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Antibiotic Stewardship and the Quality of Life for Residents Over 65 Years

Reshma Beharry-Guest
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Reshma Beharry- Guest

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Review Committee
Dr. Cheryl Cullen, Committee Chairperson, Health Sciences Faculty
Dr. Donna Clews, Committee Member, Health Sciences Faculty
Dr. Jagdish Khubchandani, University Reviewer, Health Sciences Faculty

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

Walden University
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Abstract

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Reshma Beharry- Guest

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MBA, Columbia Southern University, Orange Beach, AL. 2014

BSc, Computer Science, University of Hertfordshire, England, UK 2004

ASc College of Science, Technology and Applied Arts of Trinidad & Tobago, 2000

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Antibiotics were often over-prescribed in long term care facilities (LTCFs) and antibiotic stewardship guidelines, established by the CDC were not followed. The nursing home administrator was responsible for the quality of care for the residents and ensured that the facility met and/or exceeded the CMS antibiotic stewardship standard of care. The purpose of this quantitative study was to analyze operational secondary data collected from a Texas LTCF regarding antibiotic utilization for male and female residents over 65 years. The theoretical framework of the social cognitive theory was applicable for quality improvement in the LTCF setting. The data analysis showed that the male variable was the only statistically significant variable in the documentation of antibiotic treatment. Males had 1.79 times higher odds than female participants of having documentation of antibiotic treatment. A chi-square analysis was used to determine that there was no association between urine culture results and the antibiotic spectrum for treatment on record. There was a, moderate small negative correlation between the number of days reevaluated after initial antibiotic therapy with the length of antibiotic therapy explaining approximately 5% of the variation between the two variables. As the duration of antibiotic treatment increased, the number of days when the participants were reevaluated decreased. Positive social change occurred within the LTCF under study and was generalized to the long-term care population by informing health care leaders, nursing home administrators, clinicians, and public health leaders regarding actual versus required antibiotic documentation and quality of care.

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Dedication

First, I would like to thank my Heavenly Father for helping me to make it this far and making my dreams a reality! This dissertation is dedicated to both my late husband and Dad. Thank you to my husband, first love, best friend, cheerleader, and mentor, Bob Guest, who passed away in November 2018. To my Dad, who passed away in May 2019, thank you for teaching me at an early age the value of pursuing an education. You were right, Dad. I am who and where I am because of you. I love you both, my angels.

Acknowledgments

I would like to thank my chair, Dr. Cheryl Cullen, for challenging me toward achieving academic success during the completion of my dissertation in spite of my losses. Thank you for your prayers, patience, countless sessions of guidance, immediate responses to emails, conference calls, and text messages throughout this journey. I appreciate you, Dr. Cheryl.

Thank you to my late husband, Bob, for your constant prayers and support throughout this journey. At the beginning of my doctoral studies in 2016, I promised you to be your wife, best friend, and lastly, a student in that order. Thank you for convincing me that I needed to do a doctorate. I will always remember the times when you would proofread my papers and coach me about my American writing skills without hurting my feelings. Rest in peace, my love. I love you, Hon. We did it!

To my sister, Vidya and family in (U.K.), thank you for encouraging me to complete my doctorate. Our vacations in Europe with will forever be treasured. To my aunts, uncles, and many cousins in Trinidad, thank you for believing in me. To my adopted sister, Indira, (Trinidad), thank you for being my lifeline. To my teacher and friend, Ravi Ragoonath, (U.K.) thank you for setting the standards for me when I was a BSc student. Thank you pastor, Paul Wilson, Tammy Hill, Sandy Haggendorf, and life group friends at Cibolo Creek Church, (Texas). Thank you Janet, Ana, and Monica (Texas) from Dr. Vick’s office. To Billy Lambeth, (Texas), thank you for challenging me to be street smart like you. Your drive and ambition was partly responsible for pushing me to complete my research after my losses. To my Walden University classmates, I am humbled to call Dr. Joel, Annette, Christina, and the others my family.

Table of Contents

List of Tables

Section 1: Foundation of the Study and Literature Review

Introduction

Antibiotic stewardship is a health care administration and public health issue that needs serious consideration to improve the patient's quality of life, reduce patient morbidity, and reduce cost of unnecessary medications (Fishman, 2012). The numbers vary by country. Approximately 2–5 % of the developed world's older population resides in some type of long-term care facility ([LTCF) (Crnich, Jump, Trautner, Sloane, & Mody, 2015). The Centers for Disease Control and Prevention (CDC, 2017a) estimated that antibiotic-resistant bacteria caused at least two million illnesses and 23,000 deaths in the United States. A nursing home administrator is responsible for the quality of health care for the residents and ensures the facility meets and/or exceeds the Center for Medicare and Medicaid Services (CMS) antibiotic stewardship standards of care (Dyar, Pagani, & Pulcini, 2015).

The CDC (2017a) updated the McGeer Criteria for antibiotic stewardship in LTCFs. Applying the evidence-based principles of antimicrobial stewardship developed in acute care facilities to LTCFs, presented significant challenges to long-term care facilities. Positive social change occurred within the Lodge at Leon Springs, in central Texas, which is the LTCF under study, and was generalized, to the long- term care population by informing health care leaders, nursing home administrators, clinicians, and public health leaders regarding actual versus required antibiotic documentation and quality of care. Health care leaders, nursing home administrators, clinicians, and public health leaders may benefit from these findings regarding antibiotic documentation and quality of care which may result in positive social change in makes it useful to utilize in an ever- changing health care system.

I used the social cognitive theory (SCT) as the theoretical foundation for this study. The SCT was appropriate to analyze social and environmental policy changes imposed by the nursing home administrator and a multidisciplinary team fostered a movement towards implementing antibiotic stewardship. Researchers use SCT as the structural framework to assess quality improvement in health care administration, multidisciplinary health care teams, and nurse/client/community settings ("Neuman Systems Model," 2011). The broadness of the SCT makes it useful in an ever- changing health care system.

This study includes information to inform the nursing home administrator of the practice of antibiotic utilization and compliance issues, if any, to ensure CDC antibiotic stewardship guidelines are met. The nature of this study was quantitative, and I utilized deidentified secondary operational data, collected for non-research purposes that were made available to me by a LTCF in Texas. Statistical analysis was computed using IBM Statistical Package for the Social Sciences [SPSS] Statistics v. 22.0 (2013) statistical software.

I conducted this doctoral research in a 200-bed nonprofit LTCF in a small bordering suburb of a large urban area in Central Texas. The targeted populations were residents, both male and female, over 65 years old, who resided in the selected LTCF. The vision of the Texas LTCF in this study was to improve the quality of health and the mission was to promote the highest quality of health care services to its residents.

Problem Statement

The problem was that antibiotics are often over-prescribed in LTCFs and outside of the CDC antibiotic stewardship guidelines, established by the CDC were not followed (Bradley & Sheeran, 2017). Dyar et al. (2015) proposed that a gap in the literature existed regarding the study of physician documentation that monitored, altered, or stopped antibiotic therapy, and they suggested further research. The average age of a resident in living in a nursing home in Texas was 78 years old (Admin, 2013). In this study, I used data on male and female residents over 65 years old who resided in the LTCF. Bradley and Sheeran (2017) concluded that people older than 65 years were generally the most targeted residents of LTCFs and were more susceptible to severe adverse effects of antibiotics. Age appeared to be a risk factor for antibiotic resistance, although other factors posed a higher risk such as recent antimicrobial use, underlying urinary abnormalities, overcrowding, lapses in hygiene, or poor infection control practices (Frieri, Kumar, & Boutin, 2017).

Overuse of antibiotics increased poor outcomes included resistant bacteria, reduction in quality of life, and increased health care costs (Shenvi, 2014). Bradley and Sheeran (2017) concluded that antibiotics were one of the most commonly prescribed medications in LTCFs and up to 75% of antibiotics were misused and incorrectly prescribed. Two important criteria are required by a medical practitioner when prescribing antibiotics for residents in LTCFs (Mody & Juthani-Mehta, 2014). Crnich et al. (2015) suggested that family preferences exert a considerable influence over prescriber decision-making in LTCTs located in the United States, Canada, and Australia.

The CDC (2017a) estimated that antibiotic- resistant bacteria caused at least two million illnesses and 23,000 deaths in the United States. The worldwide usage of antibiotics skyrocketed between 2000 and 2015 ("Global Use Of Antibiotics Soars As Resistance Crisis Worsens," n.d.). These figures continued to escalate because effective and preventable solutions could not be implemented to curb inappropriate antibiotic usage (CDC, 2017b). In a study conducted by an international team of researchers, they found that antibiotic consumption rates soared by 39% from 2000 to 2015 ("Global Use Of Antibiotics Soars As Resistance Crisis Worsens," n.d.). In health care, resistance to antibiotics represented one of the major global challenges of the 21st century (Calderone, 2015). In a study mandated by the UK government, researchers estimated that if the problem of antibiotic overuse was left unchecked, a potential excess of 10 million global deaths may occur annually by 2050 (Calderon, 2015).

The successful implementation of an antibiotic stewardship program [ASP] initiative to improve the quality of life in an LTCF is challenging and dependent on effective leadership, communication, and a coordinated multidisciplinary approach to educate all medical personnel on antibiotic stewardship endeavors (Pollack & Srinivasan, 2014). A successful ASP intervention at the LTCF resulted in significant cost savings, lives saved through improving patient's health outcomes, lower readmissions rates, and better quality of life for the residents (CDC, 2017b). Virginia Commonwealth University (VCU) Health System concluded that17% of the 211 LTCFs submitted surveyed reports of having no formal ASP protocol in place ("Survey of Hospital Antibiotic Stewardship Practices Reveals Room for Improvement," 2017). In addition, nearly 50% of LTCFs reported that a formal written statement of leadership support for antibiotic stewardship initiatives was lacking ("Survey of Hospital Antibiotic Stewardship Practices Reveals Room for Improvement," 2017). There were improvement opportunities initiatives available for LTCFs to control and monitor the use of antibiotics, most notably by the nursing home administrators for the ASPs to be successful ("Survey of Hospital Antibiotic Stewardship Practices Reveals Room for Improvement," 2017).

The nursing home administrator is responsible for the quality of care for the residents and ensuring the facility meets and/or exceeds the CMS antibiotic stewardship standards of care (Dyar et al., 2015). The updated CDC criteria stated that the nursing home administrator was responsible for (a) the indication for initiation of antibiotic therapy was documented in the medical record by the Licensed Independent Practitioner (LIP); (b) documentation of the results of the urine culture and the antibiotic spectrum was available on the medical record to ensure the appropriate antibiotic therapy was ordered; and (c) documentation of follow-up of the effectiveness of the antibiotic therapy was documented 72 hours after initiation of the first dose (CDC, 2017b). A nursing home administrator plays a crucial role in ordering urine cultures and makes the decision whether to prescribe antibiotics based on their awareness of the resident's medical condition and communicates their findings to the attending physician (Agency for Healthcare Research and Quality, 2016).

Purpose of the Study

The purpose of this quantitative study was to analyze operational secondary data collected for non-research purposes that were deidentified and made available to me by a Texas LTCF regarding antibiotic utilization for the residents over 65 years of age. The CDC guidelines regarding antibiotic utilization included information regarding pharmacy reporting of new antibiotic orders, patient follow-up within 72 hours of starting antibiotic therapy, availability of the urine microbial result available in the medical records, the appropriate antibiotic ordered met the spectrum, and whether or not the LIP documented the reason for antibiotic utilization in the medical record (CDC, 2017b).

This quantitative analysis provided information that informed the nursing home administrator of the practice of antibiotic utilization and compliance issues, if any, and ensured CDC antibiotic stewardship guidelines were satisfied in the LTCF. This study had the potential to inform the nursing home administrator regarding antibiotic utilization and identified opportunities regarding antibiotic utilization, antibiotic stewardship, policy development regarding antibiotics, and to improve the quality of life for the residents.

