsibilities can improve environmental cleaning (Rupp et al., 2014) and reduce HAIs.

Rupp et al. (2014) found that healthcare managers faced challenges in improving cleaning practices and sustaining performance. Environments of patient care are potential sources of HAIs and clean environments of care are important to not only prevent

infections but also provide assurance of quality of care. Therefore, effective cleaning and disinfection of environments of care are essential to reduce HAIs.

Reusable Medical Equipment

Booth (2016) noted that protecting the safety of patients was an essential aspect of the healthcare profession and healthcare workers should improve adherence to the standards of HH, donning of personal protective equipment (PPE), and reprocessing of RME. Duro (2016) highlighted the importance of ensuring adequate training for personnel involved in reprocessing of RME. The CDC and FDA recommended that training should occur upon hire and at least once a year thereafter, upon procurement of new devices, and when manufacturers' instructions for use change (Duro, 2016). The American National Standards Institute (ANSI) and the Association for the Advancement of Medical Instrumentation (AAMI) recommended that healthcare managers should certify all personnel performing sterile processing activities as a condition of employment. The Association of Operating Room Nurses (AORN) encouraged certification in programs, such as proper preparation of devices for processing and best practices for decontamination and sterilization (Duro, 2016).

As recommended by AAMI, sterile processing department (SPD) managers should compile and maintain competencies and other employee education records, while performing routine auditing of reusable device reprocessing (Duro, 2016). Sharing the results of any audits performed with sterile processing personnel can help improve adherence to reprocessing standards by apprising areas of successes and of concern.

Effective reprocessing of RME through concerted efforts of SPD managers, SPD personnel, OR staff, and infection preventionists can ensure adherence to standard precautions, improve quality of care, and reduce HAIs. Hessels and Larson (2016) found statistically significant relationship between better patient safety climate and greater adherence to standard precautions. In addition, efforts to improve patient safety may enhance adherence to principles for prevention of HAIs (Hessels & Larson, 2016).

Kwinn (2016) found that healthcare officials and the public have heightened awareness because of recent outbreaks of HAIs of superbugs traced to contaminated surgical instruments. The recommendations by the Food and Drug Administration officials (FDA) also emphasized strict adherence to manufacturers' instructions for use (IFU) each time a surgical instrument was reprocessed (Kwinn, 2016). The recommendations by FDA officials added more responsibilities to SPDs. Even though SPDs shoulder more responsibilities, strict adherence to IFU are good strategies for sterilizing surgical instruments and for preventing HAIs, specifically, surgical site infections.

In fall 2015, a manufacturer of complex surgical instruments studied SPD personnel's adherence to manufacturer's IFU and found that SPD personnel could not follow the IFU instructions completely, modified several required steps, and confused manufacturer's IFU with standard operating procedures (SOPs) for reprocessing similar instruments at the facility (Kwinn, 2016). Reprocessing of RME is one of the challenging areas for reducing HAIs. For example, flexible endoscopes are difficult to clean and reprocess. Ofstead et al. (2015) noted that cleaning procedure for flexible endoscopes

included using of high-level disinfectant (HLD) following manual cleaning. In a related case study, SPD managers expressed concerns that the design of the new instruments that make surgical procedures easier and improve patient outcomes were in a way that made reprocessing harder (Kwinn, 2016). For example, instruments with hidden flush ports were difficult to clean and added turnaround time of instruments in the operating rooms. Manufacturers are making surgical devices more complex to improve patient outcomes and instructions for reprocessing are becoming more complicated. One key strategy for reducing HAIs is coordination of training. Therefore, SPDs and manufacturers need to work together to ensure that training is developed for newly developed surgical devices (Kwinn, 2016).

Inadequate reprocessing of reusable medical equipment had been a common cause for outbreak investigations for endoscope-related HAIs (Ofstead et al., 2017). New guidelines required conducting visual inspections of endoscope channels using lighted magnifications (AAMI, 2015; APRN, 2016; SGNA, 2015). Hospital staff can verify effectiveness of cleaning through routine tests using biochemical markers (AAMI, 2015; APRN, 2016). Using biochemical markers and conducting visual inspection using lighted magnifications are strategies for improving surgical instruments cleaning and reducing HAIs.

Proper RME reprocessing posed challenges for the Veterans Health Administration (VHA) hospitals and triggered Congress and the Veterans Affairs (VA) secretary to request a formal investigation from the VA Office of Inspector General (OIG) in 2009 (Shimoda, Wesley, & Howard, 2012). The OIG staff investigated RME

processes at 45 VA hospitals in 2010 and identified a widespread noncompliance with reprocessing of RME (Shimoda et al., 2012). The VA senior leadership declared RME reprocessing as an organizational priority, conducted extensive education, and registered improvements, but reprocessing issues persisted for over three years (Shimoda et al., 2012). The OIG staff issued the following recommendation for VA leadership to ensure: (a) SOPs are current and consistent with MI; (b) employees consistently follow SOPs; (c) supervisors monitor compliance; (d) employees complete annual training and competencies; (e) supervisors complete documentation of annual training and competencies; and (f) senior management conduct internal oversight of RME activities (Shimoda et al., 2012). Additional recommendations include: (a) staff use flash sterilization for emergency cases only; (b) staff don PPEs appropriately in decontamination areas; and (c) maintenance of air conditioning and air ventilation systems are current. Adherence to SOPs, annual training, annual competencies, and oversight of reprocessing RME are some of the strategies to reduce HAIs. Therefore, healthcare managers should work to enhance training of staff, document annual training and competencies, provide oversight, and ensure staff adherence to SOPs.

Nurse Staffing and HAIs

Cimiotti et al. (2012) conducted a study on 161 hospitals in Pennsylvania involving 7,076 nurses to understand the effect of nurse staffing and nurse burnout on UTIs and SSIs. Cimiotti et al. found that increasing nurse workload by one patient resulted in an increase of UTIs and SSIs, resulting in 1,351 additional infections in the study population. Similarly, decreasing nurse burnout from an average of 30% to 10%

could result in preventing 4,160 infections, leading to cost savings of $41 million in the Pennsylvania hospitals (Cimiotti et al., 2012). Cimiotti et al. conducted the first study to find nursing care correlated with SSIs and nurse burnout correlated with UTIs and SSIs. Therefore, appropriate nurse staffing is one strategy for reducing HAIs and researchers have demonstrated nurse-staffing shortages results in increased HAI rates.

Rogowski et al. (2013) studied adequacy of neonatal intensive care unit (NICU) nurse staffing in the United States using national guidelines and the association with HAIs. Rogowski et al. found that there were considerable shortages in nurse staffing in NICUs relative to the United States national guidelines, and these nurse-staffing shortages led to higher rates of HAIs. Rogowski et al. recommended that hospital administrators and NICU managers should assess their nurse staffing decisions to lower HAI rates.

Hall, Johnson, Watt, Tsipa, and O'Connor (2016) included 46 research studies in their review and found that poor patient safety associated with moderate to high burnout and poor wellbeing of healthcare professionals. Of those 30 studies on burnout, 83.3% had a direct connection between healthcare professional burnout and poor patient safety; similarly, 88.9% of the studies on wellbeing had a direct correlation between poor wellbeing and poor patient safety (Hall et al., 2016). Seven of the 11 (63.6%) of the studies measuring both wellbeing and burnout found that both poor wellbeing and risk of burnout of healthcare professionals were associated with medical errors (Hall et al., 2016). Despite limitations, the studies showed the importance of staff wellbeing and burnout on patient safety. Therefore, healthcare managers should incorporate strategies

for appropriate nurse staffing, staff wellbeing and prevention of staff burnout as patient safety interventions to reduce HAIs.

Adding more patients to a nurse's workload may seem an easy and logical solution at a time of nurse shortages. However, researchers associated low nurse staffing with nurse burnout and poor patient outcomes (Cimiotti et al., 2012), and with increased mortality (Aiken et al., 2017). Researchers similarly associated nurse burnout with poor patient outcomes (Profit et al., 2014; Van Bogaert et al., 2014; Welp, Meier, & Manser, 2015). Researchers correlated staff wellbeing resulting from low nurse staffing levels with worse patient outcome (Dollarhide et al., 2014; Garrouste-Orgeas et al., 2015). Therefore, nurse staffing can be a determinant factor of quality of care and patient outcomes, and healthcare managers must give a high priority to nursing staffing levels to reduce HAIs.

When nurse staffing is negatively affecting patient outcomes, and healthcare facilities fail to recognize or ignore the correlation, then laws and regulations may help. In 2003, California mandated a minimum nurse to patient ratio for healthcare facilities to maintain. In addition, 12 other states issued laws related to hospital staffing—to have either a staffing committee or publicly report staffing levels (He, Staggs, Bergquist-Beringer, & Dunton, 2016).

The issue of nurse staffing is global and not confined to U.S. hospitals. Cho, Chin, Kim, and Hong (2016) studied nurse survey data of 4864 nurses working in 58 South Korean hospitals. The researchers found a correlation of higher incidence of patient

adverse outcome with low nurse staffing. Cho et al. recommended hospital leaders should improve nurse staffing to prevent patient adverse outcomes.

