2020

Evaluation of Inappropriate Use of Antibiotics in the Long-Term Care Community

CHARLENE A. HUGHES
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Charlene Hughes

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Julibeth Lauren, Committee Chairperson, Nursing Faculty
Dr. Susan Hayden, Committee Member, Nursing Faculty
Dr. Lilo Fink, University Reviewer, Nursing Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2020

Abstract

Evaluation of Inappropriate Use of Antibiotics in the Long-Term Care Community

by

Charlene Hughes

MSN, Towson University, 2009

BSN, Regis University, 2005

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

May 2020

Abstract

The number of antibiotics prescribed in the 65 and older population significantly increased related to the diagnosis of urinary tract infections (UTIs). Although empiric treatment is necessary at times, it can lead to antibiotic resistance; therefore, clinical symptomology with an active infection verified by diagnostic testing is the requirement for the treatment of a UTI. This project addressed the practice-focused question of how the implementation of an evidenced-based antibiotic stewardship program (ASP) in a nursing home on the East Coast may impact the overuse of antibiotics in that clinical setting. The project, guided by the theory of planned behavior, was used to evaluate current practice, improve patient outcomes, and increase nurse and provider communication. The use of an algorithm for the diagnosis and treatment of a UTI was implemented to guide clinical practice and provide direction for appropriate treatment. Patient data from 3 months post ASP program implementation was reviewed, indicating 17 patients were prescribed antibiotic treatment for a UTI. Patients under the age of 65 years were excluded leaving 13 patients in the study. Of the 13 patients receiving antibiotic treatment with a urinalysis completed, nine (69.23%) were positive for microorganisms higher than 100,000 colony forming units, indicating a UTI. The remaining 4 patients (30.76%) were negative for an active infection. Three of the 4 patients continued to receive antibiotic treatment after the negative urinalysis result, indicating incorrect use of the algorithm due to treatment continuation after a negative urinalysis. Older patients are more susceptible to UTIs due to urinary retention and other diseases. Inappropriately using antibiotics to treat patients without an active infection can have detrimental health effects on the older population.

Evaluation of Inappropriate Use of Antibiotics in the Long-Term Care Community

by

Charlene Hughes

MSN, Towson University, 2009

BSN, Towson, University, 2005

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

May 2020

Acknowledgments

I would like to take this opportunity to first give recognition to God for giving me the strength as I haven endeavored many milestones of the doctoral nursing program at Walden University. My mother has been very supportive and encouraging when I needed it the most. I would also like to acknowledge my daughter Jasmine because she was there to listen and give me reassurance when I wanted to give up. Dr. Lauren, Dr. Hayden, and Dr. Olade, including other professors, have been instrumental in my academic success.

Table of Contents

Section 1: Nature of the Project

Introduction

The overuse of antibiotics in the older population is a significant concern in the healthcare setting. The treatment of patients who do not present with clinical manifestations of an active infection, which happens when patients receive antibiotic treatment for an active infection that has not been confirmed by lab results, leads to the inappropriate use of antibiotics (McMaughan et al., 2016). Long-term care (LTC) facilities houses a population of older patients who are vulnerable to the overuse of antibiotics (Daneman et al., 2011), as patients can have dementia or other cognitive impairments that will affect their ability to advocate for themselves when it comes to treatment options. But an antibiotic stewardship program (ASP) has been found to have potential with controlling the prescribing of antibiotics in the LTC setting. The purpose of the ASP implemented at the project site was to audit antibiotic usage, length of treatments, and eliminate antibiotics that are not effective for treatment (Baur et al., 2017).

Providing education to patients, families, and staff regarding appropriate treatment options has helped to improve compliance and decrease misconceptions that patients should have antibiotics due to a change in mental status. Thus, this doctoral project, which was conducted to assess the implementation of an ASP, can have a positive impact on social change by reducing the risk of antibiotic resistance and decreasing health care costs associated with antibiotic-induced infections such as Clostridium-Difficile (C-Diff; Norman, Monroe & Carter, 2014). Additionally, healthcare providers will be more knowledgeable about recognizing the symptoms of a UTI and ensuring appropriate treatment options. Patients and families can also have better

knowledge and understanding of what to expect when making an educated decision regarding treatment options (Centers for Disease Control & Prevention [CDC], 2017).

Problem Statement

UTIs are the most commonly diagnosed infection in the LTC setting. However, studies have shown that antibiotics were prescribed based on the providers' preference and not the clinical symptomology of the patient, with up to 75% of prescriptions inappropriately prescribed (Fleming, Bradley, Cullinan, & Byrne, 2015). Several factors can also influence the prescribing of antibiotics such as evaluation of the clinical situation, diagnostic testing, families, and the nurses (Van Buul et al., 2015). Further, research has indicated in a sample that 71% of 547 residents had antibiotic prescriptions written before confirming an active infection and without any clinical symptoms of a UTI (McMaughan et al., 2016). Thus, the inappropriate use of antibiotics continues to be a problem in the LTC community. Healthcare professionals must be involved in advocating for enhanced educational practices to help improve patient outcomes through evidence-based practice .

The inappropriate use of antibiotics in the LTC setting impacts the health status of the older population. Treating a patient with a UTI consists of recognition of or obtaining clinical evidence to verify that clinical symptoms are confirmed by diagnostic workup, including a positive urinalysis and or urine culture. Up to 50% of LTC patients will have asymptomatic bacteriuria (AB), which is a bladder disorder due to age-related comorbidities (McMaughan et al., 2016). But, utilizing antibiotics to treat AB increases antibiotic resistance, which can have

detrimental health effects and increased healthcare costs (Doernberg, Dudas, & Trivedi, 2015; Sefton, 2000).

Implementation of the ASP at the project site was meant to help to encourage the nursing staff and physicians to be more mindful of treatment options when prescribing antibiotics. The implementation of the ASP reinforced the nurses' ability to assess and recognize urinary symptoms. An algorithm supplied by the organization can help nurses and physicians take charge of managing appropriate treatment options, though it only addresses patients without a urinary catheter. Any change in the patients' condition requires that the nurse identify and correlate assessment findings based on the algorithm. If the patient does not exhibit clinical signs and symptoms of a UTI such as a fever, there is a need for further observation of the patient to rule out other medical conditions.

This doctoral project holds significance for the field of nursing practice because it can help improve the way nurses recognize active symptoms of an infection requiring treatment through evidence-based practice. It can also help improve communication between the nurse and the physician, eliminating confusion regarding treatment. The project may also help nurses to become proficient in assessing for urological abnormalities such as dysuria and hematuria in addition to recognizing when to notify the physician.

Purpose Statement

In the LTC setting, providers empirically prescribe due to the limited availability of diagnostic testing (McMaughan et al., 2016). In other words, providers prescribe antibiotics without evidence of an active infection. But, antibiotics with minimal effects should be used for

uncomplicated UTI infections, whereas fluoroquinolones should be used for infections such as pyelonephritis (Percival et al., 2015). Further, when a patient presents with symptoms such as fever, dysuria, or a change in mental status, there are no specific parameters or guidelines that the nurse can use to determine if symptomology warrants additional testing to validate a positive UTI. There can also be differences among physicians—one physician' prescribed length of treatment for an e. coli UTI could be 3 days, and another physician' prescribed length of treatment for the same infection can be 5 days. Additionally, pathogens that cause a UTI in a patient with a neurogenic bladder will be different from the pathogens that cause a UTI with a catheter (Yamamoto, 2016), which means the length and amount of treatment will vary. There are also no general guidelines that practitioners use to determine appropriate antibiotic therapy based on the microorganism. Treatment of a UTI ranges from 5 to 14 days, depending on the severity with an average treatment of 7 days (Yamamoto, 2016). Therefore, in LTC, there is a knowledge gap in the ability of providers to determine appropriate antibiotic treatment regarding the microorganism.

This DNP project helped to enforce specific recommendations for managing symptoms and prescribing antibiotic treatment by evaluating the results of the implementation of an evidence-based ASP. Utilizing an algorithm helps to guide staffs' decisions regarding the initiation and appropriateness of treatment. In this project, focusing on the treatment of UTI's in the older population, the following practice-focused question was proposed: How will the implementation of an evidence-based ASP in a nursing home in Maryland impact the overuse of antibiotics in that clinical setting? There was a potential to address a gap in nursing practice by

providing nurses with resources and specific guidelines regarding appropriate treatment options for patients experiencing a UTI. There was also a lack of specific guidelines regarding comprehensive treatment options for patients experiencing a UTI. Nurses were provided with the algorithm, which identified specific criteria each patient needed to have to begin antibiotic treatment.

Nature of Doctoral Project

As a quality improvement project, data were collected monthly for 3 months to determine the effectiveness of the ASP. A review of the medical record for each patient during the month helped to determine the appropriateness of the antibiotic treatment. For instance, a review of the nurse's notes helped to determine if the patient complained of or presented with active symptoms of an infection. The three most qualifying criteria used to determine an active UTI in the older population are bacteriuria, pyuria, and other symptoms (Midthum, 2004). A review of the lab results also determined if the patient met the criteria for antibiotic treatment. A microorganism > 100,000 colony forming units is usually indicative of an active infection requiring antibiotic treatment (Midthum, 2004). Data were compared to an algorithm to determine appropriate treatment options for a UTI.

A spreadsheet was used to keep data collection organized. Information obtained on the spreadsheet helped to identify the consumption of antibiotics and the appropriate antibiotic treatment for the microorganism. Data collection was compiled weekly, placed in folders labeled by the month, and stored electronically to prevent loss or damage. A password-protected spreadsheet was executed using Microsoft Excel to assist with data storage and protection.

Patients were identified using numbers to protect privacy. The purpose of the project was to evaluate the use of an ASP to assess its effectiveness in eliminating or decreasing the inappropriate use of antibiotics in the LTC setting while maximizing patient outcomes and improving the nurses' ability to recognize the appropriateness of antibiotic treatment.

Significance

The potential stakeholders who benefit from this project include pharmacies, insurance companies, healthcare facilities, nurses, and physicians. The older population are the main stakeholders because the inappropriate use of antibiotics can lead to an increase in drug resistance, which can affect health outcomes in this population But pharmacies also play an essential role in dispensing and monitoring antibiotic usage in addition to adjusting dosages based on lab results. Insurance companies can also play a part in ASPs because they determine the approval process for the antibiotic, so they help to ensure that providers are prescribing the right medication before authorizations for certain antibiotics ("Stakeholders Perspectives," 2009). Healthcare facilities are also essential stakeholders because they must consume the cost associated with antibiotic resistance, which is approximately $55 billion (Manning, Pfeiffer & Larson, 2016).