Significance

One of the most significant roles of a nursing home administrator was to determine if a LTCF is meeting the CDC’s guidelines on antibiotic stewardship (CDC, 2017a). Antibiotic stewardship is a health care administration and public health issue that needs serious consideration to improve the patient’s quality of life, reduce patient morbidity, and reduce cost of unnecessary medications (Fishman, 2012). Approximately two thirds of nursing home administrators have identified the urgent need regarding antibiotic stewardship and improving the quality of life for residents in the LTCF (CDC, 2017a). The significance of this quantitative study will guide the nursing home administrators in working with multidisciplinary teams in LTCFs to update antibiotic administration policy, educate practitioners and patients, and make a cultural change toward the practice of antibiotic stewardship. Findings from this study were utilized by LTCFs to foster and sustain an organizational culture that was geared toward maximizing health care outcomes and antibiotic stewardship (Smith et al., 2008).

Research Questions and Hypotheses

In this study, I answered the following research questions:

Research Question 1 (RQ1): Is there a statistical significant relationship of the CDC guideline documentation of the indication for antibiotic therapy for UTI and the resident's age, gender, or dementia?

Null Hypothesis ($H_0$1): There is no statistical significant relationship between the CDC guideline documentation of the indication of antibiotic therapy for UTI and the resident's age, gender, or dementia status.

Alternative Hypothesis (H_a1): There is a statistical significant relationship between the CDC guideline documentation of the indication for antibiotic therapy for UTI and the resident's age, gender, or dementia status.

Research Question 2 (RQ2): Is there a statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient?

Null Hypothesis ($H_0$2): There is no statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient.

Alternative Hypothesis (H_a1): There is a statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient?

Research Question 3 (RQ3): Is there a statistical significant relationship of the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy?

Null Hypothesis ($H_0$3): There is no statistical significant relationship between the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy.

Alternative Hypothesis (H_a3): There is a statistical significant relationship between the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy.

Theoretical Framework

Kowal (2010) stated that health care theoretical frameworks are recognized guidelines that integrate the latest evidence into new pathways of care to promote best-practice health care outcomes for patients of any population. In this study, I used the

SCT, which emphasizes the interaction between people, their behavior, and their environment. The core concept of the SCT is the idea that people can learn through observations, and utilization of the theory is to teach positive behaviors (Cherry, 2019). The SCT can be used as the structural framework for quality improvements in health care administration, public health, multidisciplinary health care teams, and nurse/client/community settings ("Neuman Systems Model," 2011).

The SCT is an inter-relation of environment, social interactions, and behavior that is learned over time (Cherry, 2019). The concepts of the SCT can be applied to the social and environmental policy changes that a nursing home administrator adapts to mobilize the LTCF to practice antibiotic stewardship and change its old habits and social norms.

The nursing home administrator at the Lodge at Leon Springs in central Texas will utilize the concepts of the SCT to encourage antibiotic stewardship and facilitated social change in the LTCF. The manner in which the nursing home administrator makes changes in habits to achieve a mutual goal is in alignment with the concepts of the SCT at the LTCF. To do so, the nursing home administrator chose a goal, selected and tried some strategies to achieve it, self-monitored to gather data to measure quality, made a judgment about their success, and experienced an increase or decrease in confidence in their abilities.

The SCT was most suitable for designing health care education and health care behavioral programs. The goals of antibiotic stewardship are focusing on the patient, improving quality of care, health care outcomes requiring a change in social interactions, and environmental changes in relationships between health care practitioners. The nurse administrator performed close monitoring to ensure hard-wiring and execution of the new behaviors social norm.

Nature of the Study

I utilized deidentified secondary operational data, collected for non-research purposes. These data were made available to me by a 200-bed nonprofit LTCF in a small suburb of a large urban area in central Texas. To answer the research questions, I utilized raw data that the nursing home provided to perform the quantitative statistical analysis. The analysis of the secondary data provided results that informed the nursing home administrator regarding the gap, if any, between the current antibiotic policies, the practice for UTI, and whether the CDC antibiotic stewardship guidelines were met in the LTCF.

Strategies used for Literature Search

I reviewed a combination of foundational research articles, peer-reviewed articles, and educational publications for the years 1991 to present. I performed several literature searches using Google Scholar search engine locate scholarly articles regarding the CDC, antibiotic stewardship, and quality of life. I utilized additional relevant resources from the CMS and National Institute of Health (NIH) websites.

I reviewed many pertinent and helpful articles, but I discovered outdated or irrelevant literature. I conducted a scholarly literature search by using the following keywords: *antibiotic stewardship, CDC and antibiotic stewardship, CMS and antibiotic stewardship, antibiotic treatment, long term care facility, nursing home administrator,* *antibiotic stewardship, UTI, quality of life, elderly, social cognitive theory, McGeer Criteria, infections, antibiotic overuse, antibiotic misuse, and LTCF residents.*

Literature Review

I used peer reviewed articles to determine how clinicians and researchers have approached the problem of antibiotic stewardship and the quality of life for residents in LTCFs. I examined the historical antibiotic utilization in LTCFs, McGeer Criteria, CMS role(s), CDC role(s), requirement for urine culture, and documentation. I identified the gap in the literature to validate the CDC findings for the McGeer Criteria for antibiotic stewardship in LTCFs.

Historical Perspectives

Discovery

Barlam et al. (2016) stated that antibiotics were discovered in the early 20th century and have been a miracle working drug because of their ability to increase the quality of life and reduce morbidity and mortality due to infectious diseases. Podolsky et al. (2015) concluded that following WWII, antibiotics were frequently prescribed both in the United States and the United Kingdom, and researchers expressed their concerns over their overuse. Ernest Jawetz anticipated improvements in diagnostics and reducing the incidence of missed diagnoses, adverse side effects, super infections, and antibiotic resistance and recruited fellow researchers to find an alternative (Podolsky et al., 2015).

The first antibiotic, penicillin, was discovered by Alexander Fleming in 1928 and more than 100 compounds have been found since, but no new class has been found since 1987 (Knapton, 2016). Crinch et al. (2015) concluded from their research that antibiotics were among the most commonly prescribed medications in LTCFs with more than 60% of the residents treated for LTCF infections receiving antibiotics for more than a week and nearly a third are treated for more than 10 days. Experimentations on mice have shown that antibiotics work well at clearing infections without side-effects (Knapton, 2016).

The initial global attempts at antibiotic stewardship occurred in the 1940s, when organizations such as the United Nations focused on antibiotic producing capabilities in war-torn states but the concern was not about antibiotic overuse but rather the lack of antibiotic availability (Podolsky et al., 2015). By the late 1950s, the World Health Organization (WHO) became more concerned with antibiotic misuse and resistance. Podolsky et al. (2015) stated that in the United Kingdom in the 1960s, concerns were raised by Andy Andersen (2009) over the spread of antibiotic resistance from animals to humans. This led to the 1969 Swann Report, banning therapeutically relevant antibiotics (Podolsky et al. 2015). In January 1981, Stuart Levy chaired a meeting that resulted in147 scientists from around the world signing a joint petition regarding worldwide antibiotic misuse and focusing on the over- prescription of antibiotics and the worldwide usage of antibiotics without prescriptions (Podolsky et al., 2015). By the late 1980s and early 1990s, Stuart Levy found a mutual ally in Joshua Lederberg who served at the Rockefeller University of New York and also had similar concerns about antibiotic misuse and challenged the United States' Institute of Medicine on his concerns and the global response to antibiotic resistance (Podolsky, et al, 2015). Health care providers may have potentially jeopardized patient safety and quality of life by over-prescribing antibiotics (Llor &Bjerrum, 2014).

The World Health Organization [WHO] held a series of meetings throughout the 1990s, while the European Union began to take more aggressive measures with respect to antibiotic resistance (Podolsky et al., 2015). As of 2014, the main accomplishment of the WHO was the release of the first global report on antibiotic resistance surveillance and the adoption of the Global Action Plan by prescribers worldwide (Podolsky et al., 2015). The lack of new drugs together with over- prescribing of antibiotics has led to bacteria becoming increasingly resistant to modern medicines. Flores-Mireles, Walker, Caparon, and Hultgren (2015) suggested that the ‘golden era’ of antibiotics was ending, and the urgent need for an alternative antibiotic treatment was increasing.

Usage of Antibiotics

Resistance to antibiotics represented one of the major global challenges of the 21^{st} century (Calderone, 2015). An international team of researchers conducted a study and proved that antibiotic consumption rates soared 39% over the span of 2000 to 2015 (“Global Use Of Antibiotics Soars As Resistance Crisis Worsens,” n.d.). A recent report commissioned by the United Kingdom estimated that if left unchecked, this problem could conservatively account for more than 10 million global deaths annually by 2050 (Calderon, 2015). According to worldwide research, antibiotics are one of the most commonly prescribed medications in LTCFs and up to 75% are incorrectly prescribed (Bradley & Sheeran, 2017). Worldwide, usage increased from 11.3 daily doses to 15.7

daily doses per 1,000 people in the LTCF ("Global Use Of Antibiotics Soars As Resistance Crisis Worsens," n.d.).

Belliveau (2016) revealed that health care providers were still writing unnecessary prescriptions for LTCF residents with an estimated 47 million avoidable antibiotic prescriptions were written by physicians in 2016. The CDC (2017a) recommended that LTCFs establish stewardship programs that develop policies and procedures for antibiotic use, provide physicians with regular feedback about prescription habits, and engage physicians through education. Researchers at the University of Southern California reported that primary care physicians reduced unnecessary antibiotic prescription use by allowing the electronic order set to suggest alternative treatments which required physicians to justify their antibiotic prescriptions in the Electronic Health Record (EHR), and send emails to providers about their prescribing patterns in comparison with fellow peers (Belliveau, 2016).

One of the most important problems in antibiotic stewardship in LTCFs was the inappropriate use of antibiotics to treat UTIs in asymptomatic residents (Abbo & Hooton, 2014). Crinch et al. (2015) researched that approximately, one in 10 LTCF residents received antibiotics on any given day. For the resident who remained in a LTCF facility for at least 6 months, this translated into a 40–70 % likelihood of exposure to at least one course of antibiotics (Crnich et al., 2015). Patients who were unnecessarily exposed to antibiotics were placed at risk for serious adverse events without any clinical benefits, which impacted their quality of life (CDC, 2017). Bradley and Sheeran 2017, concluded that fluoroquinolones were the most frequently prescribed first-choice antibiotic class

(32%), followed by nitrofurantoin (15%), trimethoprim/ sulfamethoxazole (TMP-SMX; 14%), and penicillin (12%).

A 2003 study conducted in the United States and Canada showed that nearly 80% of LTCF residents received at least one course of antibiotics over a12-month duration (Morrill et al., 2016). Antibiotics were frequently prescribed in the absence of appropriate on-site diagnostic examination in the LTCF and extensive use of antibiotics led to the emergence of antibiotic-resistant infections in LTCFs (Antibiotic Resistance Project, 2016). Antibiotic overuse increased the risk of adverse events such as allergic reactions and Clostridium difficile infection, a potentially lethal diarrheal illness that was a growing threat in LTCFs (Antibiotic Resistance Project, 2016)

The McGeer Criteria

In 1991, McGeer and his colleagues proposed the first set of infection surveillance definitions specifically for use by LTCFs (Stone et al., 2012). According to research done by Nace, Drinka, and Crinch, (2014), the McGeer Criteria was designed for surveillance and benchmarking purposes for antibiotic treatment. This criterion was proposed by an expert consensus panel based on research and evidenced-based literature whose intent was to provide standardized guidance for infection surveillance activities and research studies in nursing homes and other similar institutions (Stober, 2012). These definitions were adapted from existing surveillance definitions such as those of the CDC and were not designed for LTCFs (Stone et al., 2012).