Patient Empowerment as a Strategy to Reduce HAIs

Many researchers have addressed different strategies of reducing HAIs, but few researchers have addressed the patient empowerment as a strategy to reduce HAIs. In addressing this literature gap on patient empowerment, researchers have used patients' and HCWs perspectives to the topic. Seale et al. (2015) focused on the patients' perspective and explored the attitudes of hospital patients toward being active participants in the prevention of HAIs. Seale et al. applied semistructured interviews with surgical patients and found that (a) patients' engagement was largely associated with maintaining their own personal hygiene; (b) some patients voiced concerns about interacting with staff; and (c) some patients articulated a fear that confronting clinicians would negatively affect their care. Seale et al. conducted a qualitative study on HCWs' perceptions of patient empowerment as a strategy to reduce HAIs and found that almost all participants felt patients should take an active role in preventing HAIs.

Engaging patients to educate themselves about infections at hospitals and provide feedback can identify areas for improvement and reduce HAIs (Wellington, 2016; Seale et al., 2015). Since 2009, WHO advocated for patient empowerment programs, and healthcare leaders can play a crucial role by investing education of HCWs about empowering patients (Seale et al., 2015). The program may help patients become knowledgeable about infection control, educate visitors on preventing infections, report issues on risks for infection, provide feedback or respond to surveys, and collaborate with

HCWs to contribute in the HAIs prevention. Despite the potential values, researchers have found that patient empowerment is an underused method of preventing HAIs (Seale et al., 2015).

Prevention strategies for SSIs currently focus on the role of HCWs, but the importance of involving patients as a strategy to reduce HAIs has become more evident through empowering patients with infection prevention information (Tartari et al., 2017). Educating patients and allowing them to engage in HAI prevention strategies can improve existing strategies. Tartari et al. (2017) found that HCWs poor communication with patients, patients' lack of knowledge or low health literacy, and facilities' lack of quality information about HAIs for patients hinder patient engagement, thereby causing patients to seek information from online or untrusted sources (Rawson, 2016; Tartari et al., 2017). Therefore, healthcare managers must produce quality information on HAIs for patients and HCWs to engage patients actively through the journey of their clinical care to reduce HAIs.

Davis et al. (2015) confirmed the role that HCWs played to empower patients in engaging in the process of HAI prevention. The researchers stated the impact of patient involvement was demonstrated through HHA, use of soap and sanitizers, and through participation in survey pre- and post-clinical care. Clinicians gravitate toward traditional patient roles, as passive care receipts, more than taking active roles in infection prevention, such as reminding staff to wash hands (Davis et al., 2015).

A common method to prove the need for patient involvement can occur through a collection of patient survey data, patient interviews, and review of patients' clinical

experiences from the patients' perspective (Lawton et al., 2015; Sutton, Eborall, & Martin, 2015). More research on patient involvement can provide a better insight on the contribution of patient involvement to reducing HAIs. Even though patient involvement as a strategy to reduce HAIs needs more research, researchers have demonstrated that patient involvement is a good strategy to reduce HAIs (Davis et al., 2015; Rawson et al., 2016; Seale et al., 2015; Tartari et al., 2017).

Covered in this study so far, strategies for reducing HAIs included HHA, ASP, environmental cleaning, reusable medical equipment, nurse staffing, and involving patients as a strategy to reduce HAIs. Most of the research studies discussed above approached HAIs from a single strategy viewpoint. However, healthcare managers might struggle to attribute a single intervention to reduce HAIs; therefore, a multidisciplinary approach to infection control becomes important.

Multidimensional Approach to Reduce HAIs

Existing research on the topic explores the relationship of an individual strategy with reducing HAIs. The HAI research field of study lacks an integrative approach of exploring multiple strategies of reducing HAIs in hospital settings. Because few researchers have approached HAIs from multiple strategy point of view, Khan, Baig, and Mehboob (2016) and Beggs et al. (2015) emphasized the importance of a multidimensional approach to reducing HAIs rather than a single intervention.

Patients in ICUs have a high risk of HAIs because of the patients' compromised immune system and invasive medical interventions needed for the sick ICU patients (Yue et al., 2017). Consequently, the importance of studies on HAIs in ICU patients is evident.

Álvarez-Moreno et al. (2016) analyzed the effectiveness of multidimensional infection control strategies by the International Hospital-acquired Infection Control Consortium (INICC) in patients hospitalized in pediatric intensive care units in Columbia. The infection control strategies included the following: (a) education, (b) outcome surveillance, (c) process surveillance, (d) feedback of infection rates, and (e) performance feedback of interventions. Álvarez-Moreno et al. conducted the study on 2,564 adults and 424 pediatric patients in ICU units. Álvarez-Moreno et al. reported a significant reduction in CLABSI rates from 12.9 CLABSIs per 1,000 before intervention to 3.5 CLABSIs per 1,000 after implementing multidimensional infection control guidelines. Rosenthal et al. (2016) stated that the INICC emerged 20 years ago to provide standardized platform for benchmarking HAI rates and promote evidence-based infection control practices in hospitals worldwide. Researchers observed a reduction of HAI rates in ICU patients of INICC and credited the reduction in HAI rates to multidimensional infection control strategies (Álvarez-Moreno et al., 2016; Rosenthal et al., 2014, 2016). Therefore, implementation of multidimensional infection control is a good strategy for reducing HAIs.

Nelson et al. (2016) studied interventions, such as improved adherence to hand hygiene, improved environmental cleaning, contact precautions, and used literature reviews to evaluate cost parameters for each intervention. Nelson et al. found that combinations of interventions to prevent HAIs were cost-effective. The summaries of this literature review include strategies to reduce HAIs and the success of reducing HAIs in many instances. Researchers explored HAIs to find the root causes and to provide

evidence-based intervention strategies for reducing HAIs. Researchers focused on different strategies and quantified the reduction of HAIs as related to those strategies. The potential themes from the syntheses of this literature review include proper hand hygiene, implementation of antimicrobial stewardship programs, proper cleaning of environment of care, proper sterilization of reusable medical equipment, and adequate nurse staffing. Applying HCT and training HCWs with best strategies for reducing HAIs can harness results. Therefore, education and training of HCWs in infection prevention is a potential theme for reducing HAIs. Even though some of the research studies in this literature review focused on individual strategies, multidimensional approaches are more effective. Healthcare managers might reduce HAIs more effectively by combining these different strategies. I addressed patient empowerment as a strategy to reduce HAIs in this literature review but did not consider as a potential theme because researchers are just starting to explore the strategy. Healthcare managers can benefit from more research in the field of empowering patients. Another topic deserving more research is sustainability of these strategies to reduce HAIs. Sustainability of infection prevention strategies remains an underdeveloped area of the research (Pronovost, Watson, Goeschel, Hyzy, & Berenholtz, 2016).

Transition

In Section 1, the discussion included a rationale for conducting this research on strategies to reduce HAIs. Section 1 included an introduction to the study, a background of the problem, the problem statement, the purpose of the study, the significance of the study, research questions, and review of the professional and academic literature. The

focus of Section 1 was to provide background information of why the topic of reducing HAIs was important and deserved further analysis. The conceptual framework of this study is HCT with the premise that investing in human capital helps organizations to improve their performance. Improved skills and knowledge of employees through training and education builds on competitiveness, enhances job performances, and boasts organizational profitability.

Section 2 of the project includes 14 subsections. The section begins with the purpose statement, followed by the role of the researcher in data collection and data analysis. The remaining sections include the participants of the study, research method, research design, population, ethical research, data collection instruments, data collection technique, data organization methods, data analysis, reliability, and validity. The final subsection of Section 2 is on transition and summary. Lastly, Section 3 will include data analysis discussion, results of data analysis, findings of the study, and conclusions and recommendations, if any.

Section 2: The Project

This section included a detailed explanation of steps to explore strategies healthcare managers can use to reduce HAIs. The problem of HAIs needs proper attention from healthcare managers because of its effect on patients' lives. The role of the researcher pertains to the responsibilities for ethical research compliance, including maintaining the confidentiality of participants. This section details why purposive sampling was the best means for the selection of the most experienced healthcare managers. Section 2 also includes data collection and data analysis techniques to ensure data reliability and validity.

The main premise of this study was to identify strategies that can effectively reduce HAIs. From a human capital viewpoint, the process started at hiring best-trained physicians, nurses, technicians, other clinicians, and ancillary personnel. On-the-job training and continual requalification of skills to stay updated on innovation and new knowledge were also key provisions of the process. Healthcare managers can provide oversight on internal controls to influence forces that contribute to an increase in HAIs.

Purpose Statement

The purpose of this exploratory qualitative single case study was to explore strategies that healthcare managers in U.S. hospitals use to reduce HAIs. The target population comprised healthcare managers from a hospital within the state of Maryland who were successful in reducing HAIs. The implications for positive social change included reducing HAIs that can lead to fewer hospitalization days for patients and faster

recovery times to return to normal life. Reduced HAIs may also reduce patient deaths related to HAIs.

Role of the Researcher

The role of the researcher was to understand research protocols, comprehend the requirements of a data collection process, follow Institutional Review Board (IRB) processes, and complete the doctoral study (Bell & Waters, 2014). As a researcher, I served as the primary data collection instrument. My interview protocols met IRB recommendations. All interviewees included working adults, age 18 or older, and with whom I had no working, supervisory, or managerial relationship. I communicated to the interviewees the confidential nature of the study and offered no compensation to research participants. Participation was voluntary, and I ensured the interviewees understand all aspects of their participation in this study.