Nurses were also stakeholders because they are patient advocators and are responsible for making sure that the physician is fully aware of the patients' current condition. Nurses in the LTC setting are responsible for the prevention and recognition of infections as well as timely notification to the providers for proper treatment (Freeman-Johnson, Rogers & Ward-Smith, 2016). Nurses are also responsible for administering and monitoring antibiotic usage and should

be cognizant of whether the patients' treatment plan is still applicable following the results of the urine specimen (Manning et al., 2016). Nurses should be able to recognize when patients are experiencing active symptoms of a UTI, especially because patients in this population will often experience cognitive deficits that affect their ability to communicate abnormal findings, which interferes with accurate diagnosing (Walker, McGeer, Simor, Armstrong-Evans & Loeb, 2000). Nurses should be able to identify subtle changes such as irritability, increased agitation, or urinary incontinence to initiate the appropriate treatment plan (Walker et al., 2000). Nurses also play a role in ordering urine cultures and managing antibiotics; therefore, they need to be familiar with current practices to eliminate the overuse of antibiotics. For example, foul-smelling urine is no longer indicative of the need to obtain a urine specimen, which requires further intervention (Walker et al., 2000).

The development of an ASP helped to eliminate misconceptions regarding the appropriateness of treating UTIs and helped to guide the practitioners' decision making when ordering medications. Having nurses involved in the implementation of an ASP enables them to be proactive in helping to eliminate the overuse of antibiotics in LTC facilities (Wilson et al., 2017). Education can help increase the nurses' awareness of the incidence of antibiotic usage and the long-term effects on patient outcomes.

Physicians also benefited from the implementation of the project. Physicians rely significantly on the nurses' ability to communicate pertinent information, which can be influential in the patients' plan of care. Determining whether treatment is warranted has also been a challenge for many healthcare providers. Some physicians also felt that by not treating

with antibiotics increase symptoms and leads to confrontation between the physician, nurse, and family (Leduc, 2014). This then leads to inappropriate antibiotic use, causing an increase in antibiotic resistance, possible drug reactions, and antibiotic -associated infections (Norman et al., 2014).

The ASP is potentially transferable to other settings, such as an acute care organization and private practices, because UTI management is the same regardless of the setting. Per the CDC (2014), 39% of UTI diagnoses in the acute care setting could be avoided (as cited by Schultz, Hoffman, Pothof & Fox, 2016). UTIs have been the most frequently diagnosed problem in the emergency department, and due to limited microbiology testing, treatments for UTIs have been based on clinical findings according to evidence-based practice guidelines while limiting the use of broad-spectrum antibiotics (Zatorski et al., 2016). Primary care physicians in the community are also inappropriately prescribing antibiotics. Limited laboratory facilities and the inability to obtain urine specimens causes the physician to treat UTIs empirically (Canbaz, Peksen, Tevfik-Sunter, Leblebicioglu, & Sunbul, 2002). For example, current clinical practice guidelines indicate that appropriate treatment for a UTI is warranted if the urine sample is positive (Morrison-Pandy, Ross, Ren & Garand, 2015). The ASP will need to be revised to meet the needs of the different practice areas; however, it can help to improve the current process of identifying, managing, and treating UTIs in the older population across all healthcare settings.

The outcomes of the project can help facilities to evaluate their current practices, which includes how to utilize diagnostic tests to treat infections appropriately. Medical staff trained in both infectious disease and antibiotic treatment will help to improve treatment outcomes under

the ASP (CDC, 2016). In collaboration with physicians and nurses, the pharmacists will be able to effect positive social change by monitoring the ordering of antibiotics and reviewing lab data to validate appropriate treatment (CDC, 2017). Implementation of an ASP also limits the use of antibiotics, which decreases healthcare costs (Baur et al., 2017). Further, the implementation of the ASP can ultimately improve the well-being of the older population.

Summary

The overuse of antibiotics continues to affect the LTC community. Empiric treatment should be indicated once the urinalysis and cultures are completed. But in the LTC setting, the physicians rely significantly on the nurses' knowledge and assessment skills when communicating abnormalities that can cause inconsistencies with treatment. The ASP helped to improve nurses' ability to recognize changes in patients' status by assessing for urological changes, including fever. The use of an antibiotic algorithm thus helped guide nurses' decisions regarding appropriate treatment options. This project can help to increase the knowledge of health care providers and improve patients' and families' awareness of the impact of using antibiotics appropriately. Section 2 focuses on the background and context of the project, which includes the concepts and theories guiding the project, relevance to nursing practice, local background, and role of the DNP student.

Section 2: Background and Context

Introduction

The overuse of antibiotics in the LTC community continues to be a significant concern to healthcare providers due to the impact on the older population. For example, according to Parish and Holliday (2012), ciprofloxacin was used to treat 76% empiric cases of UTIs even though only 31% of the samples were susceptible to ciprofloxacin. Inappropriate treatment leads to a decline in the patient's condition, which can lead to problems like antibiotic-associated diarrhea. Broad-spectrum antibiotics with an extended treatment duration should be warranted when clinically appropriate (Crnich, Jump, Trautner, Sloane, & Mody, 2015). The following practice-focused question was proposed to manage symptoms of a UTI better: How will the implementation of an evidence-based ASP in a nursing home in Maryland impact the overuse of antibiotics in that clinical setting?

The purpose of the ASP at the project site was to ensure that older patients received the correct antibiotic, the appropriate dose, and the proper length of treatment, limiting the overuse of antibiotics. It also encouraged the nurse nurses to perform a thorough assessment checking for a fever, dysuria, or flank pain before notifying the physician. In the LTC setting, the physicians relied on the nurses' knowledge and assessment skills when communicating abnormalities. The program also made nurses aware of the impact of treating patients for UTI who did meet the criteria. The algorithm helped to improved current practices of identifying and treating UTIs when clinically appropriate.

Concepts, Models, and Theories

The application of theories to nursing practice helps to improve patient care, increases education and knowledge of nurses, helps to identify new methods, and increases the opportunity for further research (Colley, 2003). Analyzing concepts helped me to examine relationships between various meanings to determine its relationship or validity to the study (see Gray et al., 2017). Ajzen and Fishbein originally developed the theory of reasoned action, later revised to the theory of planned behavior (TPB; McEwen & Wills, 2014). The most important attribute of a person's willingness to respond to behavior is intention, which can be determined by the individual's approach toward the behavior, individual standards, and how the individual sees themselves as having control over the behavior (McEwin & Wills, 2014). An abrupt change in a process can cause individuals to feel overwhelmed or reluctant about making the change. The theory of planned behavior is used to give direction to understanding employees' responses to changes within the organization (Jimmieson, Peach, & White, 2008). The theory can also be useful in encouraging positive behavior changes when addressing health promotion actions (McEwen & Wills, 2014). Thus, the theory of planned behavior was the most appropriate to use for evaluating the implementation of an ASP to decrease the inappropriate use of antibiotics in LTC.

The theory of planned behavior has been used in continuing education, health promotion activities, and improvements in clinical practice (Strand & Lindgren, 2010). Education is essential for allowing change because it helps to boost confidence and increase knowledge, which allows individuals to be more receptive to adapting to a changing environment. Therefore, this theory guided nursing practice because the concentration on behavior change is

the foundation for implementing changes in healthcare. The staff was required to utilize an algorithm when communicating with the physicians who were also required to follow the algorithm when prescribing or giving orders to the nurse. The nurses had to recognize that using the algorithm would decrease the number of prescription antibiotics, which would improve patient outcomes. If the staff did not see this change in practice beneficial, they would not be willing to accept the change, as individuals are eager to accept the behavior change if they feel that it will have a positive outcome (Gantt, 2001). How individuals respond to change is also influenced by attitude toward the behavior based on beliefs, the leaders' impact on specific actions, and barriers that interfere with the ability to perform (Strand & Lindgren, 2010). Individuals' understanding, skills, and experience can also influence one's intent to modify or change their behavior.

Based on the theory of planned behavior, there are several types of interventions that can impact how the individual will respond to the behavior or intention (Ajzen, 2015). Activities that prevent the individual from acknowledging the objective of the behavior can prevent the person from carrying out the intention or purpose of the behavior (Ajzen, 2015). There are also many reasons why individuals will choose to react to changes in their environment. The theory of planned behavior can be used to encourage positive behavior if the individual sees that the behavior will have a positive outcome (McEwen & Wills, 2014), as individuals may lack the motivation to act or be inclined to positive intentions to perform the behavior (Azjen, 2015). For example, there are going to be individuals who will see the ASP as a positive influence, and others will see it as another task to complete. For an individual to act upon a behavior, they must

sense that the action will bring about a positive effect, but individuals who can also have positive intentions but fail to perform (Azjen, 2105). Thus, individuals must have the resources they need to act on those intentions to those behaviors.

Further, research has also indicated three determinants of intention that signifies the individuals' willingness to adapt to a changing environment (Jimmieson et al., 2008). The first determinant is the individuals' attitude and desire to participate in the change (Jimmieson et al., 2008). For instance, providing the nurses with the algorithm helps to guide their decisions regarding appropriate antibiotic treatment at the time of notifying the physician. This process requires commitment and dedication from the nurse. The second determinant of intention is whether the change has a social influence (Jimmieson et al., 2008). An individual who lacks confidence or is insecure in their abilities might be reluctant to accepting change such as a nurse who is not strong clinically and may not feel confident in her ability to communicate with the physician. The third determinant is perceived control over the behavioral aspect of the change (Jimmieson et al., 2008). The nurse needs to feel in control of the process, or compliance can be challenging. Any adverse outcomes because of the change will have a detrimental effect on the nurses' ability to change their behavior. With the implementation of the ASP, nurses also need to educate residents and families regarding the change in clinical practice.

Relevance to Nursing Practice

Nurses in the LTC setting must be able to rely on their ability to analyze or identify whether patients have a urological abnormality such as complaints of dysuria or hematuria that will result in the need for further intervention. This, however, can be challenging for nurses

because older patients may not always present with the typical signs of a UTI. Due to physiological changes that occur in the bladder as an individual age, recognizing and diagnosing a UTI is challenging because older patients develop bacteriuria, which causes asymptomatic responses in the body due to other comorbidities such as diabetes (Naish & Hallam, 2007). Bacteria found in the urine in the absence of symptoms is usually due to contamination (Naish & Hallam, 2007).