The McGeer Criteria on UTI surveillance definitions were used as the benchmark to determine if the nursing home administrator was meeting guidelines as mandated by

CDC. Research was conducted by Ryan, Gillespie, and Stuart (2018) at Monash Health LTCF based on the McGeer infection surveillance definitions. Their findings showed that documentation of antibiotic commencement for UTI was recorded in the medical record of all diagnosed residents in the LTCF and it was recognized that very few of the presumed UTIs for which antimicrobial therapy was commenced met the surveillance definitions (Ryan et al., 2018). This research raised concerns of over diagnosis and overtreatment of UTIs in the LTCF. Ryan et al. (2018) concluded that for the duration of the study that 42% of the 206 residents at the 2 facilities presumed to have a UTI did not meet criterion 1, 15% did not meet criterion 2, and 42.9% did not meet either criteria. It could be concluded that 85% of residents did not meet the clinical evidence required to confirm a UTI by utilizing the McGeer definitions during the 16 months of the study. A major gap between the confirmed McGeer UTI surveillance data and the clinical diagnosis of UTI was discovered as a result of the study by Ryan et al. (2018). The determination was that a need existed for UTI education and antibiotic stewardship for nurses and medical staff (Ryan et al., 2018). The original surveillance guidelines were specifically developed for use in LTCFs with older adults who required supervision, assistance with daily activities, or skilled nursing care (Stone et al., 2012). At that time of the McGeer Criteria introduction, these facilities rarely provided intravenous therapy or had on-site laboratory services for diagnosis (Stone et al., 2012). 20 years later, the McGeer Criteria should be applied to LTCFs that deliver medical services, but the 1991 McGeer Criteria had no adjustments for such (Stone et al., 2012). The CDC along with experts in long-term care developed a national standard for infection surveillance in LTCF:

• Using McGeer Criteria, three of the following criteria were met to identify a UTI (without indwelling catheter):

- Fever >100.4°F
- New or increased burning on urination, frequency or urgency
- New flank or suprapubic pain or tenderness
- Change in character of urine
- Worsening mental or functional status

• Using McGeer Criteria, two of the following criteria must be met to identify a UTI (with indwelling catheter): -

- Fever >100.4°F or chills
- New flank or suprapubic pain or tenderness
- Changes in character of urine
- Worsening mental function

Centers for Medicare and Medicaid Services (CMS) Role

In response to the alarming concern for multidrug resistance and Clostridium difficile infections, the CMS required all LTCFs in the United States to establish an antibiotic stewardship program by November 28, 2017 (Jump et al., 2017). To support compliance with CMS requirements and to aid in establishing a successful stewardship program, various committees developed an antibiotic stewardship policy template tailored toward meeting the needs of the LTCF setting (Jump et al., 2017).

As of September 2009, the CMS published standards that in the LTCF, the physician or the physician's extender is responsible for prescribing appropriate antibiotics and to document the indication for use of these medications (Doernberg, Dudas, & Trivedi, 2015). For most community LTCFs, lack of knowledge, evidence, and experience were notable barriers to implementing a successful antibiotic stewardship program. The CMS requirement for participation stated that the LTCF must have established an ASP that included antibiotic use protocols and a system to monitor appropriate antibiotic usage (Jump et al., 2017). The intent of CMS (2017) was to help LTCFs to implement a successful antibiotic stewardship policy that met or exceeded CMS requirements on antibiotic stewardship in light of over two million illnesses and 23,000 deaths annually.

According to Belliveau (2016), the entire health care community collaborated and ensured that antibiotics were prescribed only when needed by selecting the right antibiotic, dose, and duration. In 2015, to help physicians decrease inappropriate antibiotic use, the White House developed The National Action Plan for Combating Antibiotic-Resistant Bacteria whose aim was to decrease unnecessary antibiotic prescription rates by at least half by 2020 (Belliveau, 2016). Considering President Obama's executive order for a National Action Plan to combat antibiotic resistance, the CMS proposed expanded requirements that reviewed and monitored the use of antibiotics (Gray, 2014). Setting a national target that reduced unnecessary antibiotic use was a critical first step to improving antibiotic stewardship and the quality of life for residents in LTCFs (Belliveau, 2016).

Center for Disease Control and Prevention (CDC)

Improving the usage of antibiotics was an important patient safety and public health issue that the CDC identified as a key strategy to address antibiotic resistance (CDC, 2017a). A study conducted by CDC (2017b) revealed from that 11% of residents from 9 LTCFs took antibiotics on any single day, and approximately 40% of orders for antibiotics lacked important prescribing information. The CDC launched a larger scaled study with more LTCFs across the United States and pursued partnerships with nursing home networks, pharmacies, and other LTCF health care related industries that identified where quality improvement was needed (CDC, 2017a). The proven benefits of ASPs optimizing antibiotic use and minimizing adverse events prompted the CDC to recommend that all LTCFs adapt to an ASP initiative (CDC, 2017a). Rigorous work occurred to improve the prescribing of antibiotics through the implementation of ASPs designed to ensure that hospitalized residents received the right antibiotic, at the right dose, at the right time, and for the right duration (CDC, 2017a).

Requirement for Urine Culture and Documentation

Hia and Hia (2017) concluded that UTI is a vague, overused diagnosis applied to older adults over the age of 65 who have symptoms such as confusion, falls, or changes in the odor or color of urine. Older adults residing in LTCFs were more susceptible to suffering from significant functional and cognitive impairments, both of which have been shown to increase the risk of developing UTIs (Rowe & Juthani- Mehta, 2014). Institutionalized residents over 65 years old in this study often had significant underlying medical comorbidities such as dementia and stroke, which impaired their ability to communicate to medical staff and as a result they were more susceptible to a typical or nonspecific symptom when infected.

Diagnosing UTI in older adults was a challenge; although several routines helped guide medical practitioners to determine whether to treat the patient with antibiotics. Rowe and Juthani- Mehta (2014) concluded that initially, older adults presented generalized symptoms such as lower abdominal pain, back pain, and constipation. For older cognitively impaired adults who had UTI symptoms, a urinary dipstick was used to evaluate the presence of nitrite or leukocyte esterase, along with a urinalysis, was performed to evaluate for the presence of pyuria (Rowe & Juthani- Mehta, 2014). The minimum laboratory evaluation for suspected UTI included urinalysis that detected pyuria and the use of a urinary dipstick to find evidence of leukocyte esterase and nitrite (Rowe & Juthani- Mehta, 2014).

Rowe and Juthani (2014) researched that residents living in LTCFs in Connecticut attempted to identify features that would predict bacteriuria plus pyuria, both of which were necessary factors for diagnosing UTIs. Dysuria, change in the urine, and change in mental status were associated with the outcome of bacteriuria plus pyuria (Rowe & Juthani- Mehta, 2014). Rowe and Juthani- Mehta (2014) determined that the positive predictive value for detecting bacteriuria plus pyuria using the original McGeer Criteria was 57%. Findings from this research suggest that a combination of clinical features, which include change in mental status, should be further investigated for diagnosing UTIs.

UTIs can have a significant negative impact on the quality of life for residents in the LTCF (Wagenlehner Wullt, Ballarini, Zing, & Naber, 2017). UTIs are the most common indication for prescribing antibiotics for residents in LTCFs (Loeb et al., 2002). The diagnosis of UTIs in elderly LTCF residents was challenging due to a wider range of symptoms that prompted immediate urine testing, such as changes in mental status, behaviors, color or smell of the urine with or without dysuria, or falls (Midtun, 2004). Crnich et al. (2015) affirmed that with older adults, temperature elevations in response to infection were often blunted. Cognitive impairment afflicted approximately 50% of nursing home residents which made it difficult for residents to vocalize their symptoms to medical personnel (Crnich et al., 2015). As patients age, it is increasingly common to encounter positive urine cultures without evidence of an infection (Crnich et al., 2015).

Accurate monitoring and documentation of antibiotic usage for the resident at the LTCF was needed, but this frequently did not occur (CDC, 2017a). Clinical information such as the name of antibiotic, dose, duration, and indication of antibiotic therapy was documented in the medical record, and this was necessary to help guide medical practitioners caring for the resident to alter or stop therapy when required to do so. Dyar et al. (2015) concluded that this approach has not been widely studied in the literature in LTCFs and deserved further investigation. With the advancements of health information technology, Electronic Medical Records (EMRs) have been proven to improve quality and efficiency in health care outcomes (Manca, 2015). In this regard, identifying cases of UTIs using EMR data required not only objective but also subjective clinical data such as signs and symptoms.

Social Cognitive Theory

In this research, the SCT was the most relevant theory for designing health care education and health care behavioral programs. The SCT is used to explain how people acquire and maintain certain behavioral patterns when prescribing antibiotics in the LTCFs and how the concepts of the theory could be used to provide change in the environment. The SCT model was based on social influence, and its purpose was to determine how behavior was regulated through control and reinforcement overtime to reach the goal ("Behavioral Change Models," n.d.). The SCT has the potential to influence forward thinking and foster intelligent decisions capable of impacting change in the LTCF in this study.

Mohebbi et al. (2018) utilized the concepts of the SCT as the basis for antibiotic rationale in a 260 participant sample. The study participants received a questionnaire invitation to complete at the baseline and end of the intervention (Mohebbi et al., 2018). To determine the effectiveness of the SCT principles, the utilization of Chi-square (X^2), independent *t*-test, and covariance analysis used for data analysis where $P<0.05$ was statistically significant (Mohebbi et al., 2018). After the antibiotic intervention, all SCT constructs revealed significant differences in the intervention group compared with control groups $P<0.001$ (Mohebbi et al., 2018). This study concluded that appropriate educational programs based on SCT guidelines can reflect a positive impact on appropriate antibiotics usage, and a tailored health promotion intervention should be provided to enhance the awareness and general beliefs of the target groups (Mohebbi et al., 2018).

Employees as change agents. The broadness of the concept of the SCT is adaptable to utilize in an ever-changing health care system. The understanding of human nature proposed by Bandura construes that employees are vital components of change agents, rather than reluctant implementers or outright resisters in need of conversion (Tams, 2018). Employees possess the necessary knowledge and expertise that create value in solving the complex challenges that health care organizations face (Tams, 2018). They have insights about organizational dysfunctions, bureaucratic red tape, inefficient methods, out-of-date health information technology, waste of resources, or flaws in products or services (Tams, 2018). Bandura's theory was useful in the quality of health care continuum because of its application to health behavior and facilitation of changes in the environment. Nurses apply the concepts of SCT when working with patients to motivate and facilitate their progress. The SCT impacts the working environment because it assists employees with mastering their skills, and persuades them that they are capable of accomplishment.

Human resistance to change. Like Bandura's notion of collective efficacy, change efficacy refers to organizational members' shared beliefs in their collective capabilities to organize and execute the courses of action involved in change implementation (Weiner, 2009). Organizations with the same resources, endowments, and organizational structures differed in the effectiveness based on the implementation of the same organizational change depending on how they utilized organizational resources and routines (Weiner, 2009). It seemed preferable to regard organizational structures and resource endowments as the capacity to implement change rather than readiness to do so

(Weiner, 2009). This distinction between capacity and readiness have moved theory and research forward by reducing some of the conceptual ambiguity in the meaning and use of the term “readiness” (Weiner, 2009).

Organizational resistance to change. Hieneman (2015) found that it was difficult to change practice, and large changes over short periods were not typical. Citing the importance of using rigorous methods to measure the effects of the interventions used, it was equally important for clinicians to find the time needed to change routines. Readiness was more or less present at the individual, group, unit, department, or organizational level. Organizational readiness for change varies as a function of how much organizational member’s value the change and how favorably they appraise three key determinants of implementation capability: task demands, resource availability, and situational factors (Weiner, 2009). When organizational readiness for change was high, organizational members were more likely to initiate change, exert greater effort, exhibit greater persistence, and display more cooperative behavior (Weiner, 2009). The result was more effective implementation (Weiner, 2009).