My experience as a healthcare worker for over 10 years and my familiarity with healthcare policies and procedures helped me understand the qualitative data in this study. Prior to the study, I worked in a hospital in the area but excluded my previous place of work from the geographic area of the study. Hence, I did not conduct interviews in my previous place of work.

Ethical principles assist researchers and research participants in recognizing the ethical issues inherent in research involving human subjects (Belmont Report, 1979). This research addressed the Belmont Report's three principles of ethical doctoral study; the researcher (a) was fair to all participants of the study, (b) practiced beneficence to do more good than harm, and (c) adhered to the principles of justice during the entire course

of the research. Yin (2014) indicated the inevitability of bias in almost any data collection method involving human interaction between a researcher and participant. Identifying potential bias, working to the best of my knowledge to minimize bias, representing interviews well, and generating analysis that readers can understand easily was crucial for producing quality research (see Roulston, 2016). My experience in surgical services could have resulted in individual bias, but I mitigated bias and avoided personal perceptions during interviews and my analysis of the data.

The interview protocol provided a guide in conducting the semistructured, face-to-face interviews. I recorded and transcribed the interviews before analyzing them. The interviews helped me to gain an understanding of the research problem. Semistructured interviews were more flexible and allowed an open discussion between interviewer and interviewee (Crocker et al., 2014).

My responsibilities in this qualitative case study included what Collins and Cooper (2014) described as a researcher's responsibilities. These responsibilities included the following: (a) summarizing prior research pertaining to the research problem, (b) collecting primary interview data and secondary data, (c) analyzing data including triangulation of data, and (d) presenting the findings (Cooper, 2014). I collected secondary data about infection control and strategies to reduce HAIs, as these applied to the study. Interviewees participated in member checking of the interview transcripts to help with data validity and reliability of findings.

Participants

The target population comprised healthcare managers from a hospital within the state of Maryland who had experience in reducing HAIs. Five healthcare managers from the hospital in Maryland participated in the study. In a letter to the IRB of the subject hospital, I requested permission to conduct the research and obtained a list of healthcare managers who have experience in reducing HAIs.

After receiving an IRB approval, I chose five managers to participate in this study using a purposive sampling method. Purposive sampling involves a deliberate choice of selecting participants because of their specialized expertise or superior knowledge in the field of the study (Crocker et al., 2014; Etikan, Musa, & Alkassim, 2016; Robinson, 2014). Each participant received an invitation for an interview with a consent form in person. Consent forms included purpose of the study, confidentiality rules, and my intent to comply with the confidentiality agreement. Signed consent forms served as a record for conducting the interviews. I called participants to establish a rapport and followed up with concerns and questions. I gave participants my contact information to ensure a working relationship. I addressed questions from participants about the research throughout the duration of the study. IRB research ethics emphasized on assurance of confidentiality and I assured participants on confidentiality. Assuring confidentiality helped participants to establish a sense of trust with the researcher. Applying member checking, participants had an opportunity to review transcribed documents of their respective interviews. The duration of each interview was approximately 30 minutes per participant.

According to Walden University IRB regulations, I will safeguard all interview data and documents about the research for 5 years. The data will be stored in a password-protected laptop and in an external drive in a safe place at home. The information will be available to IRB committee members only upon request. After 5 years, I will delete all electronic data and shred all hard copies pertaining to the interview data.

Research Method and Design

A qualitative approach was more appropriate for this research study compared to either quantitative or mixed method because the study involved the lived experiences of participants. Quantitative and mixed-method approaches were not appropriate because this study did not involve a collection of numerical data to test a hypothesis. Specifically, the exploratory case study design was appropriate for this research study because I intended to support a rational understanding of strategies to reduce HAIs from the viewpoints of research participants. The following two sections focused on the details of the research method and the research design.

Research Method

Researchers use a quantitative method to examine the relationship between variables involving numerical data (Ingham-Broomfield, 2014). In a mixed-method approach, researchers used statistical and qualitative data to understand phenomena (Yin, 2014). Quantitative and mixed methods were not appropriate for this study because I did not intend to determine what factors or variables governed an outcome but rather explored real-life experience from the participants' viewpoints. Raich, Muller, and

Abfalter (2014) argued that mixed methods might increase cost and time associated with the study; for this additional reason, I did not choose a mixed method for this study.

In the qualitative method, participants provided an in-depth understanding of the subject under study. Crocker et al. (2014) indicated that researchers used a qualitative case study design to explore real-life behaviors and garner opinions and experiences from the research participants' viewpoints. The quantitative study method lacked the explanations that exist in a qualitative study, while mixed methods lacked the depth of explanation because of its partitioned devotion to both quantitative and qualitative. Therefore, the qualitative method included a broader view in exploring a problem compared to either the quantitative or the mixed methods (Marshall & Rossman, 2016). In the qualitative method, participants describe their individual experiences in depth to generate a deeper understanding of the research study (Marshall & Rossman, 2016). As a qualitative researcher, I was interested in improving hospital practices and performances through collaborative social inquiry (see Gergen, Josselson, & Freeman, 2015).

Research Design

The exploratory case study approach was appropriate for this research study because I intended to support a rational understanding of strategies to reduce HAIs from the viewpoint of research participants. As indicated by Yin (2014), research participants presented a critical assessment of a situation through detailed responses to interview questions. This case study included the experiences of research participants to explore strategies that healthcare managers use to reduce HAIs. The face-to-face approach helped to build rapport and created a complete understanding of the research problem.

This case study was comprised of face-to-face interviews, transcribing recorded interviews, member checking of the interview transcripts, and document reviews about infection control at the hospital located in the state of Maryland. The research design focused on the analysis of data collected and exploration of strategies to reduce HAIs. This process occurred from exploring the personal perceptions of the healthcare managers who took part in the study.

The focus of an ethnographic approach is on cultural norms and lengthy time in the field (Yin, 214). Therefore, ethnographic approach was not appropriate for this study. A phenomenological design was also not appropriate for this study because researchers applying phenomenological design focus on the lived experiences of the participants to accurately describe a phenomenon (Bevan, 2014). The concentration of a narrative approach is on lived experiences of individuals from stories, autobiographies, journals, conversations, memoranda, and personal items (Lewis, 2015); therefore, narrative approach was not appropriate for this study. A case study design exploring healthcare managers' lived experiences led to a greater understanding of strategies for reducing HAIs. Morse, Lowery, and Steury (2014) indicated a researcher should reevaluate for sufficiency of data saturation after conducting five interviews. To ensure data saturation, I reviewed infection control minutes, analyzed each interview after completion, reviewed field notes, and reviewed additional hospital documents pertaining to HAIs. Data saturation was the point at which the interview information is enough to replicate the study and additional information added no or little information (Fusch & Ness, 2015). I used member checking to verify for accuracy of information and data saturation. Each

participant provided feedback to the respective transcribed interviews and I decided the saturation point where no additional information received is providing value to the study.

Population and Sampling

Convenience sampling is a sampling strategy where the researcher selects participants based on their accessibility and/or proximity to the research (Jager, Putnick, & Bornstein, 2017). Convenience sampling was not appropriate for this study because of the selection of participants for convenience reasons to the researcher does not guarantee participants with the most experience. Random sampling is a probability sampling procedure that gives all members of the population an equal chance of being selected and was not suitable for this study because of its blind selection of participants with no consideration to experience (see Gentles, Charles, Ploeg, & McKibbon, 2015). My study required participants with specific experiences; neither convenience sampling nor random sampling guaranteed the selection of participants with the most experiences in infection control so the methods were not suitable for this study.

Purposive sampling was appropriate to support this qualitative single case study. This kind of sampling allows researchers to screen and select participants with the most experiences or the highest records of reducing HAIs (Bernard, 2013; Marshall & Rossman, 2016; Robinson, 2014). Hence, choosing participants with a purposive sampling improved the research quality to a proficiency level appropriate for a doctoral study.

Face-to-face interviews allowed me to garner open and honest responses from participants. The venues for the interview included locations with little or no distraction

to allow for uninterrupted sessions with a good flow of sharing experience. However, the participants chose interview settings most comfortable for them.

Qualitative case study samples range from one to 16 participants, but the researcher determines a sample size small enough for an individual to voice within the study (Robinson, 2014). For example, Gholston (2015) used a sample size of four participants in his qualitative single case study on strategies for hiring employees based on organizational fit. Five participants were enough for my research study, but I continually checked on data saturation after interviewing each participant. Morse et al. (2014) indicated a researcher should reevaluate for sufficiency of data saturation after conducting five interviews. Data saturation is the point at which the interview information was enough to replicate the study and additional information added no or little information (Bhati et al., 2014; Fusch & Ness, 2015; Hammer & Berland, 2014). To ensure data saturation, I reviewed infection control minutes, analyzed each interview after completion, reviewed field notes, and reviewed additional hospital documents pertaining to HAIs.

Ethical Research

This research fulfilled Walden University's standard of ethics through the approval process from the university's IRB. The requirements for these interviews also met IRB recommendations. The IRB standards ensured for voluntary participation, ethical treatment and respect for participants, and no compensation for participation.

An ethical research involves complying with the principles of respect for human subjects and honoring the participants' autonomy or the right to self-determination (U.S.