In 1988, the Clinical Laboratory Improvement Amendment made it necessary for LTC facilities and private practices to diagnosis a UTI using a urine dipstick (Midthum & Bruce, 2005). In LTC facilities, nurses are the ones responsible for performing this test. Implications for conducting this test were instituted by Centers for Medicare and Medicaid Service, which required that facilities enroll in the Clinical Laboratory Improvement Amendment program, pay certification fees, and follow testing guidelines per the manufacturer (Midthum & Bruce, 2005). Nurses at that time were responsible for proper identification of the correct patient, adequate storage, and labeling of specimens and accurate documentation of the results (Midthum & Bruce, 2005). Waiting for a urine culture, which required the collection of a clean catch urine specimen, can be considered a delay in treatment. The urine specimen was positive if the bacteria was greater than 15 high-power fields on microscopic examination (Blair, 2007).

The prevention of a UTI is just as important as diagnosing and treating a UTI. Nurses need to ensure appropriate infection control practices, such as proper hand hygiene, appropriate cleansing of the perineum, confirming that urinary catheter bags are maintained below the bladder, and ensuring adequate fluid intake is maintained (Naish & Hallam, 2007). Not

recognizing symptoms of a UTI or misdiagnosing patients can have detrimental health effects on the older population (Naish & Hallam, 2007).

The current project helped to advance nursing practice by allowing the nurse to use critical thinking skills when trying to identify whether a patient presented with symptoms of a UTI or other medical conditions requiring further treatment. The nurses were required to utilize the algorithm to identify symptoms and determine the need to collect a urine sample or notify the provider to rule out other medical conditions.

Local Background and Context

The use of antibiotics in the LTC community is becoming more prevalent, leading to adverse drug reactions and healthcare-associated infections that could potentially lead to death or other chronic health conditions (Lee et al., 2015). The use of an ASP helps to hold individuals accountable for ensuring correct diagnosis and appropriate treatment based on the organism. The program helped to ensure that nurses, physicians, pharmacists, and nursing leaders developed a collaborative approach in making sure that patients were treated for active infection and not AB, which is a contaminated specimen. Additional education helped improve the nurses' ability to recognize subtle changes in the patients' behavior and or urological status. The ASP also helped nurses to critically think in situations that may not be associated with a UTI.

The impact of antibiotics on the older population was significant to organizations because of the possible effect on patient outcomes. Providers were prescribing antibiotics without verifying that the patient has a UTI. Patients and families were also requesting the ordering of antibiotics without indications of an active infection. Furthermore, not identifying symptoms of

a UTI can result in an overuse of antibiotics. The organizations' awareness of the need for antibiotic stewardship to improve current practices while providing evidence-based education to staff was evident in their support for this DNP project. Nursing directors can be influential in reducing inappropriate use of antibiotics by reinforcing policies on antibiotic stewardship (Brandt & Heil, 2016). Adverse patient outcomes could impact reimbursement opportunities. Organizations are penalized when patient outcomes are not met, which can affect reimbursement. Centers for Medicare and Medicaid Service has developed policies that affect or limit the amount of reimbursement an organization receives based on clinical outcomes (Zielinski et al., 2014). Organizations must stay abreast of current regulations and practice guidelines to improve patient outcomes and avoid financial penalty.

The CDC and the Centers for Medicare and Medicaid Service have made it a national priority to address the inappropriate use of antibiotics by organizing an ASP. Studying the prevalence of antibiotic usage and establishing prescribing guidelines have been implemented to improve the prescribing of antibiotics in the LTC setting (Zimmerman et al., 2015). New and advanced technological diagnostic tests are being implemented in addition to more stringent antibiotic protocols to decrease the overuse of antibiotics (Miller, 2015). The Combat Antibiotic-Resistance Bacteria is being utilized to minimize antibiotic resistance by instituting ASPs in healthcare facilities, utilizing surveillance to determine the extent of antibiotic resistance, using the narrowest spectrum antibiotic based on diagnostic results, eliminating the use of antibiotics in food sources, avoiding the inappropriate use of antibiotics, and providing alternative treatment options for infections (Miller, 2015).

The Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America have also been instrumental in developing guidelines to maximize the effectiveness of ASPs focusing on appropriate therapies to improve patient outcomes and decrease drug resistance and adverse drug reactions (Dang & Huynh, 2016). According to Dang and Huynh (2016), the infectious disease pharmacists play an intricate role in antibiotic stewardship because they are responsible for auditing the appropriateness of antibiotics and making recommendations to prescribers regarding antibiotic resistance.

The CDC is currently mandating that LTC facilities implement measures to reduce the inappropriate use of antibiotics to prevent complications due to antibiotic resistance ("Protecting Nursing Home Residents" 2015). For those facilities that have implemented an ASP, the CDC states that the program must include at minimum eight core elements and they are:

- Leadership Commitment- someone committed to the appropriate use of antibiotic
- Accountability- leader responsible for overseeing the program
- Drug Expertise- a person with the ability to educate others
- Action- improve the process for ordering prescription antibiotics in the facility
- Tracking- measure results, associated antibiotic infections
- Reporting- inform providers, family, and staff of new process for antibiotic prescribing
- Education- provide educational resources to providers, families, and staff regarding antibiotic resistance ("Protecting Nursing Home Residents" 2015; CDC, 2017).

Centers for Medicare and Medicaid Service has been centering on decreasing healthcare-associated infections, which is directly related to the inappropriate use of antibiotics (Schroder, 2015). When there is resistance to an antibiotic, they are no longer effective in eradicating bacteria (Schroeder, 2015).

The CDC (2017) defined antibiotic stewardship as "a set of commitments and actions designed to optimize the treatment of infections while reducing the adverse events associated with antibiotic use" (Introduction section, para 1). The Association for Professionals in Infection Control and Epidemiology (APIC; n.d.) defined antimicrobial stewardship as "a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multidrug-resistant organisms" (Antimicrobial Stewardship section, para 1). Both definitions align with the goals of eliminating the overuse of antibiotics that are not appropriate for treating a UTI.

Role of DNP Student

I have worked in the LTC industry for over 10 years, and during that time have developed compassion for ensuring the respect and dignity of the patients. As director of nursing, I had a professional obligation to ensure that patients were receiving care that was appropriate and necessary to meet their health care needs.

As an employee of the organization where the project was implemented, I had direct access to the patients' electronic medical records and pharmacy databases. I was able to review

the lab results, nursing notes, and physicians' progress notes. While on-site at the facility, I was able to observe the communication between the nurse and provider.

As a manager, I was required to educate residents, family, and staff on the importance of appropriate antibiotic treatment. Validating the proper antibiotic and the adverse outcomes required me to be mindful of the correct treatment options. In addition to checking for the right antibiotic, I also checked to ensure that patients met the criteria for treatment. It was hard to break a practice that has become so routine for most nurses. Older patients have the right to adequate and proper treatment.

Project implementation occurred at the facility where I was also employed. Providing patient care during data collection or interfering with how the nurse communicated with the physician by making suggestions or telling the nurse how to handle a specific situation could have impacted the data. Data collection did not occur during work hours to eliminate partiality. Nurses received instructions to follow guidelines according to the algorithm. No specific information regarding the data obtained for the project will be discussed except for aggregate data.

Summary

The inappropriate use of antibiotics in the LTC can have detrimental health effects on the older population due to pathophysiological changes that occur as individuals age. The treatment and management of UTI required interventions that were appropriate for the infection to help to decrease antibiotic resistance. Nurses played a vital role in identifying physiological changes in the patients' conditions that warrant additional intervention. In the LTC setting, physicians

relied significantly on the nurses' ability to recognize a difference in the patients' status, critically analyze that information, and notify the physician accordingly. The ASP provided nurses with the ability to analyze assessment data and determine the best choice of treatment or interventions based on the algorithm. There was also a gap in knowledge regarding the current practice of utilizing an ASP to help guide health providers' decisions regarding appropriate treatment options. Execution of the project occurred in one skilled nursing facility to evaluate the ability to eliminate the inappropriate use of antibiotics in the LTC setting. The analyzed data helped to determine the impact of the project on the overuse of antibiotics. The information helped to evaluate the nurses' ability to recognize the symptoms of a UTI requiring appropriate treatment.

Section 3: Collection and Analysis of Evidence

Introduction

The overuse of antibiotics in the older population has been a significant concern in the healthcare setting that warrants improved practice guidelines. Treating patients who do not present with clinical manifestations of an active infection leads to the inappropriate use of antibiotics. The purpose of this DNP project was to evaluate the effectiveness of an algorithm in eliminating the overuse of antibiotics. Nurses at the project site were required to communicate identified symptoms to the physician so that appropriate treatment and or further medical follow up could be implemented. The use of an algorithm can help to guide the nurses' decision on whether the symptoms require antibiotic treatment. The algorithm can also help guide the physicians' decision, whether antibiotic treatment and or the length of treatment is appropriate for the infection. Collaboration and communication among all stakeholders were important to enhance and improve practice guidelines delineated under the ASP. The subsequent sections are focused on the sources of evidence, the data collection process, and how the data were evaluated and analyzed.

Practice-Focused Questions

Older patients have been inappropriately treated with antibiotics when there was no evidence of an active infection, which can have detrimental health effects. Most often, patients have received antibiotics for AB, which is not indicative of an active infection. AB presents with bacteria in the urine; however, the patient does not present with clinical symptoms (Trautner, 2015). The recommendation to initiate an ASP within the LTC community was needed to

provide guidelines regarding antibiotic usage and length of treatment, to monitor the prevalence of antibiotic prescribing in the absence of an active infection, and to monitor the incidence of antibiotic-associated infections. To improve the process of how antibiotics were prescribed in the LTC setting, the following practice-focused question was addressed: How will the implementation of an evidenced-based antibiotic ASP in a nursing home in Maryland impact the overuse of antibiotics in that clinical setting?

The purpose of this DNP project was to evaluate the effectiveness of the algorithm in eliminating the overuse of antibiotics. The algorithm provided nurses with a set of guidelines to follow depending on the type and number of symptoms the patient was experiencing. Providing nurses with information regarding the algorithm may improve clinical practice and eliminate adverse effects associated with the overuse of antibiotics. The ASP aligns with the focus question because it can increase staff awareness of the importance of managing and treating UTI symptoms using an algorithm. The algorithm is also useful in providing antibiotics type, dose and length of treatment depending upon presenting symptoms, and culture results. When patients present with symptoms, the nurse and physician utilized the algorithm to determine whether the patients' symptoms were indicative of the need to treat with an antibiotic. Furthermore, the use of the algorithm helped guide the clinical decision regarding the need for treatment, which helped to improve nurses' communication with the physician.