The nursing home administrator. A nursing home administrator is responsible for the quality of care for the residents and ensures the facility meets and/or exceeds the CMS antibiotic stewardship standards of care (Dyar et al., 2015). A nursing home administrator has access to fewer resources than hospitals for quality monitoring and continuous improvement initiatives in the LTCF (Sloane et al., 2016). The CDC updated the McGeer criteria for antibiotic stewardship in LTCFs (CDC, 2017a). The updated CDC criteria the administrator are responsible for include: (a) the indication for initiation of antibiotic therapy was documented in the medical record by the Licensed Independent Practitioner (LIP); (b) documentation of the results of the urine culture and the antibiotic spectrum was available on the medical record ensured the appropriate antibiotic therapy was ordered; and (c) documentation of follow-up of the effectiveness of the antibiotic therapy was documented 72 hours after initiation of the first dose (CDC, 2017b).

Social habits influencing prescribing antibiotics. Patient health care in the LTCF is led by nurses, whose primary duties are detecting infections, assessing patients, taking microbiology samples, and communicating results to the medical practitioner (Fleming, Bradley, Cullinan, & Byrne, 2015). In the LTCF, the relationship between the resident, the nurses, and the doctors is more significant than that of other health care settings since the doctor, nursing home administrator, or care assistant in the LTCF knows the resident for many years and can detect subtle changes in clinical signs and symptoms that suggest an infection (Fleming et al., 2015). Social habits regarding antibiotic stewardship for health care professionals is challenging because of the different backgrounds, beliefs, and cultural indifferences in prescribing antibiotics (Rocha-Pereira, Castro Sanchez, & Nathwani, 2017). Fleming et al. (2015) found that persuasion from the family directed to the prescribing nurses and doctors resulted in increased pressure for the doctor to prescribe antibiotics.

In an American study, physicians reported that they often prescribed antibiotics without seeing the patient and depend on the LTCF nursing staff to provide accurate information regarding the signs and symptoms of the patient (Dyar et al., 2015). The role of the LTCF nurse is a very strong contributing social factor in antibiotic prescribing and infection management, as reported by nurses, doctors, administrators, and pharmacists (Fleming et al., 2015). Investigations by Fleming et al. (2015) showed that patient-centered health care in the LTCF is led by nurses, who are primarily responsible for detecting infection, assessing patients, taking microbiology samples, and communicating this information to the doctors. The doctors reported that a nurse's lack of education sometimes leads to increased use of antibiotics (Fleming et al., 2015). Despite the prescribing physician's dependency on nursing staff, nurses were not fully trained to determine an accurate prognosis and dispense antibiotics to the residents in the LTCF.

Social cognitive theory and health care leadership. A study conducted by researchers at the Virginia Commonwealth University (VCU) Health System concluded that17% of the 211 LTCFs surveyed disclosed that there was no formal antibiotic stewardship program in place ("Survey of Hospital Antibiotic Stewardship Practices Reveals Room for Improvement," 2017). In addition, approximately 45% of those facilities' administrators stated they did not have a formal written statement from health care leadership in support for antibiotic stewardship initiatives in the LTCF ("Survey of Hospital Antibiotic Stewardship Practices Reveals Room for Improvement," 2017). These findings indicate that there were improvement opportunities initiatives for LTCFs in controlling the use of antibiotics, most notably by securing leadership involvement and support for these ASPs to be successful ("Survey of Hospital Antibiotic Stewardship Practices Reveals Room for Improvement," 2017). Health care leadership played a pivotal role in fostering change at the LTCF. Organizational readiness for change was considered a critical precursor to the successful implementation of complex changes in healthcare settings (Weiner, 2009).

Texas long-term care regulations. The General Appropriations Act (House Bill 1, Article II, Department of Aging and Disability Services, 84th Texas Legislature, Regular Session, 2015) allocated funds to the Texas Department of Aging and Disability Services (DADS) that conducted a statewide survey of people residing in Medicaid-certified nursing facilities to assess their satisfaction with quality of life and care (Texas Health and Human Services, 2017). The survey also included questions about the quality of care and antibiotic stewardship given to residents over 65 years old in the LTCF (Texas Health and Human Services, 2017). The Quality Monitoring Program (QMP) obtained approval from CMS that used Civil Monetary Penalty funds that implemented a number of initiatives that helped LTCFs improve the quality of care and quality of life for residents (Texas Health and Human Services, 2017). The Health and Human Services (HHSC) uses Nursing Facility Quality Review (NFQR) data to identify opportunities for statewide improvement to measure changes in the quality of services provided across time (Texas Health and Human Services, 2017).

Gap in the Literature Addressed

Antibiotic stewardship is a health care administration and public health problem that needs serious attention to improve patients' quality of life, reduce patient morbidity, and reduce cost of medications (Fishman, 2012). The CDC (2017a) estimated that annually in the United States, antibiotic-resistant bacteria caused at least two million illnesses and 23,000 deaths. Public health agencies such as the CDC have claimed that antibiotic overuse was one of the world's most pressing public health problems in LTCFs (CDC, 2017).

To improve antibiotic stewardship, the Obama administration released an Executive Order in September 2014 and a National Action Plan in March 2015 for combating antibiotic-resistant bacteria in LTCFs (The White House, 2015). This plan specifically called for strengthening antibiotic stewardship in LTCFs by expanding existing programs, developing new ones, and monitoring progress based on feedback (The White House, 2015). For the first time since 1991, the CMS was open for recommendations for LTCFs (The White House, 2015). Proposed recommendations required that organizations have an infection prevention, a control officer, and an antibiotic stewardship program that included antibiotic use protocols and a system to monitor antibiotic use (The White House, 2015).

The CDC (2017a) updated the McGeer Criteria for antibiotic stewardship in LTCFs. In the updated CDC criteria, the administrator was responsible for: (a) the indication for initiation of antibiotic therapy was documented in the medical record by the Licensed Independent Practitioner (LIP); (b) documentation of the results of the urine culture and the antibiotic spectrum was available on the medical record to ensure the appropriate antibiotic therapy was ordered; and (c) documentation of follow-up of the effectiveness of the antibiotic therapy was documented 72 hours after initiation of the first dose . However, applying the evidence-based principles of antimicrobial stewardship developed in acute care facilities and long-term care facilities, presented significant challenges.

A study conducted by Bradley and Sheeran (2017) analyzed UTI events reported from a Pennsylvania LTCFs during a 30-month period from April 1, 2014 to September 30, 2016. The findings revealed the need to reduce prescriptions for unnecessary antibiotics (Bradley & Sheeran, 2017). This study served as a wakeup call for other LTCFs to identify the antibiotic stewardships gaps in their facility to make improvements (Bradley & Sheeran, 2017). The Pennsylvania LTCF antibiotic stewardship success story showed the effectiveness of strategies executed in reducing antibiotic misuse.

The CDC (2017c) released seven core elements of antimicrobial stewardship in LTCFs. It was projected that at least 80% of LTCFs implemented the core elements by July 2018 based on the framework. The core elements of outpatient antibiotic stewardship provided a framework for antibiotic stewardship that outpatient clinicians and facilities could implement to routinely provide antibiotic treatment (CDC, 2017c). The core elements of improving antibiotic stewardship are health care leadership, action, tracking and reporting, education, and communication. Health care leadership commitment is a core element by providing the human, financial, and information resources that supports the success of the antibiotic initiative. Tracking, monitoring, and reporting antibiotic prescription patterns were all critical core elements to improve the quality of life (CDC, 2017c).

Description of Key Variables

For the data analysis aspect of this research, I used several variables to evaluate antibiotic stewardship and the quality of life for residents in LTCFs. The variables were: year of birth, gender, dementia/confusion, number of antibiotic courses over the last 12 months, duration, cost to the residents, number of days post antibiotic initiation, the resident status re-evaluated, urine culture prior to antibiotic, urine culture, reason for the culture, and resident billed for antibiotics.

Dementia/ confusion. Crinch et al. (2015) suggested that dementia/ confusion affects at least approximately 50% of nursing home residents. A substantial proportion of LTCF residents that suffer with some degree of dementia/ confusion interferes with their vision, hearing, speech, and ability to communicate signs and symptoms with caregivers (Kravitz, Schmeidler, & Beer, 2012). People with dementia/ confusion are constantly faced with the evidence of these losses, and as the disease progresses, they become gradually less and less able to carry out routine activities such as communicating with people, getting dressed, and eating. They become increasingly dependent on others which was frustrating for family, friends, and loved ones. One research that was based on dementia with regards to antibiotic by Heerema (2019) found that nursing home residents with late- stage dementia and found that among those who died, more than 40% received antibiotics in the last two weeks of their lives. It was concluded that antibiotics were often overused in advanced cases of dementia (Heerema, 2019).

Number of antibiotic courses over the last 12 months. During a 12 month period of intended usage of antibiotics, approximately seven or 14 day courses as prescribed by the physician for older residents in the LTCF (CDC, 2017b). WHO established defined daily doses for antibiotics based on the average dose used to treat most infections in most adults (Jump et al., 2017). A key component of antibiotic stewardship was to reassess the need for and appropriateness of antibiotics two to three days after initiation. Antibiotic time-out was an improvement initiative for medical staff at the LTCF to consider results of diagnostic tests, assess the resident for clinical changes, and consider alternative diagnoses. Subsequently, the prescriber chooses to narrow, shorten, or stop antibiotic therapy altogether (Jump et al., 2017).

Duration. The CDC (2017b) researched that from December 2013 to May 2014, CDC examined the medical records of nine LTCFs in the United States. Researchers found that 11% of nursing home residents are on antibiotics on any single day (CDC, 2017b). One in three of the antibiotic prescriptions were for the treatment of UTIs; yet at least half of these prescriptions were written with the wrong drug, dose, or duration (CDC, 2017b). Finally, 38% of orders for antibiotics lacked documentation of one or more important prescribing elements (CDC, 2017b). CDC launched a study with a larger number of LTCFs and pursued partnerships with nursing home networks, pharmacies, and other companies that identified where action was needed most (CDC, 2017b).

Antibiotics were given to approximately 7% to 10% of residents in LTCFs, frequently for lengthy periods of time (Smith et al., 2008). Results from a 2003 study conducted in the United States and Canada showed that approximately 80% of LTCF residents received at least one course of antibiotic therapy over a12 month duration (Antibiotic Resistance Project, 2016). Antibiotics were frequently prescribed in the absence of appropriate on-site diagnostic examination in the LTCF (Antibiotic Resistance Project, 2016). Such an extensive overuse of antibiotics, aggravated by high rates of infections, developed into the emergence of antibiotic-resistant infections in LTCFs. Antibiotic overuse increases the risk of adverse events such as allergic reactions and

Clostridium difficile infection, a potentially lethal diarrheal illness that is a growing threat in LTCFs (Antibiotic Resistance Project, 2016). Crnich et al. (2015) suggested that from a study of 100 prescribing events in a LTCF demonstrated that 43% of 1351 antibiotic days associated with these events were safely eliminated either by stopping the antibiotic because it was unnecessary or by shortening the duration of therapy.

Urine culture prior to antibiotic. It is vital to understand the symptoms of UTI that prompted an order for a urinalysis and urine culture prior to antibiotic treatment (Srirangaraj, 2014). Ideally, a urine specimen for culture is processed as soon as possible, preferably within 1–2 hour after collection (Stone et al., 2012). If a urine specimen is not processed within 30 minutes of collection, it is refrigerated and cultured within 24 hours (Stone et al., 2012). Srirangaraj (2014) researched that LTCF physicians often start antibiotic treatment for confirmed UTIs before they have a urine culture results. Obtaining recent antibiotic history from a resident is often neglected, and this diagnostic information influences interpretation of culture results and antibiotic treatment (Srirangaraj, 2014). Crnich et al. (2015) suggested that basic laboratory test results tend to be reported a day or more after they are ordered, and culture results take even longer to determine an accurate diagnosis. As result, urine dipstick and empiric antibiotic therapy continue to be the mainstays of LTCF residents because of the time delay with urine cultures.