Department of Health & Human Services, 2014; Irwin, 2013; McDermid, Peters, Jackson & Daly, 2014). Each participant received an invitation for an interview with a consent form in person. Consent forms included the purpose of the study, confidentiality rules, and my intent to comply with the confidentiality agreement. All interviewees included working adults, age 18 or older, with whom I had no supervisory relationship. I communicated with the interviewees the confidential nature of the study, and the no compensation rules for research participants. Participation in the study was voluntary. I provided enough information to participants to ensure complete understanding of all aspects of their participation in the study (Irwin, 2013; McDermid et al., 2014; Yin, 2014).

During analysis, each participant had a unique number to maintain confidentiality. No names of participants appeared in the study. I used NVivo software, which assisted in the coding and identification of themes from transcribed interview data, as suggested by Cope (2014). Applying member checking, participants had an opportunity to review interview transcripts of their respective interviews and request adjustments as needed.

According Walden University IRB regulations, I will safeguard all interview data pertaining to the research for 5 years. The data will be stored in a password-protected external drive in a safe place at home. The information will be available to IRB committee members upon request. After 5 years, I will delete all electronic data and shred all hard copies pertaining to the study. The IRB approval number for this study is 10-03-18-0037286.

Data Collection Instruments

As the researcher of this qualitative study, I was the primary data collection instrument. De Massis and Kotlar (2014) argued that researchers who conducted case study research using multiple sources should integrate both perceptual and objective data. Yin (2014) noted that having different sources of data, such as interviews, company documents, and interview notes facilitated data analysis and triangulation.

After obtaining a hospital IRB approval and the signed informed consents from healthcare managers in the hospital, I scheduled interview dates and times convenient for the participants. Before conducting the interview, I addressed any privacy and other concerns that participants may have. To make transcribing easy, I recorded interviews using a digital recorder. I made notes of interview observations, including nonverbal behavior and communications of the participants. In addition to interviews and notes, I obtained and reviewed hospital documents about infection control, training, on-the-job training, and annual competencies of hospital staff.

Validity was through interview protocol and presenting interview questions as a proper means of collecting qualitative data to achieve the research objective (Dikko, 2016; Hammer & Berland, 2014; Yin, 2014). Validity required aligning data collection instrument with the conceptual framework, HCT, focusing on education and training of staff. To ensure validity, I used member checking and participants reviewed their transcribed interview data for accuracy and completeness.

The interview protocol located in Appendix D helped facilitate consistency of the interview process for each participant and established a working relationship with the

participants. Interview protocol also helped address participants' questions and aligned responses with interview questions. Interview questions were located in Appendix C. Minimizing biases and reducing possible errors was crucial in achieving reliability of the data collection process (Yin, 2014). Interviewees participated in member checking of the transcribed interviews to gain more validity of data and helped gather findings that are more reliable. Interviewees confirmed the accuracy of their respective responses and modified prior responses, as needed. Interview protocol also enhanced reliability of the qualitative case study (Schmiedel, vomBrocke, & Recker, 2014; Yazan, 2015; Yin, 2014).

Data Collection Technique

Data collection techniques included semistructured face-to-face interview questions. The process of data collection began with invitations to the participants. Invitations for interviews included consent forms, the purpose of the study, confidentiality rules, my intent to comply with the confidentiality agreement, and a request of participant's convenient date and time for an interview. Each participant got sufficient information to understand the research topic and the purpose of the study. During the face-to-face interviews, each participant had a chance to acquire explanation of the consent form and rights of the participant. Applying member checking, participants had an opportunity to review transcribed documents of their respective interviews and made adjustments, as needed.

The venues for interviews included healthcare managers' offices and hospital conference rooms. Semistructured interview questions were not highly structured and had

the advantage of probing in-depth information from participants (Castillo-Montoya, 2016; Fusch & Ness, 2015; Yin, 2014). Semistructured interview questions did not lead participants because of the open-ended nature of the questions. This data collection technique had disadvantages, such as distractions because of workplace noise, phone calls, and possible interruptions during interview. Another disadvantage was that safe guarding information and keeping confidentiality takes efforts.

Member checking was an important tool in qualitative research to improve accuracy, capture emergent topics from the participants, and check for data saturation (Koelsch, 2013). I created a transcript of the interview data and discussed with each participant to make sure that my interpretation of the interivew data was accurate. Harvey (2015) noted member checking was the practice of reiterating participant's views and ideas for their confirmation and clarification. Member checking and transcript review were important elements of ensuring accuracy, validity, and reliability (Castillo-Montoya, 2016; Fusch & Ness, 2015; Yin, 2014).

Marshall and Rossman (2016) noted that interviewer-interviewee trust was key for success of interviews; however, an interviewer's inadequate preparation or lack of interviewing skills might jeopardize the success of the interviews. In addition to interviews, reviewing supporting documents helped researchers understand the research problem better (Russell & Brannan, 2016). Data collection techniques involved requesting supporting documentation from the healthcare managers.

Data Organization Technique

Data organization refers to storing of information in electronic files and hard copy materials in a way that is easy to retrieve and analyze information (Yin, 2014). Systematic data organization was vital to accurate analysis of the data and key to having quality research (Mandrinos & Mahdi, 2016; Gaya & Smith, 2016; Zamawe, 2015). This qualitative case study data included electronic files and hard copy files. I developed individual folders for each participant responses and hospital provided documents. I also grouped hard copy files for easy retrieval and analysis. Password-protected computer served as an archive of electronic files, including transcribed interview data, handwritten field notes, secondary data, and thematic computer-assisted qualitative data analysis software (CAQDAS) output data. A file cabinet with a lock at home served as safe storage of hard copy data, digital recorder, digital external drives, and subject hospital artifacts and will continue to serve as a safe storage for 5 years.

Baskarada (2014) noted that establishing a case study database to track research evidence and creating an audit trail of the research process to reach conclusions was important. Organizing data using methodological approach helped to track data easily, enhanced data accuracy, reduced misrepresentation of data, and ensured reliability of data (Marshall & Rossman, 2016; Gaya & Smith, 2016; Rodham, Fox & Doran., 2015). Throughout this study, the organization of data ensured easy retrieval for the data analysis. Assigning a designated code for each participant aided in protecting the identity of each participant.

Data Analysis

In qualitative research, data analysis involved a process of identifying themes, making inferences to collected data, and providing explanation of findings of the study (Harvey, 2015; W. C. Morse et al., 2014; Yin, 2014). The primary data source for the study came from semistructured interviews. Secondary data sources included infection control documents and annual competencies of hospital staff. CAQDAS applications did not analyze data but facilitated the analysis of the data (Cope, 2014). Therefore, CAQDAS helped to produce thematic coding of data and I, as a researcher, analyzed the data. Qualitative researchers used software programs such as NVivo12 to sort words of the interview data, identify commonalities, and build themes through auto coding functions (Cope, 2014; Houghton et al., 2017; Zamawe, 2015). NVivo12 is a CAQDAS software tool programmed to assist researchers in data analysis. Themes and subthemes emerged as an output of NVivo12. I then applied triangulation and analyzed thematic codes to recognize preferred strategies for reducing HAIs.

The data analysis process included methodological triangulation of interview responses, field notes and hospital documents. Triangulation converged sources from primary and secondary data, enriched evidence of research, ensured credibility, and added value to the quality of the research (Marshall & Rossman, 2016). To ensure accurate interpretation of data, the researcher continually focused on the research question (Yin, 2014). As Marshall and Rossman (2016) indicated, data analysis process occurred through self-critics during the analysis process. I exerted conscious efforts to ensure the accuracy of data interpretation.

Reliability and Validity

The quality of a research study depended on the researcher's ability to explore reliability and validity of the study. To achieve validity and reliability of qualitative research, the researcher conferred on credibility, confirmability, transferability, and dependability measures of the study (Morse, 2015). Morse (2015) noted credibility as presenting well-founded data with accurate description of the phenomenon and transferability as generalizability of findings to other contexts. Confirmability entailed achieving objectivity and accuracy of data while dependability involved ensuring consistency of analysis of data (Morse, 2015; Cope, 2014; Singh, 2014). To ensure dependability and confirmability, I followed the interview protocols (Appendix D) and evaluated the quality of data collection and data analysis processes. Member checking of transcript of interview data ensured accuracy of data interpretation and built on credibility. Transferability was the ability to apply the findings of a study to another setting or group and achieved through disclosure of participants criteria, gathering of rich data, triangulation of results, and comprehensive presentation of findings (Elo et al., 2014).

Reliability

Reliability of qualitative research depended on the degree of confidence of the researcher in carrying out the study, in precise representation the participants' views, and in the integrity of the findings to make the study worthy of consideration by other readers (Amankwaa, 2016; Cope, 2014; Pilot & Beck, 2014). Using member checking for the transcript of interview data ensured the accuracy and reliability of the data. Member

checking involved participants validating the accuracy of data interpretation to ensure the credibility of results (Birt, Scott, Cavers, Campbell, & Walter, 2016; Harvey, 2015; Rodham et al., 2015). I followed interview protocols and had each participant conduct member checking. Pierre and Jackson (2014) noted data analysis was an iterative process with the data collection process. By continually analyzing the interview data as it comes, I ensured data saturation.