Source of Evidence

Multiple electronic databases were used for this project including ProQuest, Cinahl, ProQuest & Allied Health Services, EBSCO Health, Science Direct, and Medline to obtain

relevant research data. Government websites such as Centers for Medicare and Medicaid Services and CDC were also used to provide evidence of the governments' obligation to ensure that health facilities are compliant with implementing practices to eliminate the overuse of antibiotics, thereby reducing the patient risk of antibiotic-associated infections and other complications. The utilization of key terms and phrases yielded results explicitly related to antibiotic use in the LTC setting. Phrases used included the *treatment of UTI in the elderly* and *long-term care UTI*. A Boolean search revealed a more comprehensive and exhaustive search. Phrases used were the *treatment of UTI and elderly, antibiotic treatment of UTI and elderly, UTI in the elderly* and *antibiotic treatment, UTI treatment, elderly* and *LTC, antibiotic* and *UTI* and *LTC, antibiotic stewardship,* and *antibiotic stewardship* and *UTI*. The literature search did not consist of any specific publication dates. Most of the literature was current within the past 10 years. This supports the fact that inappropriate use of antibiotics in the LTC setting has been an ongoing significant problem that continued to be a priority in healthcare. The literature review consisted of peer-reviewed scholarly journals and journals that supplied full texts.

Evidence from the Literature

Symptoms of a UTI are usually more complicated in the older adult population due to their age, physical disabilities, and diabetes (De Vecchi et al., 2012). The treatment for UTIs is prescribed based on clinical symptoms, which includes a positive urinalysis and or urine culture. But studies have shown that older patients have AB, which in most cases does not require the use of antibiotics because it is present in the urine without the presence of an active UTI (Kjolvmark et al., 2016). For example, Hedin, Peterson, Wideback, Kahlmeter, and Molstad (2002)

conducted a study and found that 55 (23%) patients had AB with e. coli being the most common microorganism accounting for 67%. Additionally, many older patients in the LTC setting may have pyuria present in their urine, which accounts for 90% of AB that does not warrant treatment with antibiotics (Kjolvmark et al., 2016). Research has also shown that e. coli (44.8%) was the primary organism that caused UTIs, followed by Proteus mirabilis at 20.4% (De Vecchi et al., 2012). In another study of 118,070 residents, only 8% met clinical symptoms of UTI and were started on antibiotics, while e. coli accounted for 70% of the organisms (Doernberg et al., 2015).

Physicians must be knowledgeable about updated guidelines regarding antibiotic resistance before initiating treatment (Haasum et al., 2013). For instance, utilizing antibiotics to treat AB increases antibiotic resistance, which can have detrimental health effects and increase the cost of healthcare (Doernberg et al., 2015; Sefton, 2000). Antibiotic resistance can eventually lead to increase mortality due to the inability to treat life-threatening infections ("Stakeholders Perspectives" 2009). Though, empirical treatment is sometimes warranted due to limited diagnostic capabilities in the LTC setting, this form of treatment leads to the overuse of antibiotics (McMaughan et al., 2016). For example, in a retrospective study, ciprofloxacin was used to treat 76% empiric cases of UTIs; however, only 31% of the samples were susceptible to ciprofloxacin (Parish & Holliday, 2012). Therefore, there is a need for education regarding the signs and symptoms of a UTI in the older population requiring appropriate intervention

Additionally, nurses may lack adequate knowledge regarding abnormalities in urine specimens, supporting the need for ongoing education so that nurses could identify symptoms of a UTI. Antibiotic management is needed to ensure the appropriate and accurate length of

treatment and discontinuation of treatment if the medication was inappropriate. The prescribing of antibiotics in the absence of an active infection predisposes the older population to antibiotic-associated infections and drug resistance. Thus, eliminating the overuse and inappropriate use of antibiotics in the LTC can improve patient outcomes.

Evidence from the Project Site

The effectiveness of the staffs' ability to utilize the algorithm to determine appropriate treatment was completed via a chart review. A review of the patients' medical records consisted of nursing notes, medication administration records, and pharmacy databases. A chart review was conducted for patients who received antibiotics for the treatment of a UTI. A review of the nursing notes helped determine if the patient complained of or presented with active symptoms of an infection. The three qualifying criteria used to determine an active UTI in the older population were bacteriuria, pyuria, and clinical symptomology (see Midthum, 2004). A review of the lab results helped to determine if the patients met the criteria for antibiotic therapy. According to Midthum (2004), a microorganism >100,000 colony forming units/ml indicated an infection and required antibiotic treatment. Data from the patients' medical records were compared to the algorithm to determine compliance with treating an active infection.

The collected data was analyzed to determine if the nurses and physicians followed the algorithm when implementing treatment. The lab results identified the source of infection, type of microorganism, and provided sensitivity results. The sensitivity results helped the nurse or provider determine which antibiotic was resistant or sensitive to the microorganism. A review of the data from the pharmacy databases helped to identify antibiotic dose, classification, and length

of treatment in the absence of the medication administration record. The medication administration record identified the name, dosage, route, duration of treatment, and whether the patient received the medication. The nurses' notes revealed if the patient presented with symptomology that would warrant additional intervention for the treatment of a UTI. If the patient presented with symptoms of a UTI and had a positive urine culture with the correct dose and duration, the treatment was considered appropriate. If the patient received an antibiotic with no evidence of an active infection, the treatment was inappropriate. The nurses' notes showed if the nurse documented changes in the patients' condition, such as mental status changes, hematuria, flank pain, and if the nurse was proactive in notifying the physician. If patients presented with symptoms and the nurse followed the algorithm, documentation would reveal urine culture results and possible treatment. If nursing notes revealed changes in mental status and another medical testing, it suggested that the nurse followed the algorithm by notifying the physician for further medical workup as mental status change alone is not indicative of the need to obtain a urine specimen. If a review of the medical record revealed that patients were being treated appropriately, then it would be safe to say that the ASP was effective in eliminating the overuse of antibiotics. It will also conclude that the staff was able to identify symptoms of a UTI that warrant antibiotic treatment.

The medical record disclosed those patients who present with symptoms of a UTI warranting a urinalysis or other medical diagnostic testing. Lab and sensitivity results helped the nurse determine if the antibiotic, dosage, and length of treatment were appropriate. Comparing the sensitivity results to the physicians' orders and comparing the prescribed antibiotic to the

algorithm validated if appropriate antibiotics were prescribed. Antibiotic, dose, and length of treatment were compared to the algorithm to determine if the correct treatment was ordered consistent with recommendations identified on the algorithm.

Data obtained from the medical record was relevant to the practice problem because the project evaluator was able to determine base on the number of antibiotics prescribed whether the algorithm was used to help determine the appropriate treatment. It also helped to identify a decrease in the number of prescription antibiotics. Prompt identification of symptoms would lead to quicker diagnosis and a better response to treatment. If the medical review had revealed the initiation of antibiotic treatment before lab testing and sensitivity results, the ASP was not effective in decreasing the overuse of antibiotics.

The project took place in one skilled nursing facility location on the East coast. The facility is corporately owned and had an administrator and a director of nursing at the facility. Nursing staff and physicians were in-serviced on the requirements of the ASP before the start of the program; however, the inability to provide training to new staff could have had a negative impact on the outcomes of the project, causing less validity. Another limitation of the project was the inability to control the physicians' preferences of treating empirically and prescribing antibiotics based on the desires of patients and families. The organization utilized a pharmacy database, which provided a report of antibiotics delivered to the facility for the month. The report helped the program evaluator to determine the number of patients who received antibiotics. Access to data included the ability to review nursing documentation, lab results, medication administration record, and the pharmacy database.

Before gaining access to the evidence, Walden's IRB approval was required. Permission was also necessary from the company's legal department, the administrator, director of nursing of each facility, and the information technology department, before initiating the project. Access to data included the ability to review nursing documentation, lab results, medication administration record, and the pharmacy database.

Nursing documentation is a legal document; therefore, it should be accurate and complete to the best of the nurses' ability (Paans, Sermeus, Nieweg & Van der Schans, 2009). A review of the patients' medical records was the best way to obtain objective data as it related to the treatment of a UTI. Documentation of symptoms, lab results, and antibiotic treatment in the medical record was considered reliable data. Nursing notes reflect treatments and expected outcomes and should be accurate and reflect unambiguity (Paans et al., 2010). Data collection occurred for three months after implementation to determine if the ASP was influential in eliminating the overuse of antibiotics.

The ASP helped the provider to evaluate and limit the number of antibiotics given inappropriately in the LTC setting. An algorithm helped to establish a set of guidelines to assist nurses in determining the appropriate plan of care. The algorithm provided a list of criteria for patients without a urinary catheter. Before notifying the physician, the nurse had to utilize the algorithm to determine the best treatment approach based on the patients' symptoms.

The algorithm identified symptoms that required further nursing assessment and a follow-up phone call to the provider. A review of recommendations increased the nurses' awareness of appropriate treatment. Nurses located within the skilled nursing facility contributed data to the

project by communicating changes in the patients' status to the provider promptly. Timely notification of symptoms impacted patient outcomes. If patients received empirical antibiotics, nurses had to alert the provider of the microorganism. If treatment was not appropriate for infection type, the nurse needed to alert the provider for new antibiotic orders. On the other hand, if the results indicated AB, the nurse was required to inform the physician. Early identification and prompt notification of lab results provided reliable data that the program evaluator analyzed to determine the efficacy of the ASP. A decreased in the overuse of antibiotics was a direct reflection of the nurses' educational obligation to eliminate the adverse effects of antibiotics on the older population.

Recruitment of patients was not needed for this project. A medical records review provided evidence of those patients on antibiotics during the month with a UTI. Program consent was not required. The project helped to evaluate quality improvement initiatives and patient outcomes at the facility.

Data collection conducted at the project site consisted of demographic material and relevant quantitative data focusing on the prescribing of antibiotics. Data collection by project staff occurred weekly, mostly on the weekends, to eliminate the omission of data due to discharges, and then data were transferred on to an electronic spreadsheet. Data collection forms were placed in a folder and labeled by the month. Data stored electronically helped to protect the information from damage, which can be later used for other analytical purposes (Gray et al., 2017). After collecting and analyzing the data, antibiotics were classified under drug type, dose,

duration, and de-escalation. Data were reviewed for accuracy before placing it on a Microsoft Excel spreadsheet.

The identity of each patient was protected during the project by using numbers based on when they were placed on antibiotics. Antiviral protection was downloaded on the computer to protect data from being affected by viruses. Only the program evaluator had access to the computer, which was also be password protected. Data storage occurred on an encrypted laptop provided by the organization where the project was implemented. An encrypted flash drive was requested to ensure the integrity of data in the event the computer is lost, stolen, or destroyed. The flash drive was secured in a locked drawer at the facility after all data was saved on the laptop and updated.