Abbo and Hooton (2014) stated that the diagnosis of UTIs in elderly LTCF residents is challenging due to a wider range of events that prompt urine testing, such as changes in mental status, confusion, behaviors, color or smell of the urine with or without dysuria, and falls. Crnich et al. (2015) concluded that cognitive impairment afflicted about 50% of LTCF residents which made it difficult for residents to vocalize their symptoms to the attending medical personnel to make an appropriate diagnosis.

Reason for the urine culture. Loeb et al. (2002), suggested that UTIs are the most common indication for prescribing antibiotics for residents in LTCFs. The diagnosis of UTIs in elderly LTCF residents is challenging because there is a wider range of events that prompt urine testing, such as changes in mental status, confusion, behaviors, color or smell of the urine with or without dysuria, or falls (Abbo & Hooton, 2014). Among older adults, temperature elevation or decline/ depression in response to infection is often blunted (Crnich et al., 2015). Dyar et al. (2015) conducted an American study, and many of the nurses reported that urine specimens are routinely sent for culture for a variety of reasons in the absence of signs or symptoms of infection. In a Finnish study of LTCFs, urine odor was used as a symptom for UTI and a reason for taking a urine specimen (Dyar et al., 2015).

The reasons for obtaining a urine culture are new on- set confusion, foul smelling urine, or burning during urination (CDC, 2017b). Crnich et al. (2015) suggested that vague symptoms that have no clear relationship to UTI, such as malaise or falls, are often cited as a reason to test the resident’s urine samples. Obtaining recent antibiotic history from a resident and including it in the documentation is often neglected, and this diagnostic information influences interpretation of culture results (Srirangaraj, 2014). Limited sensitivity of urine cultures due to prior antibiotic consumption enforces the need to take proper history and avoid sending samples for culture to the microbiology lab.

Such periodic laboratory audits significantly improve patient care, limit misuse of antibiotics, and have a lasting impact on the quality of the laboratory report (Srirangaraj, 2014).

LTCF. LTCFs are defined as institutions that provide health care to people who are unable to manage independently in the community (Smith et al., 2008). An LTCF is the home for the resident, who is usually elderly, with declining health (Smith et al., 2008). Residents often stayed for years, and, comfort, dignity, and rights are paramount (Smith et al., 2008). According to Crnich et al. (2015), nearly 1.4 million residents resided in the 15,700 LTCFs in the United States, Canada, and the United Kingdom. Typically, residents living in these types of living facilities are frail and susceptible to developing infections and other morbid diseases which affect their quality of life (Crnich et al., 2015). LTCFs are vulnerable to elderly and crowded residents, and antibiotics are among the most commonly prescribed classes of medications for UTI infections in these facilities (Smith et al., 2008).

As people live longer, the demand for LTCFs continues to be on the rise (Dyar et al. 2015). Approximately, 25% of the population of older adults in the United States were estimated to reside in an LTCF at some point in time (Buhr, Genao, & White, 2011). Dyar et al. (2015) estimated that by 2030 there will be 70 million people in the United States aged 65 years or older, and the need for LTCFs would increase.

Definition of Terms

Agency for Healthcare Research & Quality (AHRQ): Refers to the health services research arm of the United States Department of Health and Human Services that provides a major source of funding and technical assistance for health service research and training at universities and other institutions in the United States (Johnson, R.W. 2013).

Urinary Tract Infections (UTI): Referred to considerable bacteriuria in a patient who has signs or symptoms attributable to the urinary tract only (Matthews, & Lancaster, 2011). Urinary tract infections (UTIs) are a common problem in the elderly population (Matthews, & Lancaster, 2011).

Asymptomatic Bacteriuria (ASB): A positive urine culture without any symptoms of a symptomatic urinary tract infection (Trautner & Grigoryan, 2013).

Symptomatic Urinary Tract Infection (SUTI): A fever greater than 100.4°F (38°C); urgency, frequency, dysuria, or suprapubic tenderness with no other recognized cause, and a positive urine culture (Trautner, & Grigoryan, 2013).

Infectious Disease Society of America (IDSA): Refers to the medical society that represents physicians, scientists, and other health care professionals whose specialty is primarily in public health and infectious diseases (Rowe, & Juthani- Mehta, 2014).

Center for Disease Control and Prevention (CDC): The CDC is the national public health institute in the United States. The CDC estimates that annually in the United States, antibiotic-resistant bacteria cause at least two million illnesses and 23,000 deaths (CDC, 2017a).

Electronic Health Record (EHR): Electronic health records (EHRs) are a distributed documentation system that enhances the efficiency and effectiveness of a work flow (Alvandi, n.d.). Electronic health records (EHRs), have the potential to greatly enhance the quality of care by streamlining information presentation, reducing repetitive tests, and organizing medical information in a useful manner ("5 Initial Steps to Move From Volume-Based to Value-Based Healthcare," n.d.).

Assumptions

The following assumptions of this research were hereby acknowledged by the researcher. This quantitative study was based on secondary data obtained from a LTCF in central Texas. The following assumptions included: (a) the nursing home administrator was motivated to improve antibiotic stewardship at the LTCF; (b) the secondary data set was accurately collected by the designated employees; and (c) the nursing home leaders and physicians took the necessary actions to improve ASP at the LTCF if the findings indicated a gap in compliance do exist.

Scope and Delimitations

Palinkas et al. (2015) stated that limitations were restrictions that limit the generalizability or credibility of the findings of a research. There were anticipated barriers that threatened the desired outcome of this doctoral research. Such as, in this study, I used secondary data which was previously collected and stored in the database at the LTCF. Limitations to the use of secondary data include limited data quality that drew any meaningful conclusions.

Limitations include low numbers of residents diagnosed with UTIs, dementia, and cognitive impairment which hindered the accuracy of the results. More incorrect responses about antibiotics by lower educated employees have been due to misunderstanding some of the medical terminology. In this study, I did not identify the socio-economic status and geographical location of the LTCF which could have been a rural or urban settlement in Texas. A major limitation of the study is being limited to one type of health care facility. The scope of this study was descriptive, and conclusions were based on long term care facilities only. The result of this study was generalized to the United States population since the sample was done locally.

Significance, Summary, and Conclusions

Significance of the **S**ummary

In the significance of the study, I explored the impact of the McGeer Criteria 20 years later and how these definitions were applied in skilled nursing facilities and nursing homes that care for the frail elderly populations. Antibiotic stewardship is a health care administration and public health issue that needs serious consideration to improve the patient's quality of life, reduce patient morbidity, and reduce cost of unnecessary medications (Fishman, 2012). This quality improvement initiative has the potential to contribute significantly to impact positive social change in the medical field. This research supports all the elements of social change both local and international.

Efforts on a global level to improve current educational programs are required, and it is necessary to develop appropriate educational programs targeted towards LTCFs. Clinicians acknowledged that deficits and lack of education in the area of antibiotic stewardship among health care providers needs to be addressed (Fishman, 2012). CDC, (2017a) concluded that improved communication, ongoing health care education, and guidance leads to greater antibiotic stewardship. However, these methods could be effective although there was no proven scientific evidence to confirm this.

Significance of the Theory

I used the SCT guidelines because they are frequently used in health care to guide behavior changes, and they are related to antibiotic stewardship and the quality of life for residents in LTCFs. A comprehensive approach to antibiotic stewardship and the quality of life for residents at the LTCF requires changing the practices of social systems that have widespread detrimental impact on the residents' quality of life and health care outcomes. Kowal (2010) stated that health care models are recognized guidelines that integrate the latest evidence into new pathways of care that promote best-practice outcomes for patients of any population.

The SCT is a model based on social influence and external and internal social reinforcement ("Behavioral Change Models," n.d.). The purpose of the SCT is based on how behavior is regulated through control and reinforcement over time to reach the goal ("Behavioral Change Models," n.d.). This theory was most compatible with the social and environmental policy changes that the nursing home administrator adapted to move the facility to practice antibiotic stewardship and changed routines and social norms. The broadness of the SCT was adaptable to utilize in an ever-changing health care system. It has been used as the structural framework for improvements in health care administration and continuum of the health care interdisciplinary team ("Neuman Systems Model," 2011).

Significance of Practice.

Dyar et al. (2015) concluded that a nursing home administrator is responsible for the quality of care provided to residents and ensuring the facility meets and/or exceeds the CMS antibiotic stewardship standards of care. Clinicians acknowledged that deficits and lack of education in the area of antibiotic stewardship among health care providers needs to be addressed (Fishman, 2012). CDC, (2017a) evaluated an improved educational intervention for health care employees, patients, and families which impacted antibiotic stewardship although there was no medical evidence or proof.

Education intervention is an effective behavioral measure in situations where knowledge deficiencies drive observed practice patterns. Crnich et al. (2015) concluded that educational interventions have a modest impact on antibiotic use in nursing homes. Educational intervention should cover the importance of antibiotic stewardship, plans for implementation of specific stewardship activities, and the responsibilities of clinical staff in achieving and maximizing stewardship goals (Crnich et al., 2015). Lee et al. (2015) noted that clinician education in combination with audit and feedback intervention seemed to be the most reliable way to antibiotic stewardship. Lee et al. (2015) presumed from the results that clinician education combined with other strategies effectively decreased the rate of antibiotic prescriptions by 52% in comparison to other strategies at 72%. All professionals involved in the continuum of health care at the LTCF received continuing education about the impact of antibiotics on the residents' quality of life.

Significance to social change. This doctoral research supports positive social change. I used the evidence from this doctoral study which provides information that encourages positive social change by the improvement of antibiotic stewardship for residents in LTCFs. Positive social change may occur within the LTCF in the study, and may be, generalized to the long-term care population by informing health care leaders, nursing home administrators, clinicians, and public health leaders. Findings from this study can be utilized by LTCFs to foster and sustain an organizational culture that is targeted toward maximizing health care outcomes.

Summary of the Literature Review

This section included a review of the literature associated with antibiotic stewardship and the quality of life for residents in LTCFs. Implementing an ASP initiative to improve the quality of life in an LTCF is challenging. Factors such as effective leadership, communication strategies, and a coordinated multidisciplinary approach are fundamental to help educate all medical personnel in the LTCF on antibiotic stewardship endeavors (Pollack & Srinivasan, 2014). Implementing a successful ASP intervention resulted in significant advantages such as cost savings, saving lives through improving patient's health outcomes, lower readmission rates, and better quality of life for the residents in the LTCF (CDC, 2017a).

Section 2: Research Design and Data Collection

Introduction

The purpose of this study was to analyze operational secondary data collected for reasons that was deidentified and made available to me from a Texas LTCF. In this chapter, I discuss the research design, setting, region, target population. I also discuss the setting, data instruments, data collection, analysis procedures, and ethical considerations that I used to address the research questions. My main goal for this research was to develop evidence- based guideline for improving the quality of life for long-term care residents. This study was a quality improvement initiative in health care administration which was aimed toward the nursing home administrator in a LTCF as it was related to antibiotic stewardship and the quality of life for residents in the geriatric

Research Design and Rationale

I used a logistic research design to examine the correlation between the variables within the targeted population. The purpose of this quantitative study was to analyze operational secondary data collected for nonresearch reasons that was deidentified and made available to me from a Texas LTCF regarding antibiotic utilization for the residents. Analysis of data involved using IBM SPSS Statistics v. 22.0 (2013) statistical software.