Reliability ensured that research findings accurately represented the realities of healthcare managers' world who worked to reduce HAIs. Reliability was the ability to achieve similar results when other researchers repeated the study and enhanced trustworthiness of the findings (Noble & Smith, 2015; Rodham et al., 2015; Yin, 2014). Constructing objective research question and suitable interview questions for the study, avoiding the personal bias of researcher, and ensuring accuracy and completeness of data helped me build on the reliability of the research study. The healthcare managers participating in the interview had expertise in addressing HAIs and provided credible and reliable information to address the research problem.

Validity

Collecting data from multiple sources and converging the information to support findings helped achieve validity (Yin, 2016). The collection of data for this study involved semistructured interviews, handwritten field notes, reflexive journaling, observation, and secondary data. Secondary data included policies, documents pertaining to infection control, SOPs, and other strategies to reduce HAIs, as these documents were pertinent to the study.

Yin (2016) noted methodological triangulation of data ensures validity and credibility. The primary data analysis process for this study included methodological triangulation of interview responses, field notes, and hospital documents. Triangulation converged sources from primary and secondary data, enriched evidence of research, and added value to the quality of the research (Marshall & Rossman, 2016). I used triangulation of the all the data sources and discussed the interpretation of the interview transcripts with the participants. Through purposive sampling, the selection of expert healthcare managers to participate in the interviews enriched the qualitative study. The Walden University IRB and the National Institute of Health (NIH) recommendations guided the adherence for protection of research participants and built on credibility of the study.

Transition and Summary

This doctoral study included three sections. Section 1 consisted of the foundation of the study, background, problem statement, purpose statement, nature of the study, research question, conceptual framework, significance of the study, and a review of the professional and academic literature. The focus of Section 2 was on conducting a quality research study according to the doctoral study rubric. The section began with the purpose statement, followed by the role of the researcher in data collection and data analysis. In Section 2, I also addressed the participants of the study, research method, research design, population, ethical research, data collection instruments, data collection technique, data organization methods, data analysis, reliability, and validity.

In Section 3, I conducted interviews to healthcare managers, collected responses to the interview questions using digital recorder and field notes, transcribed the interview data, analyzed the data, and identified themes. The themes helped me recognize the strategies that healthcare managers use to reduce HAIs. Conducting this qualitative case study enabled an exploration of strategies healthcare managers use to reduce HAIs. I also collected hospital documents related to infection control to gain understanding of strategies and means of sustaining strategies for reducing HAIs. Section 3 included data analysis discussion, presentation of findings from the data analysis, applications of the research to professional practice, Implications for positive social change, recommendations for action, recommendations for further research, self-reflections about my research experience and research study conclusions.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative exploratory case study was to explore the strategies healthcare managers used to reduce HAIs. The participants answered eight open-ended interview questions. The participants each had a successful experience in implementing strategies to reduce HAIs, and each participant provided comprehensive responses to the interview questions. All five participants (Participant 1 to Participant 5) were current healthcare managers working at the hospital in the state of Maryland (see Appendix B). In addition to conducting semistructured interviews, I recorded field notes and collected hospital documents related to infection control. Once I transcribed the interviews and conducted member checking, I imported these data into NVivo12 software for thematic coding. I analyzed the NVivo12 output and identified five essential themes. Within the emergent themes and using the data to answer the research question, I outlined strategies to reduce HAIs.

Presentation of the Findings

In this research study, I conducted face-to-face interviews with five healthcare managers selected through purposive sampling. The site IRB required me to have a principal investigator (PI) to oversee data collection process. Through purposive sampling, the PI and I selected five healthcare managers with the most experience about HAIs. The chief medical officer of the hospital also confirmed that the selection of the five healthcare managers as research subjects was a good selection, and the selected participants had the experience needed for conducting the study.

Purposive sampling ensured the selection of key participants with knowledge and expertise in the field of study (see Marshall & Rossman, 2016). Each participant signed a consent form and permitted audiotaping of the interviews. Participants answered open-ended interview questions and follow-up questions pertaining to their experiences in reducing HAIs. To maintain confidentiality, I referred to the hospital as a hospital in Maryland and each participant as Participant 1 through Participant 5.

The business problem in this research study was that some healthcare managers lacked strategies to reduce HAIs. The research question of the study was as follows: What strategies do healthcare managers in U.S. hospitals use to reduce HAIs? I collected data from different sources, such as interview data, field notes, and hospital documents.

Triangulation, as a synthesis of data from multiple sources, led to more comprehensive interpretation, enhanced confidence of the results of the research findings, and created better understanding of a phenomenon (see Birt et al., 2016; Chen et al., 2016). I achieved data triangulation by analyzing the data from multiple sources. I used the semistructured interview questions as a template to conduct the research study.

After member checking and comprehensive review, I entered the interview transcripts into NVivo 12 software. I used NVivo 12 to evaluate the relationship within data, and I developed common themes from the output of the software. The deductive content analysis for this study included exploring strategies by demonstrating connectivity to the conceptual framework and literature reviews.

The conceptual framework for the study was HCT. Schultz (1961) first introduced the HCT with a premise that education empowered employees with useful knowledge and

skills. All aspects of infection control, reprocessing of reusable medical equipment, sterilization techniques, hand washing, and other sterile techniques for reducing HAIs involved education and training. The participants' responses supported the human capital theory. Healthcare managers could reduce HAIs and attain sustained performance in reducing HAIs by applying HCT and investing in human capital to produce a collective value over time.

Another important field in HAI prevention was corporate social responsibility (CSR). Embraced worldwide, CSR is a process of organizing ethically responsible actions of an organization or taking societal responsibilities within the organization (Tai & Chuang, 2014). This process would have a positive influence on the society, environment, employees, and other stakeholders (Tai & Chuang, 2014).

I used the relationship between the literature review, study findings, HTC, and CSR to develop an understanding of the strategies that healthcare managers used to reduce HAIs. My data collection reached data saturation after obtaining participants' consistent information and similar knowledge on HAIs, and after any added information did not provide new information. The data analysis and coding process resulted in five major themes (see Table 1).

Table 1

Frequency of Major Themes

Emergent Themes	Frequency
Use of Data	56
Cleaning	47
DMAIC	25
Education and Training	15
ASP	14

Emergent Theme 1: Use of Data

The five participants that their departments at the hospital gathered data on infections and noncompliance of their respective departments. Participant 1 talked about the importance of tracking such data and about the data during meetings. All participants stated the infection control department of the hospital held a monthly meeting with all hospital departments. Participants 2 through 5 stated that each of their departments discussed its HAI-related data once every 3 months during the infection control meetings. All five participants discussed using data had importance in the fight against HAIs. Participant 1 stated that when the departments focused on the data, worked together, and spoke about the data, infections seemed to go away. Participant stated that paying more attention to data and taking about the data creates a Hawthorne effect. The literature had limited coverage on using data as a strategy to reduce HAIs; however, using data to

create awareness and to reduce HAIs was a strategy which is working well for the subject hospital.

Emergent Theme 2: Cleaning

Cleaning was one of the five themes identified. However, cleaning was in four different strategies. I classified cleaning into four subthemes: environment of care cleaning, instrument cleaning, hand cleaning/staff hand hygiene, and patient cleanliness. As shown in Table 2, the healthcare managers confirmed that this emergent theme applied in different hospital settings such as the environment of care cleaning, hand hygiene, instrument cleaning and patient cleanliness.

Table 2

Frequency of Subthemes

Subthemes	Frequency
Environment of Care Cleaning	20
Hand Hygiene	10
Instrument Cleaning	9
Patient Cleanliness	8

Subtheme A: Environment of care cleaning. The environmental services department at the subject hospital had a 7-step cleaning method in place to maintain the highest standards of cleanliness. The seven steps included (a) pulling trash and linen, (b) completing the high dust process, (c) damp wiping all contact surfaces, (d) thoroughly cleaning the restrooms, (e) dust moping properly, (f) damp mopping all appropriate areas, and (7) inspecting the work according to standards. Leadership of the department also

required cart setup for this 7-step cleaning method, and supervisors trained staff on safety, damp wiping, waste handling, routine floor care, restroom cleaning, infection control, and the use of disinfectants. Participant 4 stated that up on hire, the department supervisors trained each staff member with this 7-step cleaning method, and supervisors and managers checked to ensure staff were following these steps. Participant 4 added that a thorough and consistent completion of the 7-step cleaning method helped reduce HAIs. According to Participant 4's responses, supervisors at this environmental services department also conducted blacklight inspections. Supervisors conducted inspection by marking high touch surfaces in discharged rooms with translucent markers and inspecting after cleaning of the rooms using a blacklight flashlight. The marks were visible with a black light only when staff members did not clean the marked surface.

Figures 1 and 2 show the two instruments in use at the hospital: a translucent marker and blacklight flashlight. The department used these two instruments to conduct inspection of how well staff cleaned the environment of care at the hospital. Participants 1 and 4 stated that infection control also conducted ATP testing to check if staff cleaned high-touch surfaces, and supervisors provided retraining for staff who missed cleaning surfaces. Rupp et al. (2014) demonstrated that implementing cleaning protocols, adhering to cleaning checklists, providing training to staff, and having objective measurement of cleaning was a strategy for reducing HAIs and increasing cleaning compliance rates. Therefore, the subject hospital strategies for cleaning discharged rooms and its objective measurement of cleanliness to reduce HAIs are in congruence with what I found in the literature.