According to Polit (2010), nominal measurement classifies variables using numbers and or letters. Data were analyzed to determine whether the correct classification of drug was used for the right organism or whether the dose and or duration of antibiotic was the appropriate treatment. Data analysis also determined if antibiotics were discontinued or changed based on culture results.

Analysis and Synthesis

Data obtained from the patients' medical records were placed onto a data collection form for each patient. Identification occurred using numbers in the order the patient was placed on antibiotics not to disclose the identity of the facility in case of theft or lost data. The spreadsheet had specific headings that correlated to the data obtained. See headings below:

- Age

- Presenting symptoms if yes, what were the symptoms, no
- Was physician notified- yes or no
- Urinalysis & culture ordered, yes or no
- Urinalysis results

  Culture results- organism present
- Empiric treatment ordered, yes or no
- Name of antibiotic
- Antibiotic dose
- Length of treatment
- If urinalysis & culture results negative, was treatment discontinued
- Drug classification
- Treatment appropriate according to the algorithm.

Information was entered directly onto the data collection form at the facility.

Data were collected weekly, usually on the weekends, between the hours of 9 am to 3 pm. In the event patients had been discharged, charts were obtained from medical records.

Summary

The inappropriate and or overuse of antibiotics in the LTC has detrimental health effects on the older population. Existing evidence showed that improper treatment of AB increased antibiotic resistance and caused patients to exhibit symptoms of antibiotic-associated infections. ASP helped the provider to audit the use of antibiotics and eliminate those antibiotics that were not effective for treatment (Baur et al., 2017). Utilizing an algorithm helped guide healthcare

providers' decisions when deciding appropriate treatment options. The algorithm also helped to determine if the program was effective in eliminating the overuse of antibiotics in the LTC setting and if it was beneficial in improving the nurses' ability to recognize symptoms of a UTI. The next section will focus on the findings, recommendations, strengths, and limitations of the project.

Section 4: Findings and Recommendations

Introduction

Despite continued efforts to apply antibiotic stewardship per the CDC guidelines to manage patients with a UTI, the overuse of antibiotics has still been a problem in the LTC community. Older patients are prone to UTI related to age-associated changes involving the bladder, post-void residuals, and other comorbidities (Irwin & Forrester, 2019). However, they are often treated unnecessarily for a condition called AB, which lacks urinary symptoms to support antibiotic treatment (Duncan, 2019). The treatment of AB in the absence of an infection is usually related to the onset of mental status change (Irwin & Forrester, 2019). Suspected UTIs without diagnostic testing also accounts for 30-60% of antibiotics prescribed in LTC (CDC, 2017).

This project was conducted to address a gap in practice, as nurses at the project site lacked adequate knowledge regarding the recognition of signs and symptoms that would warrant treatment for UTI. When patients start to display symptoms such as a fever, it should warrant additional interventions. However, as patients age, pathophysiological changes in the body result in lower body temperatures; therefore, a temperature elevation may not be recognized as a fever (Leduc, 2014). Nurses should know the patients' average temperature to acknowledge that there is a change requiring further implications. Thus, implementation of an evidence-based UTI algorithm was done to improve communication between the nurse and the provider as well as increase the use of evidence-based practice guidelines for managing patients presenting symptoms versus those with a confirmed infection. Nurses were required to utilize an algorithm

when assessing the patient, which provided them with specific guidelines before notifying the provider for further interventions. Resources were also provided to improve nurses' assessment skills and increase the identification of patients who may or may not have needed treatment with antibiotics.

The algorithm was used to guide the evaluation to determine if nurses followed the exact process for obtaining a urinalysis and notifying the physician before starting empiric treatment. The algorithm gave support to analyzing if the right antibiotic, dose, and treatment duration were taken into consideration when treating the patient who had an active UTI infection according to the algorithm. The requirements for obtaining a urine culture included acute dysuria or gross hematuria and new or an increase in urinary incontinence, urgency, or frequency. Per the algorithm, fever, leukocytes, and or more than one of the following was necessary for a urine specimen collection, and they include new or a costovertebral angle tenderness, including the symptoms listed above. The physicians' preference for treatment, the patients' health status, and allergies could have been used to determine if the patient could be treated with antibiotics not included in the algorithm. Communication with the provider for clarification on proper treatment by the nurse was completed for patients who did not meet the qualifications for an active infection.

For this project, a review of the data from the project site medical records for patients placed on antibiotics during their stay in LTC was completed for 3 months. The urinalysis results for patients on antibiotics for the treatment of a UTI were reviewed. The urine culture was also reviewed to determine the type of microorganism, and if the results were 100,000

colony forming units After identifying patients who had an active infection, the culture results were reviewed to identify antibiotic resistance to the microorganism. A review of the progress notes was essential for determining if the patient had any presenting symptoms that warranted the nurse calling the provider such as changes in mental status, fever, urine odor, or cloudiness. Temperatures were also reviewed for those being treated for a UTI to determine a fever. Over 3 months, a total of 17 residents received treatment for a UTI. Older adults at least age 65 years of age, were included in the study (see World Health Organization,2002).

The goal of this doctoral project was to identify gaps in knowledge and evaluate the significance of an ASP implemented to eliminate the overuse and inappropriate use of antibiotics in the LTC setting. This project was guided by the evidence-based practice focus question, including: How will the implementation of an evidence-based ASP in a nursing home in Maryland impact the overuse of antibiotics in that clinical setting? The project was used to evaluate current practice guidelines to improve patient outcomes and guide communications between the nurse and the provider. This section will describe the findings of this project, provide recommendations for practice, and highlight the role of the project team. . The analysis of data for this quality improvement evaluation project is also reviewed.

Findings and Implications

The results of this project align with current literature supporting that antibiotics are inappropriately prescribed in LTC. Per the algorithm, the patient had to experience dysuria, or if no fever or leukocytes, then two or more of the following had to be present costovertebral angle

tenderness, gross hematuria, increased urinary incontinence, urgency or frequently versus one symptom if they presented with a fever. Most of the patients reviewed experienced one symptom, which included either a fever or a change in mental status. Over 3 months, data were available for a total of 17 patients of those who received a prescription antibiotic for a UTI. This data could indicate that the incidence of UTIs is low at this facility, or that the nurses were unsuccessful in identifying patients with symptoms warranting further intervention and follow up. The data excluded patients less than the age of 65 years; so four, were not included in the study. Of the data for the 13 who received antibiotics and had a urinalysis completed, only nine (69.23%) were positive for microorganisms higher than 100,000 colony forming units. The other four (30.76%) were negative for an active infection. Of those patients, three (23%) on empiric treatment continued to receive treatment after receiving the final urinalysis results. The microorganisms found in urinalysis included Klebsiella, e. coli, Pseudomonas, Enterococcus Faecalis, Actinobacteria, Enterobacter, and Mirabilis Proteus. Klebsiella was present at 17.65%, followed by e. coli 11.75% (see Appendix A).

The average length of treatment for those treated with antibiotics for an active infection was 7 to 10 days. The average length of treatment for those treated without an active infection was 7 days. The classification of antibiotics used were fluoroquinolones, cephalosporins, penicillin, and aminoglycosides. Fluoroquinolones were given 47% of the time, followed by nitrofurans at 17.65%, cephalosporins at 11.75%, and aminoglycosides, oxazolidinone, and penicillin at 5.88% (see Appendix B). Of the fluoroquinolones, ciprofloxacin was prescribed for seven patients 41% of the time. Of those seven, only four (24%) were given for an active

infection. Three patients (17.64%) received empiric treatment, pending the results of the urinalysis. Of those three, only one patient had his treatment discontinued. For the patient who received ciprofloxacin empirically, the antibiotic was changed to levofloxacin even though the urinalysis was negative.

The presenting symptoms resulting in the physician notification and a urine specimen included fever, mental status change, and increased lethargy. Fever was reported 38.45% of the time, followed by a mental status change at 30.76%, and increased lethargy at 7.69%. There was no documentation of symptoms in the medical record for three (23.07%) of the patients. Of those with unknown presenting symptoms, the urinalysis and cultures were positive for an active infection.

All the physician orders to obtain a urinalysis and culture were completed. Based on the algorithm, empiric treatment for a UTI without pyelonephritis include nitrofurantoin, amoxicillin/ clavulanate, and for an average of 5-7 days. Of the patients (17.65%) placed on nitrofurantoin, the length of treatment was 10 days. Patients with a UTI and pyelonephritis can receive ceftriaxone, levofloxacin, ciprofloxacin, and sulfamethoxazole and trimethoprim for up to 14 days. Of those patients placed on ciprofloxacin (41%), the length of treatment was 7 days, but there was no documentation of pyelonephritis per the algorithm.

The length of treatment for the antibiotics ordered differed by 50% of the UTI algorithm indicating insufficient use of the algorithm, with opportunities for improvement. Of the 13 patients, three received empiric treatment. The antibiotic was not consistent with the recommendations provided by the UTI algorithm without a urinary catheter. It is unknown

whether the provider chose an antibiotic that was appropriate for the specific needs of the patient, which is an unknown variable. The providers were not contacted to verify alternate treatment options. Although sulfamethoxazole and trimethoprim are listed on the algorithm as an approved antibiotic, it was not a treatment of choice for the providers. Four patients with symptoms of mental status change were treated for an active UTI. Based on the algorithms, mental status change was not listed as a symptom requiring further analysis and treatment. Further assessment is needed to validate the correlation of mental status change and UTI.

After the initiation of empiric treatment, there was no documented follow up in reviewed records to support the continued need for antibiotic therapy. The facility had three active providers who were responsible for prescribing antibiotic treatment. The nurses caring for the patients did not follow up with the provider to determine if the current antibiotic therapy should continue with a lack of urinalysis and culture results. It is possible that some patients were exhibiting possible symptoms of UTI or other medical conditions requiring further treatment, which was not acknowledged by the nurse.

The project focused primarily on data collected for patients over the age of 65 based on the CDC definition of an older individual. There were four (24%) of the patients who were under the age of 60 placed on antibiotics, which could not be included in the study. Another unanticipated limitation was the total number of patients who were prescribed antibiotics over 3 months for the treatment of a UTI compared to other infections.

The appropriate use of antibiotics will decrease healthcare costs and eliminate adverse events associated with antibiotic use (Leduc, 2014). The facility will incur the cost associated

with the overuse of antibiotics. Continued education and training by the facility on recognizing symptoms of a UTI are crucial for improving patient outcomes and decreasing the incidence of C-Diff colitis, which is detrimental to the older population. Family can also be a contributor to excessive antibiotic use due to a lack of knowledge and education regarding appropriate treatment options. Providing educational resources to families will help to eliminate their misconceptions about treating patients with a UTI. Although the mental status change was not listed on the algorithm as a symptom requiring further interventions, of the 30.76% of the patients with this symptom, only one patient had positive culture results. The algorithm provided a set of guidelines to help the nurse determine which symptom required provider notification for further intervention.