Secondary Data Analysis Methodology

The calculation of descriptive statistics (means and standard deviations) was appropriate for continuous variables and categorical variables were summarized with frequency counts and percentages. In the data analysis, for RQ1, I used a logistic regression statistical analysis. The variables met the specifications for performing logistic regression testing. For RQ 2, I used the chi- square statistical analysis. A combination of extensive medical research and statistical analysis were the best choice to determine future medical diagnosis and treatment option. For RQ 3, I used Pearson's correlation statistical analysis. It was the most suitable data analysis method because it can be used to measure pre and post intervention changes. The utilization of statistical analyses tested significance and improved the power of the doctoral study.

Population Sample Frame, Sampling Procedure, and Power Analysis

I used secondary data obtained from the LTCF in Texas to compute the power analysis. Open Source Epidemiologic Statistics for Public Health, Version 2.3.1 calculated the power analysis. An 80% power analysis calculation for sample size of 200 was a relatively small population which provided a high enough effect volume for the research. I analyzed the sample through SPSS version 23 for sample size for the data collected for 12 months. The researcher recoded the dependent variables: dementia/ confusion, number of antibiotic courses, name of antibiotic, length of antibiotic treatment, 72 hours after antibiotic initiation, urine culture prior to antibiotic, reason for urine culture. The independent variables were CDC documentation, age/ gender/ dementia. The calculation of the estimated confidence level assisted in determining an effective sample size for the research study by utilizing the Power calculations provided by Open Source Epidemiologic Statistics for Public Health Version 2.3.1.

Table 1

Sample Size for a Frequency in a Population

Sample Size (n) for Various Confidence Levels	
Confidence Level (%)	Sample Size
95	132
80	91
90	116
97	141
99	154
99.9	169
99.99	177

Results from OpenEpi, Version 3, open source calculator—SSPropor

Table 2

RQ1 CDC Guideline Documentation of the Indication for Antibiotic Therapy for UTI and the Resident's Age, Gender, or Dementia

Sample Size (n) for Various Confidence Levels	
Confidence Level (%)	Sample Size
95	132
80	91
90	116
97	141
99	154
99.9	169
99.99	177

Results from OpenEpi, Version 3, open source calculator—SSPropor

Table 3

RQ 2 CDC Guideline Documentation of the Urine Culture Results and the Antibiotic Spectrum for Treatment on the Medical Record and the Appropriate Antibiotic Ordered

Sample Size (n) for Various Confidence Levels	
Confidence Level (%)	Sample Size
95	132
80	91
90	116
97	141
99	154
99.9	169
99.99	177

Results from OpenEpi, Version 3, open source calculator—SSPropor

Table 4

RQ 3 CDC Guideline Documentation of the Patients Being Re-evaluated 72 Hours After Antibiotic Initiation

Sample Size (n) for Various Confidence Levels	
Confidence Level (%)	Sample Size
95	132
80	91
90	116
97	141
99	154
99.9	169
99.99	177

Results from OpenEpi, Version 3, open source calculator—SSPropor

Data Accessibility and Permissions

The collection of data came from a LTCF in Texas. The data collection tool generated a report from the EHR for the variables in relation to the number of residents required in the study (See Appendix A). Thereafter, I completed an analysis of all inputted data via SPSS software. I protected all confidential documentation. At the beginning of this study, the nursing home administrator at the LTCF utilized in the study verbally agreed to assist me in furnishing the data upon retrieving the proper documentation from Walden University. The nursing home administrator was knowledgeable about doctoral research and the sensitivity of the content.

Data Collection and Management

This study utilized secondary data analysis. The administrative personnel in the LTCF received a designed data collection audit tool (See Appendix A) to document the data needed to complete the doctoral research. The request was for the employees to complete the data collection in 14 days. Weekly follow up calls were made to remind the employees to collect the data for me. However, due to work overload, the collection of data exceeded scheduled date. The following variables were used to collect data. The data were: CDC documentation, age/ gender, dementia/ confusion, number of antibiotic courses, name of antibiotic, 72 hours after antibiotic initiation, length of antibiotic treatment, urine culture prior to antibiotic, and reason for urine culture.

Instrumentation

The designed data collection audit tool distributed to the administrative personnel in the LTCF helped the clinical and pharmacy data to select residents based on the needed variables to complete this doctoral research. The variables used to collect data were CDC documentation, age/ gender, dementia/ confusion, number of antibiotic courses, name of antibiotic, 72 hours after antibiotic initiation, length of antibiotic treatment, urine culture prior to antibiotic, and reason for urine culture. The variables used for testing met the specifications and requirements for the particular statistical analysis. Participants received no monetary compensation as a token for their contribution in the study. There was no need to use a consent form, because the deidentified data were completely anonymous.

Operational Definitions of Variables

Table 3 showed the variables used in the data analysis. I used the nominal variables age/ gender, dementia/ confusion, name of antibiotic, CDC documentation, and reason for urine culture in the data analysis. The researcher summarized the variables by creating a single variable score ranging from 1–5. All variables were recoded using the SPSS auto function.

Table 5

Operational Definition of Variables

Name	Measurement	Values of Variables
Age	Ordinal	
Gender	Nominal	Male (1) Female (0)
Dementia/ Confusion	Nominal	Yes (1) Positive No (0) Negative
No. of Antibiotics Courses Over 12 months	Ordinal	
Name of Antibiotic	Nominal	Nitrofurantoin (1) TMP/SMX (2) Cipro (3) Septra (5)
Urine Culture Prior to Antibiotic	Ordinal	Yes (1) Positive No (0) Negative
Reason for Urine Culture	Nominal	Confusion (1) Soul Smell Urine (2)

Data Analysis Plan

For the data analysis, I used IBM SPSS Statistics v. 22.0 (2013) statistical software. Using the data mining program SPSS, I entered the findings to calculate a true descriptive analysis in this research. I was able to determine the correlation, if any, between the variables by utilizing the data analysis. The use of SPSS allows for data to be mined at any desired time frame of the study and produce statistics findings at any point. In the data analysis technique, for RQ1, I used a logistic regression testing. For RQ 2, I used the chi- square statistical analysis. For RQ 3, I used a Pearson's correlation for the data analysis.

Data Cleaning Procedures

The initial sample size for the secondary data set comprised of 200 residents at the Lodge, Leon Springs, Texas for a 12 month period. Prior to analyzing the research question, data cleaning and data screening occurred to ensure that the variables under study met the appropriate statistical assumptions. I used additional inclusion criterion that required residents to be at least 65 years of age because of the nature of the research geared toward an aging population only.

Research Questions and Hypothesis

This scholarly project attempted to explore the following questions:

RQ 1: Is there a statistical significant relationship of the CDC guideline documentation of the indication for antibiotic therapy for UTI and the resident's age, gender, or dementia?

$H_0$1: There is no statistical significant relationship between the CDC guideline documentation of the indication of antibiotic therapy for UTI and the resident's age, gender, or dementia status.

H_a1: There is a statistical significant relationship between the CDC guideline documentation of the indication for antibiotic therapy for UTI and the resident's age, gender, or dementia status.

RQ 2: Is there a statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient?

$H_0$2: There is no statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient.

H_a2: There is a statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient.

RQ 3: Is there a statistical significant relationship of the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy?

$H_0$3: There is no statistical significant relationship between the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy.

H_a3: There is a statistical significant relationship between the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy.

Analysis Techniques

For RQ1, I executed a logistic regression to examine the relationship between documentation of antibiotic treatment and (a) age; (b) gender; and (c) dementia. For RQ2, I used chi-square statistical analysis. A combination of extensive medical research and statistical analysis are the best choices to determine future medical diagnosis and treatment options. Chi-square statistical analysis is an adequate tool for exploratory research; the conclusions drawn must be interpreted with caution, although they often provide scientifically highly interesting follow-up questions (Cleophas & Zwinderman, 2013). For RQ3, I used a Pearson’s correlation. It was the most suitable statistical analysis technique to calculate significance and improve the power of the doctoral study.

Rationale for Inclusion of Confounding Variables

I used these variables: dementia/ confusion, number of antibiotic courses, name of antibiotic, length of antibiotic treatment, 72 hours after antibiotic initiation, CDC documentation, urine culture prior to antibiotic, reason for urine culture and, age/ gender/ dementia which may have the potential to influence the nursing home quality of care. A nursing home administrator has the potential to improve the LTCF’s revenue, reduce the overall burden of antibiotic resistance, improve patient outcomes, quality of care, and safety once an ASP has been successfully implemented in the LTCF (CDC, 2017b).

Implementing an antibiotic stewardship program is challenging and it requires health administration leadership intervention and the participation of all medical personnel (Barlam et al., 2016). The goals of an antibiotic stewardship initiative involving focusing on the patient, improving the quality of care and health care outcomes that require social interactions, and environmental changes in relationships between health care practitioners (Barlam et al., 2016). The social cognitive theory (SCT) is frequently used to guide behavior change interventions (Tams, 2018). A comprehensive approach to antibiotic stewardship and the quality of life for residents at the LTCF required changing the practices of social systems that have widespread detrimental impact on the health of residents. The broadness of the SCT is adaptable in an ever-changing health care system (Tams, 1991).

Interpretation of Results

To interpret the analysis of results, I used logistic regression for RQ1 to test the overall significance of the quantitative data that included the relationship between documentation of antibiotic treatment, and (a) age, (b) gender, and (c) dementia. For RQ2, I used chi-square statistical analysis to determine if there was an association between urine culture results and the antibiotic spectrum for treatment on record. For RQ3, I used Pearson's correlation to examine the relationship between the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record, and the length of antibiotic therapy.

Threat to Validity

In this quantitative study, the researcher identified, if there was the possibility of external and internal threats to validity.

External Validity

All social exploration includes estimation or perception and the point it is measured or watched. The legitimacy of exploration frequently alludes to the conclusions that are drawn about the nature of the measures (Frankfort-Nachmias & Nachmias, 2008). Two primary issues of external validity are the reactive arrangements in the research procedure and the representativeness of the sample (Frankfort-Nachmias & Nachmias, 2008). To ensure the generalizability in this study, the sample was drawn from the targeted population and not from an accessible population, thus avoiding a potential threat to data retrieval. A significant question was whether the research findings were generalizable to larger populations and whether the findings could be applied to various social and political settings. There was a possibility of Hawthorne effect occurring which involved employees retrieving the data by responding favorably to the data collection tool and thus jeopardizing external validity. To overcome this, the reason for the study was clearly communicated to the employees thus stressing the importance of them being truthful and honest when extracting the data.

Internal Validity

Natural variables are changes in the units contemplated amid the exposition period, changes in the instrument of estimation, or the responsive impact that happened in the study (Frankfort-Nachmias & Nachmias, 2008). According to Frankfort- Nachmias and Nachmias (2008), threats to internal validity may nullify any causal interpretation found in the research findings. History denotes all events that happen during the study period might affect the unit or the individuals studied and provide an opposing explanation for changes observed in the dependent variable. Confounding variables are the result of the existence of extraneous factors and distort the association between the independent and dependent variables (Pourhoseingholi, Baghestani, & Vahedi, 2012). Lurking variables that could influence the outcome of this study were the size of the LTCF (bed size), geographical location, and socioeconomic status. Since it was not possible to exclude facility-type based on bed size, geographical location, and social economic status, inclusion of these variables remained.

Construct Validity

Construct validity has traditionally been defined as the experimental demonstration that a test was measuring the construct it claimed to be measuring (Brown, 2000). Construct validity measures are chosen by the researcher to capture the essence of the construct (Brown, 2000). According to Dijksterhuis et al. (2013), construct validity is demonstrated by evidence of statistical testing. To determine the construct validity, I used statistical analysis as evidence to demonstrate the significance of the variables to determine the construct validity of the variables. The concept of construct validity is very well accepted (Brown, 2000).