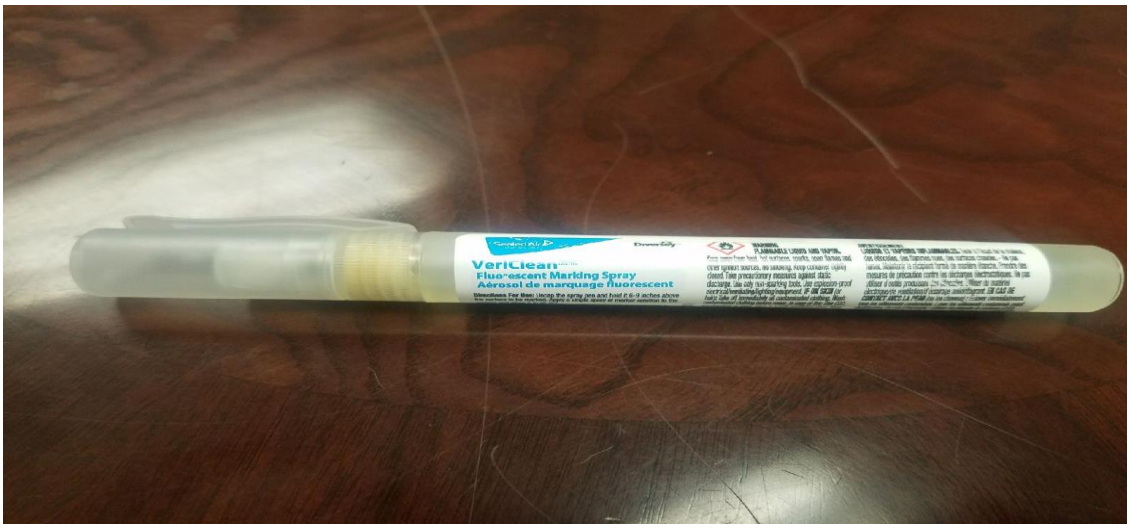

Figure 1. Translucent marker used by supervisors at the subject hospital to mark items in discharged rooms without the knowledge of staff who clean those discharged rooms.

Figure 2. Blacklight flashlight used by supervisors at the subject hospital to check on the existence of marks made at discharged rooms using translucent marker. Absence of mark after the discharged room cleaning indicates thorough cleaning.

Subtheme B: Hand hygiene. Hand hygiene adherence (HHA) is the single most effective method of reducing HAIs (Davis et al., 2015; Tartari et al., 2017; White et al., 2015). In this qualitative study, I could not quantify the HHA at the subject hospital, but

Participants 1 and 3 discussed the importance of hand hygiene during interviews. Specifically, Participant 1 stated the hospital staff and patients had an infection, and infection control team followed the problem to a unit and found a low adherence of hand hygiene. The infection control department, along with the affected unit, conducted some interventions, such as collecting data on HHA and improving hand hygiene. The hand hygiene intervention, along with other interventions, played role in controlling the infection (Participant 1). Carboneau, Benge, Jaco, and Robinson (2010) stated HHA by healthcare workers was an ongoing challenge requiring multifaceted approach in educating staff, developing supportive culture, and making facilities' improvements.

October 14 through 20, 2018 was an International Infection Prevention Week, and the infection control department of the subject hospital conducted education sessions to staff throughout the week. One of the flyers on hand hygiene titled "CLEAN HANDS COUNT" detailed the subject hospital's product choices for hand cleaning and best practices for hand hygiene. Dai et al. (2015) reviewed 13,772,022 hand hygiene opportunities at 35 different U.S. hospitals and found an overall rate of 38% adherence to hand hygiene. These low rates of adherence to hand hygiene were good incentives for healthcare managers at the subject hospital and at hospitals around the country to enact interventions to raise HHA rates and reduce HAIs.

Subtheme C: Instrument cleaning. Hessels and Larson (2016) found statistically significant relationship between better patient safety climate and greater adherence to standard precautions. Participant 5 stated that the sterile processing department followed manufacturer's protocols and guidelines when cleaning instruments.

According to Participant 5, even clean loaner trays went through the cleaning process at the hospital, and then were sterilized to ensure 100% compliance for ensuring the instruments were safe for patient use. Participant 5 stated that staff at the sterile processing department were all board certified, which helped the department with improving performance in cleaning, eliminating flash sterilization, and adhering to sterilization standards. The CDC and FDA recommended that training should occur after hire and at least once a year thereafter, after procurement of new devices, and when manufacturers' instructions for use change (Duro, 2016). The subject hospital complied with these requirements by providing training after hire and maintained full annual competencies for procedures performed at the sterile processing department (Participant 5). The subject hospital also went beyond the requirements by hiring board certified technicians.

Subtheme D: Patient cleanliness. Tartari et al. (2017) stated that prevention strategies for SSIs currently focused on the role of HCWs, but the importance of involving patients was a strategy to reduce HAIs has become more evident. Participant 2 stated hospital staff provided patients with chlorhexidine gluconate (CHG) 4%, so the patients could take a bath the night before surgery (see Figure 3). The hospital staff used CHG wipes on the day of surgery to reduce the surgical site infections (Participant 2). Even though using patient involvement as a strategy to reduce HAIs needed more research, researchers demonstrated that patient involvement was a good strategy to reduce HAIs (Davis et al. 2015; Rawson et al., 2016; Seale et al., 2015; Tartari et al., 2017). The subject hospital staff applied the involvement of patients as a strategy, which

might give the hospital a competitive edge in reducing HAIs. Participant 2 stated that providing patients with CHG 4% to take a bath, with the aim of reducing skin flora, was one of the strategies that worked best for reducing SSIs at the hospital.

Other strategies that hospital staff implemented pertained to prepping the patient, following manufacturer guidelines for prepping the surgical site, letting it dry for 3 minutes, performing hair clipping, and removing hair around the surgical site outside of the operating room to prevent contamination of the surgical wound (Participant 2). Participant 1 also reiterated that the reduction of SSI at the hospital was achieved through the bundle of the strategies mentioned above.

Figure 3. Chlorhexidine gluconate 4 %, provided by the subject hospital to patients so that they take bath using this CHG 4% the night before surgery.

Theme 3: DMAIC

Srinivasan, Muthu, Devadasan, and Sugumaran (2016) stated that define, measure, analyze, improve, and control (DMAIC) was the model compatible for nourishing the benefits of Six Sigma, and the applications of this model in nonconventional sectors, such as the healthcare industry, were yet to begin widely and intensively. Participant 1 stated that every department in the subject hospital uses DMAIC. All five participants stated they used DMAIC as part of their strategies to reduce HAIs. Per the documents I gathered from the subject hospital, the DMAIC process involved developing a work plan, defining or justifying project selection, defining project charter and financial impact, defining pillar of excellence alignment, designing measurement plan and target goal, analyzing data and getting to the root cause, designing improvement matrix, and creating control and monitoring plan for sustainability.

Researchers have found the DMAIC approach an effective strategy, which ensured significant reduction in HAIs, while providing means for sustaining strategies (Improta, Cesarelli, Montuori, Santillo, & Triassi, 2017; Kuwaiti & Subbarayalu, 2017; Montella et al., 2017). Carboneau et al. (2010) also studied an application of Lean Six Sigma on hand hygiene compliance at hospital in Albuquerque, NM and found a reduction of MRSA by 51% using multifaceted strategies identified through the DMAIC process of the Lean Six Sigma. According to the hospital documents provided to me, each department at the subject hospital measured the influence at the end of every DMAIC process related to financial savings, patient satisfaction, employee morale, enhanced over all cleanliness of the hospital, better utilization of staff time, and improved

patient outcome and patient safety. The participants stated they outlined lessons learned of each DMAIC process. Therefore, DMAIC was a strategy used at the subject hospital for monitoring strategies for reducing HAIs. All participants believed DMAIC was playing a role in reducing HAIs.

Theme 4: Education and Training

Directly related to the HCT, education and training involved equipping staff with the knowledge and skills they need. Participants 1, 4, and 5 discussed the importance of education and training in their responses to interview questions. The participants stated the hospital leaders brought in representatives of vendors (reps) to train staff on proper handling of instruments and products in use at the hospital. The training was common for teaching staff on how to clean and sterilize instruments by following manufacturer protocols and guidelines. Participant 4 stated that environmental services also brought in reps to give in-service for products the department staff used to clean.

The hospital departments conducted education and training through daily huddles, monthly education meetings, inter-department communications, and infection control meetings. Confirming that employees had the correct education, providing on-the-job training, and conducting annual competencies were investments in human capital, which might improve organizational performance. The sterile processing department confirmed adequate education of staff by hiring only board-certified technicians. Duro (2016) found that the CDC and FDA recommended that training should occur after hire and at least once a year after the initial hiring date. According to participants, the department not only provided staff initial training after hire but also maintained full compliance with annual

competencies. Specifically, Participant 5 stated that everything they did at the department was in the annual competencies folder because it was a JCAHO requirement.