The evaluation of an ASP was needed to determine the nurses' ability to assess and manage patients with a UTI and to establish appropriate treatment options. The use of an algorithm helped to guide clinical practice and gave direction to the appropriate treatment plan. Clinical practice and the treatment of infections due to antibiotic resistance will change over time. It was essential to have provided nurses with education on what constituted an active infection, current and alternative treatment options, and the pathophysiology behind the aging process as it related to the urological system. The low number of patients being treated for a UTI could be due to a lack of nursing assessment and the inability to identify symptoms requiring further intervention and or treatments. It was evident that the algorithm was not used correctly due to 3 patients continuing to receive antibiotic treatment with a negative urinalysis and culture. Older patients are more susceptible to UTIs due to urinary retention and other diseases.

Inappropriately using antibiotics to treat patients without an active infection can have detrimental health effects on the older population.

Recommendations

Continuous education and training on antibiotic stewardship by the facility and the impact on the older population will help to enforce the implications of treating patients inappropriately with antibiotics. The organization should continue to emphasize the use of the algorithm, which helps the nurse identify which symptoms require provider notification and the antibiotic that should be prescribed. Algorithms assist providers with differentiating between AB versus an acute infection (CDC, 2017). The organization currently uses an antibiotic time-out procedure, which signals the nurse to contact the provider within a specified period after the initiation of antibiotics. According to the CDC (2017), the use of an antibiotic time-out procedure decreases costs and eliminates the overuse of antibiotics. The time-out procedure also allows providers to initiate broad-spectrum antibiotics until a specific classification of medication that is susceptible to the organism can be determined (Graber et al., 2015). If there is an active order for an antibiotic, the antibiotic time-out order alerts the nurse to follow up with the provider in 24-48 hours to verify the need for continued treatment. If there is a lack of follow up for patients on empiric therapy, the request for the time-out process will not be timely. Although empiric treatment is sometimes necessary, it disposes the patients to C-Diff and other health-related complications (CDC, 2017). The recommendation is that the antibiotic time-out order is included as an order set when the order is written. This would alleviate the need to remember to place an additional order.

Creating a line-listing to include urinalysis and culture results, identification of microorganisms, initiation of empiric treatment, and the time-out process is recommended to help to improve the tracking process. The line-listing would allow the unit manager or nursing director to provide ongoing education regarding the implications of appropriate treatments. Providing quality training on antibiotic stewardship will keep nurses abreast of current evidence-based practice based on CDC and other regulatory guidelines. A laminated copy of the algorithm can be made available when placed on staff badges, which would allow the nurse quick access to the information. LTC facilities can improve clinical outcomes and decrease the inappropriate use of antibiotics by providing education and providing feedback to both the nurses and ordering providers (CDC, 2017).

Another recommendation included involving pharmacy in the management and prescribing of antibiotics for the treatment of UTIs. The pharmacy involvement in the management of an ASP can be vital to the success of the organization. Faxing urinalysis and culture results to the pharmacy will allow the pharmacists to make recommendations regarding antibiotic classification, dosage, and length of treatment. The pharmacy would need to have access to the algorithm for compliance with the facility's policies and procedures. In cases where the provider has ordered antibiotics for treatment of a UTI, the pharmacists would verify appropriate treatment options. Having pharmacy involved would ensure proper dosage adjustments based on renal functions (CDC, 2017).

According to Davey (2016), an ASP assists with timely, adequate antibiotic treatment eliminating adverse complications. The CDC recommends that LTC utilize facility-specific

treatment guides based on current evidence-based practice when treating infections. The implementation of communication tools using situation, background, assessment, and recommendation format will help to facilitate the exchange of quality information about the patient (CDC, 2017). Nurses could use the tool to lessen anxiety experienced when calling the provider. Per the CDC, antibiotic time-out prompts the nurse to reevaluate the need for antibiotics, the length of treatment, or additional diagnostic testing (CDC, 2017). A shorter duration of therapy is more effective and lessens the opportunity for antibiotic-associated complications (CDC, 2017).

Contributions of Doctoral the Team

The algorithm used to evaluate appropriate treatment options were obtained from the facility intranet site under antibiotic stewardship. Following the algorithm is a collaborative effort.

Strength and Limitations of the Project

One strength of the project is the use of the UTI algorithm, which provided nurses with a specific set of guidelines to follow based on the patients' symptoms. The algorithm gave structure and guidance to define appropriate treatment options for patients on antibiotic treatment. Although the patient population was small, the evidence supported the need for further education regarding the impact of treatment for nurses. The limitation of the project was a small patient sample for the project. Over 3 months, there were only 17 patients who received prescription antibiotic treatment for a UTI within the LTC. Due to exclusions, only 13 patients met the inclusion criteria. Patients admitted to the LTC facility with an active order for

treatment of a UTI was not included in the project. There was no way to validate presenting symptoms, results of diagnostic testing, or the initiation of antibiotic treatment. Another limitation of the study was the duration of the study. The expected duration of the study was 6 months. The project was cut short due to delays in securing a site.

LTC no longer consists of only older patients. Adults at least 18 years of age can live and receive care in an LTC setting. This project was limited to the evaluation of antibiotics on patients over the age of 65 who reside in LTC settings. Evaluating the adverse effects, the antibiotics, such as the incidence of C-Diff, would also be considered for future quality improvement projects. Assessing and evaluating the overuse of antibiotics in a patient under the age of 65 may also be a meaningful quality improvement project to consider in the future, as the inappropriate use of antibiotics can have adverse effects on patients of all ages.

Recommendations for future exploration would entail evaluating the use of antibiotics in patients under the age of 60. The sample size for this project was small; therefore, the goal would be to collect and analyze data for 6 months or longer to give a true reflection of whether the algorithm was effective in decreasing antibiotic use in the older population and if the staff was successful with utilizing the tool. For quantitative data to have a normal distribution, the sample size needs to have at least 30 patients (Gray et al., 2017). LTC no longer consists of only older patients. Adults at least 18 years of age can live and receive care in an LTC setting. This project will be limited to the evaluation of antibiotics on patients over the age of 65 who reside in LTC settings. Evaluating the adverse effects, the antibiotics, such as the incidence of C-Diff, would also be considered for future quality improvement projects.

Section 5: Dissemination Plan

Dissemination to the LTC organization will take place by informing the chief nursing officer and the research committee of the organization when the project is completed and approved for publication in ProQuest. The written project will be emailed to the members of the research committee. Plans to disseminate the outcomes of the project include a presentation to the research committee team members. The best venue for dissemination of the project will be the publication of the project in a journal that reaches the LTC community. Publishing project information in areas other than nursing journals or the clinical agency will also help to disperse project findings to other areas of the healthcare arena (see Oermann & Hays, 2019).

Antibiotic stewardship in the LTC setting is an ongoing process that requires continuous efforts to improve antibiotic usage among the older population. Recommendations for decreasing the overuse of antibiotics are needed to prevent health complications in the older population. Audiences that would benefit from the dissemination of the project include skilled nursing facilities, primary care physicians, and assisted living facilities. Organizations such as the CDC would also benefit from project dissemination. Individuals or other organizations performing research will have access to recent data that reflects the current state of antibiotic use in LTC.

Analysis of Self

Having the awareness and capability to make the necessary changes in healthcare is important for improved clinical outcomes, enhanced nursing practice, and enriched clinical knowledge of nursing clinicians. This project was important for evaluating resources and current

healthcare practices within the nursing profession for improvements such as improving the management of patients with UTIs. As a scholar, it is essential to not only develop resolutions but to focus on problems that continue to cause adverse outcomes, which in this study was the problem of overprescribing antibiotics for UTIs. The inappropriate use of antibiotics is a concern not only in LTC but in other healthcare settings such as hospitals and primary care physicians' offices, which can lead to antibiotic resistance. As a nursing scholar, advancing nursing practice also improves credibility within the nursing profession, allowing for more advanced opportunities within the nursing practice. Practitioners must demonstrate inter-professional and intra-professional skills, recognizing that each healthcare provider comes with a unique set of ideas to promote successful clinical patient outcomes (Houghton, Casal, Fortuna, & Larson, 2015). As a project manager, the ability to assess, evaluate, and develop process improvement initiatives is also important.

Incorporating and utilizing assistance from other healthcare providers when developing programs and services helps to create opportunities for improvement that will be beneficial for patients. A collaborative effort is a requirement of all disciplines to effect a positive change in healthcare. Not only must there be an inter-professional collaboration between healthcare providers, but there must also be the same communication between patients. Long-term professional goals include continuous research and analysis of clinical practice involving the use of antibiotics. Further career advancement demonstrating a positive influence on the nursing profession will help to improve, perfect, and evaluate current practices. The American Association of Colleges of Nurses (2006) recognizes that advanced practitioners should

exemplify an enriched knowledge base to improve patient outcomes and reevaluate those processes as needed.

The responsibility of advanced practitioners is to ensure the delivery of evidence-based practice across all socioeconomic statuses with the assistance of other providers. Patient and family education regarding protocol involving antibiotic use for the treatment of a UTI is required for all patients. It helps to alleviate misconceptions and delivers a sense of ownership when the patient is involved in making decisions regarding treatment options. When working as a team, nurses must recognize and embrace the goals of others to meet the healthcare needs of the patients. (Zaccagnini & White, 2014). As a scholarly leader, it is essential to ensure that patients have access to resources that will help improve their health and well-being.

Summary

The purpose of this project was to evaluate the nurses' ability to effectively utilize an algorithm when caring for patients with a UTI. The ASP can also ensure correct antibiotics based on diagnosis, appropriate dosing, and length of treatment. Education was a relevant component to the project because it helped enhance nurses' compliance with recognizing symptoms of a UTI and prompt physician notification. The older population is at increased risk for adverse events and complications associated with the overuse and incorrect use of antibiotics due to pathophysiological changes that occur with aging. Nurses were given clear guidelines on what symptoms required physician notifications for further treatment and pathophysiology on the urinary system, including signs and symptoms of a UTI; however, treatments varied. Additionally, although the mental status change was not identified on the algorithm as a

symptom requiring further intervention, several patients were positive for a UTI. A thorough assessment is necessary by the nurse regardless of the presenting symptoms. Regardless, communicating the findings of the evaluation to the provider helped facilitate prompt treatment and timely and accurate diagnosis. Having the pharmacy involved with dosing the antibiotic, determining the duration of treatment based on the organisms can also help to decrease the inappropriately use of antibiotics. This project emphasized the need for continued education on antibiotic stewardship in the LTC to reduce antibiotic-associated infections related to the overuse and incorrect use of antibiotics.