Ethical Procedures

To meet the requirements of Walden's research standards, I obtained approval from the Institutional Review Board (IRB). The IRB approval number for this study is 04-29-19-0657718. To fulfill the research requirements of Walden University, I got a legal document signed and stamped by the nursing home administrator at the LTCF in Texas. This legal document notified the IRB at Walden University that the extracted data came from the LTCF database and that staff members were knowledgeable about the confidentiality and the duration of the doctoral study.

Permission

For this doctoral research, before data collection began on the research, the IRB reviewed and approved the methods and procedures. I completed appropriate knowledge and training regarding human research subject matter protections, ethical conduct of research and applicable regulations. I ensured that knowledge needed to properly conduct the specific protocol change in antibiotic stewardship and the quality of life for residents in LTCFs occurred.

Ethical Concerns

As the principal investigator, I prepared a simple data tool for the easy retrieval of data. Data extraction and collection occurred on the LTCF premises by the LTCF's administrative personnel. Incorrect entry, data tampering, and system failure are ways that data may be compromised (Alvandi, n.d.). Both data security and participant confidentiality were always maintained. I made sure to emphasize the steps needed to ensure data integrity to the staff at the LTCF. They staff implemented security measures using audit trails and developed policies and procedures. I shredded the completed data tool after the extraction of necessary data for analysis. As the principal investigator, I was responsible for ensuring compliance with the IRB policies and procedures.

Treatment of Data

As the principal investigator, I ensured the integrity of data. As the driving force in evidence-based practice, data integrity is critical in the health care environment (Hebda & Czar, 2013). The securing of information was a result of data encryption, data backups, access controls, input validation, and data validation (Alvandi, n.d.). Data integrity was not comprised. Thorough checks, policies, and conservative practices are the responsibility of all health care personnel. Constant review of policy, practices, and data was essential in maintaining the integrity of the action plan. I was responsible for ensuring compliance with the IRB policies and procedures as mandated by Walden University.

Summary

This chapter, I dealt with the methodology of the quantitative study. Section two of this quantitative study outlined the method of retrieving data from a LTCF in Texas. I addressed Walden's ethical issue in complying with their laws in retrieving secondary data. I outlined the potential threats to validity and proposed measures to minimize validity and improve reliability. I ensured that I took deliberate steps to maintain data integrity until I obtained approval from Walden’s IRB. In the next section I will discuss the results and findings of the three research questions computed using SPSS software.

Section 3: Presentation of the Results and Findings

Introduction

In section 3, I will review the data collection and statistical analysis of the secondary data as discussed in section 2. The objective of the research study was to determine whether the nursing home care team met and/or exceeded the CMS antibiotic stewardship standards of care. I calculated and analyzed the frequency, standard deviation, average, percentage, mean, mode, sum, and differences in male and female residents.

I utilized statistical analysis to answer each research question to accept or reject the null hypotheses. RQ1 sought to measure the CDC guideline documentation of the indication for antibiotic therapy for UTI and the relationship, if any, to the resident's age, gender, or presence of dementia. RQ2 sought to measure the reason for urine culture, new onset confusion or foul smell, and the antibiotic ordered for the patient. RQ3 sought to measure the CDC guideline of documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of and the length of antibiotic therapy. I made the decision to choose either the null or alternative hypothesis based on the relationship of variables. From the sample, I presented a visual representation that contributed to the explanation of the data analysis. This research was a quantitative study of secondary data collected from an LTCF in Texas.

Residents in the study were male and female over 65 years old. I completed the evaluation of the average age of male versus female, most common antibiotic prescribed, average number of days of antibiotic treatment, length of antibiotic treatment, documentation of antibiotic follow-up, average number of days for reevaluation, and the cost per dosage. The pharmacy and clinical teams completed a chart audit to ensure the pharmacy documentation and clinical documentation in the medical record was in one place for each resident and available to the researcher in the study.

Data Collection of Secondary Data Sets

I customized the data collection tool to collect pertinent information related to the doctoral study. The data collected for the variables were age, gender, presence of dementia/confusion, number of antibiotic courses, name of antibiotic, length of antibiotic therapy. The quality assurance representative of the LTCF coordinated the pharmacy and clinical chart audits and provided the de-identified information to protect patients' identities and comply with the Health Insurance Portability and Accountability Act of 1996 (HIPAA). Following the guidance of HIPAA ensures the confidentiality, integrity and security of the electronic protected health information. The timeframe of the data was from March 2018 through March 2019.

I maintained the protection of the data and professional integrity to use the information for the purpose of potential social change. I ensured that the contents of medical records were not tampered with and the data were used for the sole purpose of the research. To comply with the ethics of this research, permission to proceed with the research was sought from the Walden Institutional Review Board (IRB). The IRB approval number for this study is 04-29-19-0657718. The analysis of medical data retrieved from the LTCF will be presented in this chapter.

Results

I retrieved and analyzed 200 entries using the data collection tool. The data analysis represents the results of the descriptive statistics with (*N* = 200). Table 7 showed the frequency distribution for variables used in the study. The variables used were gender, history of dementia, history of dementia by gender, reason for the urine culture, name of antibiotic treatment, documentation of antibiotic treatment, and documentation of antibiotic treatment by gender.

Table 6

Frequency Distribution for Variables Used in the Study

Variables	Categories	N	%
Gender	Male	84	41.40
	Female	116	58.60
History of Dementia	No	83	41.50
	Yes	117	58.50
History of Dementia by Gender	Male	41	49.40
	Female	42	50.60
Reason for Urine Culture	New On Set Confusion	66	55.00
	Foul Smell	53	45.00
Name of Antibiotic Treatment	Nitrofurantoin	36	21.56
	TMP/SMX	38	22.75
	Cipro	63	37.72
	Septra	30	17.96
Documentation of Antibiotic Treatment	No	115	57.50
	Yes	85	42.50
Documentation of Antibiotic Treatment by Gender	Male	115	57.50
	Female	85	42.50

RQ1: Is there a statistical significant relationship of the CDC guideline documentation of the indication for antibiotic therapy for UTI and the resident's age, gender, or dementia?

$H_0 1$: There is no statistical significant relationship between the CDC guideline documentation of the indication of antibiotic therapy for UTI and the resident's age, gender, or dementia status.

$H_a 1$: There is a statistical significant relationship between the CDC guideline documentation of the indication for antibiotic therapy for UTI and the resident's age, gender, or dementia status.

Table 7

Summary of Logistic Regression Analyses for Variables Predicting Documentation of Antibiotic Treatment (N = 200)

Variables	*B*	S.E.	OR		95% Lower CI	95% Upper CI
Reference Group	-1.66	1.55	0.19			
Age	0.01	0.02	1.01		0.97	1.06
Male	0.58	0.30	1.79	*	1.00	3.19
No Dementia	0.05	0.30	1.05		0.59	1.88

Reference group = Females with dementia

*$p < .05$

Note. From "Attitudes Toward Dissertation Editors," by W. Student, 2008, *Journal of Academic Optimism*, *98*, p. 11. Reprinted with permission.

I used a logistic regression to examine the relationship between documentation of antibiotic treatment and (a) age, (b) gender, and (c) dementia in Table 7. Documentation of antibiotic treatment, the dependent variables were dichotomous and the independent variables of history of dementia and gender were dichotomous, and age was a continuous variable. As a result, I dummy coded gender and dementia. Females received a code of zero, and males received a code of one. Residents noted as having dementia received a code of zero as opposed to those residents that did not have dementia received a code of one.

The logistic regression model was not statistically significant, $\chi^2(3) = 4.59$, $p >$ .05. The model explained 3.1% (Nagelkerke R^2) of the variance for documentation of antibiotic treatment and correctly classified 60.4% of cases. The male variable was the only statistically significant variable in documentation of antibiotic treatment in which males had 1.79 (*OR* 1.79; 95% *CI*: 1.00 – 3.19) times higher odds than female participants of having documentation of antibiotic treatment. As a result, I rejected the null hypothesis, and the alternative hypothesis was accepted. Due to residents' age and dementia status not being statistically significant, I failed to reject the null hypotheses for $H_0$1a and $H_0$1c. The results were presented in Table 7.

RQ2: Is there a statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient?

$H_0$2: There is no statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient.

H_a2: There is a statistical significant relationship between the reason for urine culture, new onset confusion or foul smell and the antibiotic ordered for the patient?

Table 8

Chi-square Analysis of Urine Culture Results and Antibiotic Spectrum for Treatment

	Name of Antibiotic Treatment				
Reason for Urine Culture	Nitrofurantoin	TMP/SMX	Cipro	Septra	Total
New On Set Confusion	15	17	22	11	65
Foul Smell Urine	8	11	23	10	52
Total	23	28	45	21	117

$\chi^2(3) = 2.07$, $p > .05$

Due to the nature of the antibiotic spectrum for treatment and the medical record being categorical, I used a chi-square analysis to determine if there was an association between urine culture results and the antibiotic spectrum for treatment on record. A chi-square analysis indicated a no significant difference result $\chi^2(2) = 3.70$, $p > .05$. Therefore, the results I failed to reject the null hypothesis. The result of the chi-square analysis is presented in Table 8.

RQ3: Is there a statistical significant relationship of the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy?

$H_0$3: There is no significant difference between the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy.

H_a3: There is a statistical significant relationship between the CDC guideline documentation of patients being re-evaluated 72 hours after antibiotic initiation, documentation of antibiotic follow-up in the medical record and the length of antibiotic therapy.

Table 9

Pearson's Correlation for Length of Antibiotic Therapy and Days Re-Evaluated Post Antibiotic Treatment

Variables	*M*	*SD*
Age	74.54	7.13
Days of Antibiotic Treatment	13.19	2.25
Days Re-Evaluated Post Antibiotic Treatment	7.75	1.76

Due to the majority of participants having documentation of antibiotic follow-up within their medical record, I used Pearson's correlation to examine the length of antibiotic therapy and the CDC guideline of patients being re-evaluated 72 hours after antibiotic initiation. Preliminary analyses gave the indication that the relationship was linear since both variables were not normally distributed, as assessed by Shapiro-Wilk's test ($p < .05$), which is often the case when there are larger sample sizes (e.g., larger than 50 cases). There were no outliers.

There was a statistically significant, moderate small negative correlation between the number of days reevaluated after initial antibiotic therapy $r(160) = -.22$, $p < .01$ with the length of antibiotic therapy explaining approximately 5% of the variation between the two variables. As the duration of antibiotic treatment increased, the number of days decreased when the re-evaluation of participants occurred. As a result, I rejected the null hypothesis, and I accepted the alternative hypothesis.

Summary

In this section, I used statistical analysis to support the practice problem and explain that data collected at the LTCF evaluated in this study. The purpose of the descriptive analysis was to summarize the variables and measurements within the research study with the use of quantitative analysis. The null hypotheses for research questions one and three were rejected because there were statistically significant. For research question one, the male variable was the only statistically significant variable in documentation of antibiotic treatment in which males had 1.79 (*OR* 1.79; 95% *CI*: 1.00 – 3.19) times higher odds than female participants of having documentation of antibiotic treatment. For research question two, the null hypothesis was not rejected due to no statistical significance. For research question three, there was a significant small, negative correlation for the duration of antibiotic treatment and the number of days when the participants received reevaluation. In other words, as the duration of antibiotic treatment increased, the number of days when the participants received reevaluation decreased. This chapter included a summary of the interpretation of the findings, limitations, recommendations, and implications for professional practice and social change.

The study brings emphasis between males and females and helps to present distinctive differences. Given these distinctive differences, it is important that studies reassess conventional practices with respect to addressing CDC documentation in both male and female residents independently. The sample size was relatively smaller to note any statistically significant findings or relationships. The data analysis from the quantitative data provided information to inform the nursing home administrator of the practice about antibiotic utilization and compliance to ensure CDC antibiotic stewardship guidelines have been satisfy in the LTCF. From the data analysis, it can be concluded that CDC documentation continues to be a significant problem in the LTCF setting. Given these differences, it is important that future studies reassess conventional practices with respect to prescribing antibiotics and address both male and female residents independently.