Theme 5: Antimicrobial Stewardship Program

Processes enacted within Antimicrobial Stewardship Program (ASP) provided a systematic approach to use antimicrobial agents prudently by promoting the selection of the right antibiotics, appropriate dosage, duration of therapy, and route of administration to achieve an optimal outcome (Leuthner & Doern, 2013). Participants 1 and 3 stated the subject hospital enacted ASP and removed inappropriate use of antibiotics. Both participants stated that ASP involved advocating for prudent use of antibiotics and educating providers to discontinue antibiotics that were no longer needed. Participants 1, 2, and 3 discussed the ASP at the hospital and its importance. Important milestones on the ASP program of the hospital, as part of the healthcare system, include: (a) In 2015, developed policy to restrict antibiotic usage with an electronic medical record (EMR) alert system, (b) also in 2015, developed intravenous (IV) to by mouth conversion policy, (c) in 2016, implemented an EMR alert system for a 48-hour antibiotic review, (d) in 2017 developed antimicrobial therapy guidelines and distributed providers' education bulletin, and (e) also in 2017, implemented a five-day automatic stop date for antibiotics along with procalcitonin testing. Participant 3 stated that a new blood test called the procalcitonin was useful in identifying patients that did or did not have an infection. According to participant 3, the hospital providers were often ordering this blood test when there was a question of whether there was an infection. When a result of the procalcitonin was high for a patient, the likelihood of an infection was high and providers

ordered antibiotics for that patient. When the result of the procalcitonin was low for a patient, the likelihood of infection was very small and providers discontinued the antibiotics with confidence. In this way, procalcitonin was playing a role in eliminating antibiotics that were no longer needed. According to Participant 3, the hospital also enacted a strategy to stop antibiotics after 5 days. Participant 3 added that after 5 days of antibiotic use, providers can re-evaluated patients to check if additional order of antibiotics were necessary. Leuthner and Doern (2013) stated that processes enacted within ASP provide a systematic approach to use antimicrobial agents prudently by promoting the selection of the right antibiotics, appropriate dosage, duration of therapy, and route of administration to achieve an optimal outcome. Because of ASP efforts to control antibiotic use, complications from antibiotic use and overuse are similarly limited. As supported by literature review, the subject hospital implemented an effective ASP, which earned recognition from the state. The Maryland Patient Safety Center awarded the healthcare system, which included the subject hospital, with the 2017 Minogue Award as part of Circle of Honor Winners for its ASP and for changing the culture of inappropriate antibiotic use. Besides the ASP award, the hospital sets as great example in its efforts and aggressive policy against Clostridium Difficile Infection (CDI). The hospital implemented multidimensional approach to infection control to deal with a high infection rate of CDI during the second quarter of 2016. The hospital implemented multiple strategies, assembled multidisciplinary team, and reduced CDI from Standard Infection Rate (SIR) 2.37 in 2016 to SIR 0.23 in 2018. Hospitals in Maryland had an average SIR of 1.02 and the subject hospital excelled in CDI reduction when compared to

other hospitals in Maryland. Strategies that contributed to the reduction of CDI included Specimen Stewardship (testing of appropriate stool), ASP, increased staffing model of environmental service and use of bleach in all discharged rooms. Álvarez-Moreno et al. (2016) analyzed the effectiveness of multidimensional infection control strategies and reported a significant reduction in CLABSI rates from 12.9 CLABSIs per 1,000 before intervention to 3.5 CLABSIs per 1,000 after implementing multidimensional infection control guidelines. Nelson et al. (2016) studied interventions, such as improved adherence to hand hygiene, improved environmental cleaning, contact precautions, and used literature reviews to evaluate cost parameters for each intervention. Nelson et al. found that combinations of interventions to prevent HAIs were cost-effective. Literature review supports the bundle strategy for reducing HAIs at the subject hospital. Wellington (2016) summarized research findings by the CDC that showed a 70% reduction in HAIs when employees and providers were aware of infections and had adequate training in infection prevention. The conceptual framework, HCT, is an appropriate theory to improve performances of healthcare facilities in reducing HAIs because all strategies to reduce HAIs involve education and training of staff.

Application to Professional Practice

Analysis of the interview transcript, field notes, and hospital documents provided basis for the findings. I also coupled the findings with demonstration of connectivity to the conceptual framework, CSR, and literature reviews. By matching best practices at the hospital and strong support of literature reviews, I identified the strategies that could effectively reduce HAIs.

The research participants described the importance of strategies to reduce HAIs. The strategies that worked best for the subject hospital included the use HAI-related data to create awareness and design means to reduce HAIs. The hospital also incorporated a detailed step for environmental cleaning with a choice of cleaning agents, improved adherence to hand hygiene, followed manufacturers' guidelines for cleaning and sterilization of instruments, and provided CHG 4% to patients to use for bathing the day before surgery. The last three emergent themes as strategies to reduce HAIs at the hospital included implementation of DMAIC as a strategy to monitor HAI-reducing strategies, providing education and training, and implementation of the ASP.

HAIs inflict cost to the patient, hospital, and community (Zimlichman et al., 2013). Marchetti and Rossiter (2013) estimated the direct and indirect costs of HAIs in the United States ranged from $96 to $147 billion a year and the cost per infection ranged between $16,359 and $25,903. Focusing on CSR more than cost, lives lost to HAIs are of concern to hospital leadership. HAIs are causing approximately 99,000 deaths per year in the United States (Cimiotti et al., 2012; Hessels & Larson, 2016; Lacanna, 2014). Hospital leaders have faced the need to not only develop strategies that work best for them for reducing HAIs but also design sustainment strategies.

DMAIC was a strategy used at the subject hospital for monitoring strategies for reducing HAIs. All five participants confirmed they used DMAIC as part of their strategies to reduce HAIs. The participants stated they outlined lessons learned at the end of each DMAIC process, which was specifically important for sustainment of strategies. All participants believed DMAIC played a role in reducing HAIs. Healthcare managers

were aware of the beneficial aspects of reducing HAIs to their hospital and the health economic benefits to patients.

Implications for Social Change

Morillo-García et al. (2015) expressed that the prevention of HAIs could contribute to economic efficiency of hospitals. Any knowledge gained from this study could help leaders of healthcare facilities to develop strategies to reduce HAIs effectively. Reducing HAIs could not only help with economic efficiency of hospitals but also with its corporate social responsibility (CSR). Embraced worldwide, CSR refers to a process of organizing ethically responsible actions of an organization or taking societal responsibilities within the organization to influence a positive influence on society, environment, employees, and other stakeholders (Tai & Chuang, 2014). Hospital leaders benefit from reduced HAIs because of (a) doing the right actions for patients, (b) having a positive image in the community because of lower infections, and (c) possibly improving staff morale. Identifying and exploring strategies to reduce HAIs might increase awareness on the effects of the infections on the safety of patients, healthcare workers (HCWs), and visitors. Even though the study approached the issue from a patient perspective, reduced HAIs could also come with reduced risk of infections for HCWs and visitors.

Knowledge gained from this study might help staff of infection control departments alter techniques to facilitate teaching of infection control strategies by providing evidence-based practices. The study findings might also help staff of infection control departments pay more attention to multidimensional approaches and sustainment

strategies. Reduced HAIs leads to less hospitalization days for patients, faster time to return to work or normal life, improved health of communities, increased business productivity due to early return of patients to work, and improved school attendance, if the patient is a student. Knowledge gained from this study might also have a ripple effect beyond the direct influence.

Recommendations for Action

The focus of this research study was exploring strategies to reduce HAIs. Researchers have noted that HAIs negatively influence profitability of hospitals. The challenge for healthcare manager involved providing patients with quality care, while reducing HAIs. Healthcare manager could leverage their strategies with the findings and recommendations of this study.

Healthcare managers could reduce HAIs or sustain reduced HAI rates by implementing effective strategies identified in this study. The strategies that worked best for the subject hospital included (a) the use of HAI-related data to create awareness and design means to reduce HAIs, (b) implementation of through cleaning method, (c) implementation of DMAIC as a strategy to monitor HAI-reducing strategies, (d) the use of education and training, and (e) implementation of ASP. Literature strongly indicated support of these strategies. My recommendations in this study emanated from the best practices of the subject hospital and strong research support.

My first recommendation is for hospitals to have detailed steps for environmental cleaning with best cleaning agents and testing mechanisms to adhere to protocols and procedures. This recommendation is important because cleanliness of environment of

care influences every department in the hospital. In a clean environment of care, cross contamination by the hands of HCWs and through high-touch items will not be possible. Likewise, adherence to hand hygiene will not be effective if the environment of care is dirty and having a clean environment of care supplements the strategy on hand hygiene. The subject hospital has done well by implementing a 7-step cleaning and black light testing method to inspect thoroughness of cleaning.

My second recommendation is for hospitals to include patients as a strategy to reduce HAIs. This aspect is an emerging strategy in the research field. To include patients in the strategy to reduce HAIs, the subject hospital staff provided patients with CHG 4%, so patients could bathe with it the night before surgery. Moreover, the hospital staff utilized CHG wipes the day of surgery to reduce the surgical site infections. Participant 2 stated providing patients with CHG 4% reduced skin flora and was one of the strategies that worked best for reducing SSIs.

According to the conceptual framework, HCT, hiring competent staff, providing education, and training of staff are key to success. My third recommendation is for hospitals to hire competent staff and place high emphasis on education and training of staff. The subject hospital set a good example for other hospitals by hiring only board-certified technicians at its sterile processing department. Participant 5 stated that having board-certified staff helped the department register improved performance in cleaning, eliminating flash sterilization, and adhering to sterilization standards.