References

American Associations of Colleges of Nursing. (2006) *The essentials of doctoral education for advanced nursing practice*. Retrieved from http://www.aacn.nche.edu/DNP/pdf/Essentials.pdf

Association for Professionals in Infection Control and Epidemiology. (n.d.). Antibiotic stewardship. Retrieved from www.apic.org/Professional-Practice/Practice-Resources/Antimicrobial-Stewardship

Azjen, I. (2015). The theory of planned behaviour is alive and well, and not ready to retire: A commentary on Sniehotta, Presseau, and Araújo-Soares. *Health Psychology Review, 9*(2), 131-137. doi: 10.1080/17437199.2014.883474

Baur, D., Gladstone, B.P., Burkert, F., Carrara, E., Foschi, F., Dobele, S. ,…Tacconelli, E. (2017). The effect of antibiotic stewardship on the incidence of infection and colonisation with antibiotic-resistant bacteria and clostridium difficile infection: A systematic review and meta-analysis. *The Lancet Infectious Disease, 17*(9), 990-1001. doi:10.1016/s1473-3099(17)30325-0

Blair, K.A. (2007). Evidence-based management of urinary tract infections across the lifespan: Current update. *The Journal of Nurse Practitioners, 3*(9), 629-632. doi:10.1016/j.nurpra.2007.07.020

Brandt, N. J. & Heil, E. (2016). Antimicrobial stewardship in the post-acute long-term care setting: Case discussion and updates. *Journal of Gerontological Nursing*, *42*(7), 10-14. doi:10.3928/00989134-20160613-01

Canbaz, S., Peksen, Y., Tevfik-Sunter, A., Leblebicioglu, H., & Sunbul, M. (2002). Antibiotic prescribing and urinary tract infection. *International Journal of Antimicrobial Agents*, *20*(6), 407-411. doi:10.1016/S0924-8579(02)00252-2

Centers for Disease Control. (2016). National quality partners playbook: Antibiotic stewardship in acute care. Retrieved from http://www.qualityforum.org/Publications/2016/05/National_Quality_Partners_Playbook__Antibiotic_Stewardship_in_Acute_Care.aspx.

Centers for Disease Control. (2017). The core elements of antibiotic stewardship for nursing homes. Retrieved from https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html

Colley, S. (2003). Nursing theory: Its importance to practice. *Nursing Standard, 17*(46), 33-37. doi:10.7748/ns.17.46.33.s56

Crnich, C. J., Jump, R., Trautner, B., Sloane, P. D., & Mody, L. (2015). Optimizing antibiotic stewardship in nursing homes: A narrative review and recommendations for improvement. *Drugs Aging*, *32*, 699-716. doi:10.1007/s40266-015-0292-7

Daneman, N., Grunier, A., Newman, A., Fischer, H. D., Bronskill, S. E., Rochon, P. A., Bell, C. M. (2011). Antibiotic use in long term care facilities. *Journal of Antimicrobial Chemotherapy, 66*(12), 2856-2863. doi:10.1093/jac/dkr395

Dang, C. & Huynh, T. (2011). Antibiotic stewardship: Perspective on clinical decision-making. *Drug Topics*, *155*(4), 42, 44.

De Vecchi, E., Sitia, S., Romano, C. L., Ricci, C., Mattina, R., & Drago, L. (2012). Aetiology and antibiotic resistance patterns of urinary tract infections in the elderly: A 6-month study. *Journal of Medical Microbiology, 62,* 859-863. doi:10.1099/jmm.0.056945-0

Doernberg, S. B., Dudas, V., & Trivedi. K. K. (2015). Implementation of an antimicrobial stewardship program targeting residents with urinary tract infections in three community long-term care facilities: A quasi-experimental study using time-series analysis. *Antimicrobial Resistance and Infection Control, 4*(54), 2-8. doi:10.1186/s13756-015-0095-y

Duncan, D. (2019). Alternative to antibiotics for managing asymptomatic and non-symptomatic bacteriuria in older persons: A review. *British Journal of Community Nursing, 24*(3), 116-119. doi:10.12968/bjcn.2019.24.3.116

Fleming, A., Bradley, C., Cullinan, S., & Byrne, S. (2015). Antibiotic Prescribing in Long-Term Care Facilities: A Meta-synthesis of Qualitative Research. *Drugs Aging, 32,* 295-303. doi:10.1007 /s40266-015-0252-2

Freeman-Jobson, J. H., Rogers, J. L., & Ward-Smith, P. (2016). Effect of an education presentation on the knowledge an awareness of urinary tract infection among non-license and licensed health care workers in long-term care facilities. *Urologic Nursing, 36*(2), 67-71. doi:10.7257/1053-816x.2016.36.2.67

Gantt, C. J. (2001). The theory of planned behavior and postpartum smoking relapse. *Journal of Nursing Scholarship, 33*(4), 337-341. doi:10.1111/j.1547- 5069.2001.00337.x

Graber, C. J., Jones, M. M., Glassman, P. A., Weir, C., Butler, J., Nechodom, K., …

Goetz, M. B. (2015). Taking an antibiotic time-out: Utilization and usability of a self-stewardship time-out program for renewal of vancomycin piperacillin-tazobacozam. *Hospital Pharmacy, 50*(11), 1011-1024. doi:10.1093/ofid

Gray, R., Grove, S. K., & Sutherland, S. (2017). *Burns and grove's the practice of nursing research: Appraisal, synthesis, and generation of evidence*. (8th ed.). St. Louis, MO: Sanders Elsevier.

Haasum, Y., Fastbom, J., & Johnell, K. (2013). Different patterns in use of antibiotics for lower Urinary tract infection in institutionalized and home - dwelling: A register -based study. *European Journal of Clinical Pharmacy, 69*(3), 665-671. doi:10.1007/s00228-012-1374-7

Hart, P., Eaton, L.A., Buckner, M., Morrow, B. N., Barrett, D. T., Fraser, D. D.,… Sharrer, L. A. (2008). Effectiveness of a computer-based educational program on nurses' knowledge, attitude, and skill level related to evidence-based practice. *World Views on Evidenced-Base Nursing, 5*(2), 75-84. doi:10.1111/j.1741-6787.2008.00123.x

Hedin, K., Peterson, C., Wideback, K., Kahlmeter, G., & Molstad, S. (2002). Asymptomatic bacteriuria in a population of elderly in municipal institutional care. *Scandinavian Journal of Primary Health Care, 20*(3), 166-168. doi:10.1080/028134302760234627

Irwin, J., & Forrester, L. (2019). Urine collection practices in a small rural hospital: Evaluation of alignment with antimicrobial stewardship guidelines. *Canadian Journal of Infection Control, 34*(1), 35-40. doi:10.36584/CJIC.2019.005

Jimmieson, N. L., Peach, M., & White, K. M. (2008). Utilizing the theory of planned behavior to inform change management: An investigation of employee intentions to support organizational change. *The Journal of Applied Behavioral Science, 44*(2), 237-262. doi:10.1177/0021886307312773

Kawar, L. N., Pugh, D. M., & Scruth, E.A. (2016). Understanding the role and legal requirements of the institutional review board. *Clinical Nurse Specialists, 30*(3), 137-140. doi:10.1097/NUR.0000000000000197

Kjolvmark, C., Tschernij, E., Öberg, J., Påhlman, L., Linder, A., & Åkesson, P. (2016). Distinguishing asymptomatic bacteriuria from urinary tract infection in the elderly-the use of urine levels of heparin binding protein and interleukin-6. *Diagnostic Microbiology and Infectious Disease, 85*(2), 243-250. doi:10.1016/j.diagmicrobio.2016.03.005

Leduc, A. (2014). Reducing the treatment of asymptomatic bacteriuria in seniors in a long-term care facility. *Canadian - Nurse.Com, 110*(7), 25-30. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/25920165

Manning, M. L., Pfeiffer, J., & Larson, E. L. (2016). Combating antibiotic resistance: The role of nursing in antibiotic stewardship. *American Journal of Infection Control, 44*, 1454-1460. doi:10.1016/j.ajic.2016.06.023

McEwen, M., & Wills, E. M. (2014). *Theoretical basis for nursing*. (4th ed.). Philadelphia, PA: Wolters Kluwer Health.

McMaughan, D. K. Nwaiwu, O., Zhao, H., Frentzel, E., Mehr, D., Imanour, S.,… Phillips, C. D. (2016). Impact of a decision-making aid for suspected urinary tract infections on

antibiotic overuse in nursing homes. *BMC Geriatrics, 16*(81), 1-9. doi:10.1186/s12877-016-0255-9

Midthum, S. J. (2004). Criteria for urinary tract infection in the elderly: Variables that challenge nursing assessment. *Urologic Nursing, 24*(3), 157-14, 70. Retrieved from https://www.suna.org/download/education/2006/article06157170.pdf

Midthum, S. J., & Bruce, A. W. (2005). The clinical laboratory improvement amendment: How it applies to the use of urine dipsticks in the long-term care facility. *Geriatric Nursing, 26*(5), 309-316. doi:10.1016/j.gerinurse.2005.08.007

Miller, M. (2015). The white house forum on antibiotic stewardship impacts labs across the U.S. *Medical Laboratory Observer, 47*(11), 28. Retrieved from PubMed Database.

Morrison-Pandy, L. E., Ross, C. A., Ren, D., & Garand, L. (2015). The role of the nurse practitioner and asymptomatic urinary treatments. *The Journal of Nurse Practitioners, 11*(9), 903-906. doi:10.1016/j.nurpra.2015.06.008

Naish, W., & Hallam, M. (2007). Urinary tract infection. Diagnosis and management for nurses. *Nursing Standard, 21*(23), 50-58. doi:10.7748/ns2007.02.21.23.50.c4520

Norman, A., Monroe, T., & Carter, M. (2014). Potential inappropriate treatment of suspected urinary tract infections among nursing home residents. *Clinical Scholars Review, 7*(1), 52-56. doi:10.1891/1939-2095.7.1.52

Oermann, M. H., & Hays, J. C. (2019). *Writing for publication in nursing*. (4th ed). New York, NY: Springer Publishing Company.

Paans, W., Sermeus, W., Nieweg, R. M., & Van der Schans, C. P. (2009). Development of a measurement instrument for nursing documentation in the patient medical record. *Studies in Health Technology and Informatics, 146,* 297-300.

Paans, W., Sermeus, W., Nieweg, R. M., & Van der Schans, C. P. (2010). Prevalence of accurate nursing documentation in patient records. *Journal of Advanced Nursing, 6*(11), 2481-2489.