Based on strong support from literature review, my fourth recommendation is for hospitals to place high emphasis on hand hygiene. The research participants did not

emphasize the importance of hand hygiene during interviews, and the recommendation might be of importance to the subject hospital too. This recommendation was of significance because hand hygiene adherence was the single most effective method of reducing HAIs (Davis et al., 2015; Tartari et al., 2017; White et al., 2015). The reason behind this recommendation was that researchers found that a median HHA rate of HCWs was only 40% (Azim et al., 2016; Johnson et al., 2014; J. A. Watson, 2016).

Based on literature review and with support of the subject hospital's practices, implementation of multidimensional approach can be effective to reduce HAIs. Khan et al. (2016) and Beggs et al. (2015) emphasized the importance of a multidimensional approach to reducing HAIs, rather than a single intervention. According to Participants 1, 2, and 3, the subject hospital also implemented bundles to reduce HAIs with a focus on a multidimensional approach.

My last recommendation reflects the research study that healthcare managers should focus on sustainment of strategies. Sustainability of infection prevention strategies remains an underdeveloped area of the research (Pronovost et al., 2016); however, I posit the problem of HAIs is not due to lack of strategies but because of challenges in sustainment of strategies. These recommendations are of interest for healthcare managers because the managers and directors are responsible for developing and implementing strategies to reduce HAIs.

Recommendations for Further Research

The purpose of this exploratory qualitative single case study was to explore strategies that healthcare managers in U.S. hospitals used to reduce HAIs. The findings of

this study were limited to hospitals and further research could expand findings to nursing homes and outpatient clinics. I addressed the research question from healthcare managers' viewpoints, and another recommendation for further research could involve researchers addressing the research question from staff point of view.

The literature review indicated patient empowerment as a strategy to reduce HAIs, and I considered empowerment of patients as a potential strategy because researchers were just starting to explore the strategy. Healthcare managers could benefit from more research in the field of empowering patients. Another topic deserving more research was sustainability of these strategies to reduce HAIs. Sustainability of infection prevention strategies remained an underdeveloped area of the research (Pronovost et al., 2016).

CMS nonpayment for the bottom performing hospitals related to HAIs, and the findings were helpful to the bottom performing hospitals to realize cost savings. Through this qualitative study, I noted that continued training to assure staff competencies, conducting root cause analysis, providing education feedback, and doing proactive assessments could help reduce HAIs. However, conducting a mixed method research could also enrich the research findings by comparing variables influencing HAIs and linking participant interviews to the dominant variables.

Reflections

Completion of a doctoral degree was my life-long educational goal, and Walden faculty have enriched my research skills and made this educational goal a reality. The faculty and students have been very engaging in class discussions and I learned a lot from

the class room interactions. The prospectus and proposal of the study were developed in class discussions and during Walden residencies.

The developments of my study prospectus and proposal enhanced my research skills. As part of the proposal, the construction of section 2 and fulfillment of IRB requirements tested my patience. However, completing this research study and fulfilling all the requirements helped me develop research skills and master research techniques. I have an interest to make my due contribution to quality healthcare delivery and attaining this degree will help me to further research to make healthcare delivery safer. In general, the study provided me with the skills of being a practitioner in the healthcare field.

The participants enhanced my knowledge of key concepts related to HAIs. The experiences shared by the participants include best practices at the hospital and could set example for other healthcare facilities in the United States and beyond. The common areas where the literature review and best practices at the hospital match were the sources of the recommendations made in this study. I am hopeful that hospitals and healthcare managers will use the study findings and recommendations for reducing HAIs.

During the course of the study, I discovered that healthcare managers are well aware of strategies to reduce HAIs but the problem is on sustaining strategies because the delivery of safe healthcare has been an ongoing concern. The concern will persist in the future requiring an ongoing engagement from healthcare managers. The managers who participated in this study are in position to create policies for safety and quality healthcare and make changes to the policies pertaining HAIs. Therefore, the findings of this study will be helpful in bringing positive change in the delivery of safe and quality healthcare.

Conclusion

The findings from this single case study indicated healthcare managers could successfully use strategies to reduce HAIs through Themes 1 to 5. HAIs significantly increased health care cost, with an estimated $10 billion annual direct cost to U.S. hospitals (McCalla et al., 2017). The strategies used at the study hospital were consistent with the literature review. Staff at U.S. hospitals have worked to reduce HAIs not only from cost saving perspective but also because it is the right thing to do for patients. The conceptual framework, HCT, provided a linkage between strategies healthcare managers' use and reduced HAIs. Providing training to staff and physicians, conducting annual competencies, providing in-service of new products, creating awareness of HAIs among staff, and hiring board certified staff enhanced effectiveness of strategies to reduce HAIs and were consistent with HCT. Healthcare management practices, coupled with HCT, are important in providing quality care in a safe manner.

The experiences study participants shared were important for other hospitals and healthcare managers to incorporate into their strategies for reducing HAIs. The participants provided five areas of focus regarding reducing HAIs in hospitals: education and training, ASP, cleaning, use of data, and an overall Six Sigma strategy called DMAIC. I recommend that healthcare managers and hospital leaders utilize the findings and recommendations of this study to increase awareness on best practices and strategies to effectively reduce HAIs. Hospitals and patients can benefit from reduced HAIs.

The findings of the study were consistent with professional healthcare practices and had implications for positive social change. Besides the five strategies identified in

this qualitative study, having a focused effort in hand hygiene could reduce HAIs because hospitals across the United States have suffered from low adherence to hand hygiene. A better insight to current strategies of how hospital staff approach delivering quality care in different areas of healthcare delivery demonstrates a contribution to social change.

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Appendix A: Cover Letter

Date

Dear _____:

Mr. Yohannes Debesai, doctoral candidate in Business Administration with emphasis on Healthcare Management at Walden University requests permission to conduct an academic doctoral study project including a program review using data from your Medical Center's infection control and prevention, specifically data related to infection control, annual competency and other achieved data related to hospital-acquired infections. My research question is: What strategies do healthcare managers in U.S. hospitals use to reduce HAIs? Over the years, hospitals have strategically applied best practices to reduce hospital-acquired infections. Since the need for reducing HAIs continue to increase, it is important to examine how facilities can reduce HAIs and associated costs.

Qualitative approach is more appropriate for this research study than either quantitative or mixed methods. I will use exploratory qualitative single case study to explore strategies healthcare managers in U.S. hospitals use to reduce HAIs and plan to interview about five managers.

The requirements for these interviews met Walden University's IRB recommendations. All interviewees are working adults, age 18 or older and none of the interviewees have supervisory or any other relationship with interviewer. I will communicate with the interviewees that their identity will remain confidential and that they will not be compensated for participating in the interviews based on the rules governing research participants.

The project will consist of literature reviews and review of secondary data on infection control and annual competency over the past 2 years.

If granted permission, the data needed will consist of interview of five managers and hospital documents related to infection control. These data would permit Mr. Debesai

to explore strategies regarding education and training of employees as related to infection control and other infection control related data.

The patients and employees included in the data sets will remain anonymous. And identity of this hospital will also remain confidential and be referred as "a hospital in the state of Maryland".

The data will only be used to identify if education and training of employees regarding infection control correlate with significant reduction in HAIs.

In summary, the doctoral study will be comprised of historical background, literature review, use of a qualitative methodology, analysis of data collected, conclusions of findings, and recommendations.

For any questions and/or concerns, please feel free to contact Mr. Yohannes Debesai, via email and/or by phone.

Thank you for your time and consideration.

Yohannes Debesai
Yohannes Debesai,
Doctoral Candidate

Appendix B: Case Study Participants

Participant Identification	Gender	Years of Experience
Participant 1	Male	Over 5 years
Participant 2	Female	About 3 years
Participant 3	Male	Over 6 years
Participant 4	Male	About 1 year and half at current position and over 30 years as a manager of Environmental Services at different hospitals
Participant 5	Female	Over 6 years

Appendix C: Interview Questions

Interview questions for addressing the targeted research question are:

1. What strategies do you use to reduce HAIs?
2. Which of those strategies are working well in the reduction of HAIs and why?
3. Which strategies worked best, based upon your experiences and data, and why?
4. How do you achieve improvements in the strategies for reducing HAIs?
5. How have you implemented strategies for reducing HAIs?
6. What feedback are you experiencing from staff to potentially improve the strategies?
7. How do you incorporate feedback into strategies for reducing HAIs?
8. Please share information that I did not ask about your successful strategies you have implemented that reduced HAIs in the hospital.

Appendix D: Interview Protocol

1. Invite participants for interview and set up interview date and times convenient for the participant.
2. Create a folder for each participant's interview data.
3. Arrive at the interview place 15 minutes early.
4. Explain to each participant the purpose of the study and kindly inform each participant that interviews will be recorded using digital audio recorder.
5. Assure confidentiality and ask if participants have questions or concerns.
6. Inform participant that interviewer might ask probing questions to find deeper meanings of responses.
7. Thank each participant for their time and willingness to participate in the study.
8. Inform participants that the transcribed interview data will be shared with each participant so that each can edit for better accuracy.

Appendix E: NIH Certificate

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Yohannes Debesai** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 03/11/2016.

Certification Number: 2029818.