Parish, A., & Holliday, K. (2012). Long-term care acquired urinary tract infections' antibiotic resistance patterns and empiric therapy: A pilot study. *Geriatric Nursing, 33*(6), 473-478. doi:10.1016/j.gerinurse.2012.05.003

Polit, D. F. (2010). *Statistics and Data Analysis for Nursing Research*. (2nd ed.). Upper Saddle River, NJ: Pearson Education Inc.

Protecting Nursing Home residents with proper antibiotic use. (2015). *American Nurse, 47*(5), 6-6.

Sefton, A.M. (2000). The impact of resistance on the management of urinary tract infections. *International Journal of Antimicrobial Agents, 16,* 489-491. doi:10.1016/S0924-8579(00)00282-X

Schofield, C. (2002). Clinical queries. My patient may have a UTI- what next? *Nursing, 32*(10), 17. Retrieved from Walden Databases. Retrieved from https://journals.lww.com/nursing/Fulltext/2002/10000/My_patient_may_have_a_UTI_what_next_.9.aspx

Schroeder, S. D. (2015). Antibiotic stewardship. *South Dakota Medicine, 67*(6), 243.

Schultz, L., Hoffman, R. J., Pothof, J., & ox, B. (2016). Top ten myths regarding the diagnosis and treatment of urinary tract infections. *The Journal of Emergency Medicine, 51*(1), 25-30. doi:10.1016/j.jemermed.2016.02.009

Shigemura, K., Yamashita, M., Tanaka, K., Arakawa, S., Fujisawa, M., & Adachi, M. (2011). Chronological change of antibiotic use and antibiotic resistance in Escherichia coli causing urinary tract infections. *Journal of Infection and Chemotherapy, 17*(5), 646-651. doi:10.1007/s10156-011-0241-2

Stakeholder perspective limiting antibiotic resistance: The payer's role. (2009). *American Health & Drug Benefits, 2*(2), S88-S89.

Strand, T., & Lindgren, M. (2010). Knowledge, attitudes, and barriers towards prevention of pressure ulcers in intensive care units: A descriptive cross-sectional study. *Intensive and Critical Care Nursing, 26*(6), 335-342. doi:10.1016/j.iccn.2010.08.006

Trautner, B. W., Peterson, N. J., Hysong, S. J., Horwitz, D., Kelly, P. A., & Naik, A. D. (2015). Overtreatment of asymptomatic bacteriuria: Identifying provider barriers to evidence-based care. *American Journal of Infection Control, 42*(6), 653-658. doi:10.1016/j.ajic.2014.02.003

Van Buul, L. W., Van der Steen, J. T., Achterberg, W.P., Schellers, F.G., Essink, R.T., de Greff, S. C., … Hertogh, R.B. (2015). Effect of tailored antibiotics stewardship programs on the appropriateness of antibiotic prescribing in nursing homes. *Journal of Antimicrobial Chemotherapy, 70*(7), 2153-2162. doi:10.1093/jac/dkv051

Walden University (2017). Institutional review board for ethical standards in research. Retrieved

from http://academicguides.waldenu.edu/researchcenter/orec/welcome

Walker, S., McGeer, A., Simor, A. E., Armstrong-Evans, M., & Loeb, M. (2000). Why are antibiotics prescribed for asymptomatic bacteriuria in institutionalized elderly people? *Canadian Medical Association Journal, 163*(3), 273-279. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/10951723

Wilson, B. M., Shick, S., Carter, R. R., Heath, B., Higgins, P. A., Sychla, B., … Jump, R. (2017). An online course improves nurses' awareness of their role as antimicrobial stewards in nursing homes. *American Journal of Infection Control, 45*, 466-470. doi:10/1016/j.ajic.2017.01.002

World Health Organization. (2002). *Proposed working definition of an older person in Africa for the MDS Project*. Retrieved from https://www.who.int/healthinfo/survey/ageingdefnolder/en/

Zaccagnini, M.E., & White, K. W. (2014). *The Doctor of nursing practice essentials: A new model for advance practice nursing* (2nd ed.). Sudbury, MA: Jones & Bartlett.

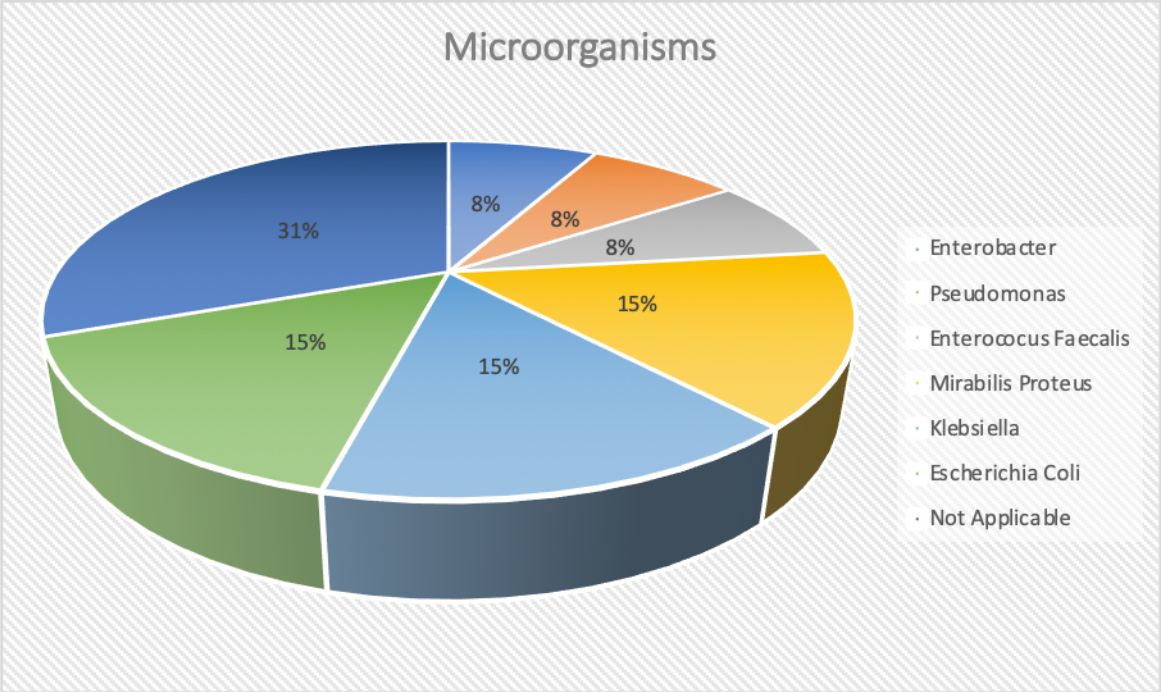
Zatorski, C., Zocchi, M., Cosgrove, S. E., Rand, C., Brooks, G., & May, L. (2016). A single center observational study on emergency department clinician non-adherence to clinical practice guidelines for treatment of uncomplicated urinary tract infections. *BMC Infectious Diseases, 16*(1), 638-646. doi:10.1186/s12879-016-1972-6.

Zielinksi, M. D., Thomsen, K. M., Polites, S. F., Khahasawneh, M. A., Jenkins, D. H., & Habermann, E. B. (2014). Is the Centers for Medicare and Medicaid Service's lack of

reimbursement for postoperative urinary tract infections in elderly emergency surgery patients justified? *Surgery, 156*(4), 1009-1017. doi.org/10.1016/j.surg.2104.06.073

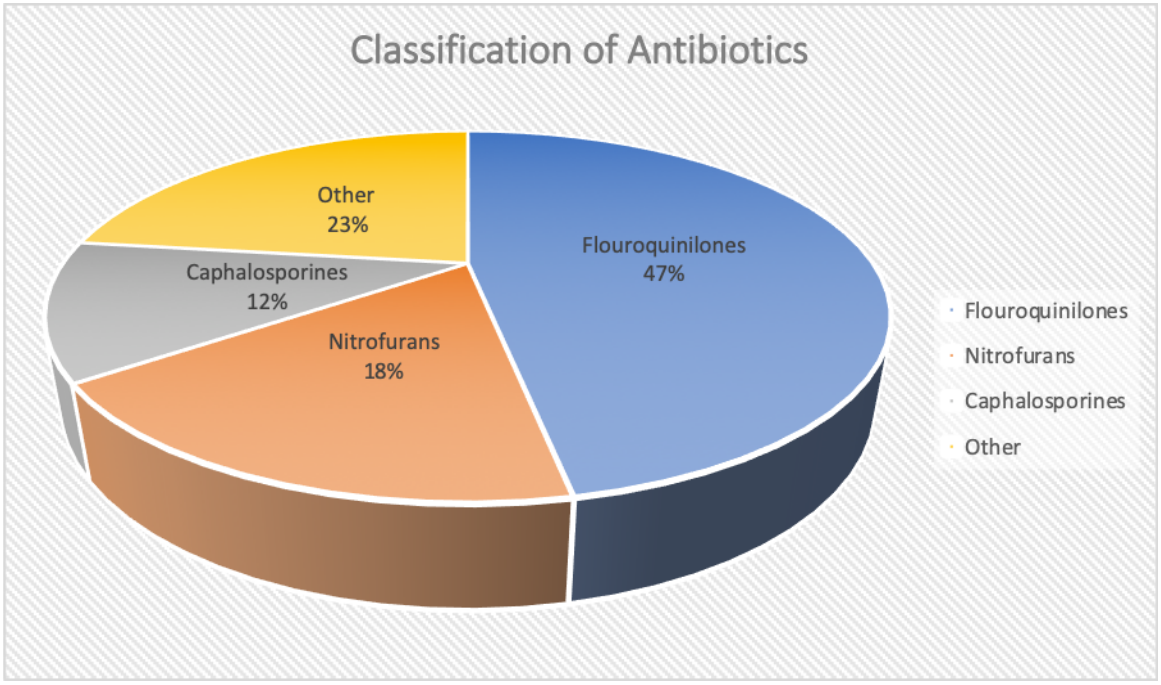
Zimmerman, S., Mitchell, C. M., Beeber, A. S., Kistler, C., Reed, D., Chisholm, L. … Sloane, P. D. (2015). Strategies to reduce potentially inappropriate antibiotic prescribing in assisted living and nursing homes and inform other quality improvement efforts. *American Journal of Medical Research*, *2*(1), 41-52. Retrieved from https://www.ahrq.gov/hai/patient-safety-resources/advances-in-hai/hai-article8.html

Appendix A: Microorganisms



List of Microorganisms for Patients Placed on Antibiotics

Appendix B: Antibiotic Classifications



List of Antibiotics Used to Treat Empiric and Positive UTIs