The evidence collected and the data analyzed during this quality improvement project added benefit to the advancement of research in this area. In the next section I will expand on the findings, implications, and recommendations relating to the effect the ASP had on this facility. Finally, I will share a personal analysis from my perspective of being a DHA student to the different roles assumed throughout the project and in relation to the scholarly journey.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

Antibiotic stewardship is an important concept for all providers who deliver health care. The evidence collected and the data analyzed during this quality improvement project can provide added benefits to further medical and scientific research. The results obtained in the quantitative analysis may provide information to inform the nursing home administrator of the practice of antibiotic utilization and compliance issues, if any, to ensure CDC antibiotic stewardship guidelines have been met. This study has the potential to inform nursing home administrators about antibiotic utilization and, identify opportunities regarding antibiotic utilization and antibiotic stewardship, policy development regarding antibiotics, and how to improve the quality of life for the residents.

Interpretation of the Findings

Findings from this study can be utilized by LTCFs to foster and sustain an organizational culture that is geared toward maximizing health care outcomes and antibiotic stewardship. The evidence collected and the data analyzed during this quality improvement project can add benefit to further studies. Findings from this research provides a platform so that other researchers, doctoral students, scientists, stakeholders, and medical practitioners can conduct similar research in order to promote positive social change.

The significance of this quantitative study guided the nursing administrator to work with multidisciplinary teams to update the antibiotic administration policy, educate practitioners and patients, and make a cultural change toward the practice of antibiotic stewardship. Also, the nursing home administer ensured that employees at the LTCF were more compliant with CDC documentation of antibiotic treatment for both male and female residents.

Limitations of the Study

This doctoral research had many strengths and limitations. One notable strength involved the commitment from the medical team at the LTCF in the study to the successful completion of this project. The medical team worked with the researcher to provide the quantitative data. Another strength was that the project provided support for the argument that many health care professionals are not aware how severe the overuse, misuse, and inappropriate use of antibiotics is at their facility.

The study sample was small which may have contributed to the lack of statistically significant findings since the sample only derived from one geographical location in central Texas only. Therefore, neither claims of cause and effect nor generalizability to a larger population such as the entire United States can be made from this doctoral study because of these limitations and delimitations. The selection of variables came from the literature review and professional medical associations and societies in the United States. Selection of different variables could yield different results and findings. Regardless of these limitations, the research should be deemed original and reminiscent of the need for more significant research to be executed.

Recommendations

The fields of medicine and health care are always changing due to developing research in new diagnoses, medicines, and treatments. Implementing an antibiotic stewardship program includes the use of several strategies, including leadership support, accountability, drug expertise, actions to improve use, tracking antibiotic use and resistance, education, and reporting information to staff on improving antibiotic use and resistance. The core elements of improving antibiotic stewardship are health care leadership, action, tracking and reporting, education, and communication. Health care leadership commitment is a core element by providing the human, financial, and information resources to support the initiative of antibiotic stewardship. Providing adequate and continuous medical education requires effective teamwork by all medical professionals to achieve better health care outcomes. Obtaining the support of the government, the state, and the local community will be beneficial in the creation of new programs. An action such as a core element uses at least one recommended action such as antibiotic time outs, delayed prescribing practices, or watchful waiting (CDC, 2017c). Tracking, monitoring, and reporting antibiotic prescription patterns are all critical core elements to improve the quality of life (CDC, 2017c).

The CDC (2017b) concluded that improved communication, ongoing health care education, and guidance could lead to greater antibiotic stewardship. However, these methods may be effective although there is no proven scientific evidence to confirm this. Raising awareness to the public, patients, and health care professionals through educational programs is important. Providers and nurses alike need to constantly maintain the most diligent level of continuing education and passion for new knowledge. A mandatory number of continuing education hours or courses about antibiotic stewardship may prove to be effective to staying current and remaining in compliance with prescribing and administering guidelines. Efforts on a global level to improve current educational programs are required, and it is necessary to develop appropriate educational programs targeted towards LTCFs.

Healthcare informatics and technology are aiding in clinical decision making, and drop-down menus within the electronic medical record have been proven useful (Alvandi, n.d.). When an antibiotic is chosen, a drop-down box will request the provider to justify the need for an antibiotic. These drop-downs can be programmed according to current guidelines. So, if a health care provider chooses an inappropriate antibiotic, incorrect dosage, or improper duration, a recommendation will be given and an opportunity to change to an alternative treatment will manifest.

Another recommendation is a more in-depth research on antimicrobial resistance. The future of antimicrobial resistance is unknown. Antimicrobial resistance has been around for many years, and it continues to be on the rise. Future opportunities in the fight against antimicrobial resistance include improving current preventative programs and campaigns and creating new ones. New programs will need to have the support from leadership in order to be successful. As information becomes more readily available, and education on antimicrobial resistance increases, there will be many opportunities to do more research on antimicrobial resistance.

Professional Practice

In an ever changing health care environment, there is a parallel revolution of education and the ease of remaining updated can be challenging (Rocha-Pereira et al., 2017). In LTCFs, professional medical education has not been updated with the revolution of education for many reasons such as poor leadership to improve health systems, misalignment of strategic planning, absence of electronic medical records, lack of published guidelines, lack of personnel, and persistent gender stratification of professional status (Rocha-Pereira et al., 2017).

The need for antibiotic stewardship across the spectrum of health care has been recognized in the National Action Plan for Combating Antibiotic- Resistant Bacteria issued by the White House in March 2015 (Barlam et al., 2016). This plan called for establishment of ASPs in all acute care hospitals by 2020 and for the CMS to issue a Condition of Participation that participating hospitals develop programs based on recommendations from core elements of hospital antibiotic stewardship programs (Barlam et al., 2016). Expansion of the ASP extends to ambulatory surgery centers, dialysis centers, nursing homes, LTCFs, emergency departments, outpatient settings (Barlam et al., 2016).

Positive Social Change

With similar doctoral research like this study and more visibility of the guidelines from establishments such as the CDC by way of information pamphlets, office posters, and social media exposure, antibiotic prescribing habits can continue to change. The antibiotic resistance crisis is evident worldwide. The evidence collected and the data analyzed during this quality improvement project can add benefit to further studies. The evidence may provide information to implement positive social change first within the LTCF in this study and help to generalize the information to the long-term care population informing nursing home administrators, clinicians, and public health leaders.

Findings from this study can be utilized by health care organizations to foster and sustain an organizational culture that is geared toward maximizing quality and safety protocols. Prescribing medical providers can all benefit from continued or further education about the role they each play in keeping patients protected from the negative side effects of antibiotics. A continued effort is warranted through online continuing education courses, annual conferences, and social media to be a successful nation at decreasing the millions of annual antibiotics that are written and inappropriately prescribed. A well-defined action plan can positively impact patient care, outcomes, and safety once it has been successfully implemented. The significance of this doctoral study may guide the nursing home administrator to work with multidisciplinary teams in the LTCF to update antibiotic administration policy, educate practitioners and patients, and make a cultural change towards the practice of antibiotic stewardship.

Methodological, Theoretical, and Empirical Implications

For this scientific analysis, the most appropriate research design was a quantitative design which was used to collect and analyze data through the use of statistics. I designed and distributed a data collection audit tool to the administrative personnel in the LTCF to identify clinical and pharmacy data for each resident to compile the information needed for the variables to complete this doctoral research. The following variables were used to collect data which included: age/ gender, dementia/ confusion, number of antibiotic courses, name of antibiotic, length of antibiotic treatment, CDC documentation, urine culture prior to antibiotic, and reason for urine culture. These variables were appropriately used for testing since they met the specifications and requirements for statistical analysis as it related to the research.

The theoretical framework used in this quantitative research study was the social cognitive theory (SCT). SCT emphasizes the interaction between people, their behavior, and their environment (Cherry, 2019). A nursing home administrator can utilize the concepts of the SCT as a model to encourage antibiotic stewardship and to facilitate social change in the LTCF. The SCT model of change focuses on how a nursing home administrator systematically makes changes in their habits to achieve a mutual goal.

Conclusion

In summary, the misuse of antibiotics to treat residents in the LTCFs remains as a significant problem. This study may provide information to inform the nursing home administrator of the practice of antibiotic utilization and compliance issues, if any, and to ensure the CDC antibiotic stewardship guidelines have been satisfied. A nursing home administrator can utilize the concepts of the SCT as a model to encourage antibiotic stewardship and to facilitate social change in the LTCF.

Antibiotic stewardship is an important concept for all providers who deliver healthcare. Health care leadership is mandatory in ensuring resource allocation of ongoing educational opportunities to support antibiotic stewardship programs. Antibiotic stewardship encompasses the wise attitude and practice about monitoring infectious bacterial and viral illness and correcting antibiotic prescribing. I anticipate sharing these findings with colleagues so that they are mindful of antibiotic stewardship. Since I am a subject matter expert in antibiotic stewardship, I am optimistic that I am able to significantly decrease the amount of antibiotic prescriptions written and increase more medical visits with watchful waiting.

Throughout this doctoral project I have gained a deeper understanding of antibiotics and the quality of life for older people. I believe that I am now an antibiotic stewardship ambassador and can continue to encourage additional positive social change by encouraging my colleagues to be more mindful antibiotic steward. The information gained from this doctoral project may cause additional transformation in practice patterns and develop educational programs that will address the needs of both the provider and the patient.

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Appendix A: Data Collection Form

Year of Birth	Gender		Dementia/ Confusion		CDC Doc		# Antibiotic Courses Last 12 months	Name of Antibiotic (ATB) Ordered	# Days of ATB Tx	# Days post ATB initiation patient re-evaluated After 72 hours	Urine Culture Prior to ATB		Was Urine Culture Positive		Reason for urine culture?	
	F	M	Y	N	F	M					Y	N	Y	N	New On-set Confusion	Foul Smell Urine
1930		M	Y		Y		0					N		N		
1932		M	Y		Y		2	Nitrofurantoin	7	7	Y		Y			✓
1932		F		N	Y		3	TMP/SMX	14	7	Y		Y		✓	
1932		F	Y			N	1	Nitrofurantoin	14	10	Y		Y			
1933		M	Y			N	2	Nitrofurantoin	7	10	Y		Y		✓	
1933	F	F		N		N	1	Nitrofurantoin	7	14	Y		Y		✓	
1933	F	F	Y			N	2	Nitrofurantoin	7	10	Y		Y		✓	
1933		M	Y			N	1	TMP/SMX	7		Y		Y		✓	
1933		M	Y		Y		3	TMP/SMX	7	7	Y		Y			✓
1933		M		N	Y		1	Cipro	7	10	Y		Y			✓
1933	F	F	Y			N	2	Nitrofurantoin	7	7	Y		Y			✓
1933	F	F	Y			N	3	Septra	7	10	Y		Y			✓
1933		M		N		N	3	TMP/SMX	7	10	Y		Y			✓
1933		M	Y		Y		1	Cipro	7	10	Y		Y			✓
1933		M	Y		Y		3	TMP/SMX	7	7	Y		Y			✓
1933	F	F	Y			N	2	Cipro	7		Y		Y			✓
1934	F	F		N	Y		1	Septra	7	10	Y		Y			

1934		M	Y			N	0					N		N		
1934		M		N	Y		3	Septra	7	7	Y		Y			
1934		M	Y			N	3	Cipro	14	7	Y		Y			
1934	F	F		N		N	0					N		N		
1934	F	F		N		N	2	Nitrofurantoin	14	10	Y		Y			✓
1934	F	F	Y			N	3	Septra	14	7	Y		Y			✓
1934	F	F	Y		Y		1	TMP/SMX	7	10	Y		Y			✓
1934	F	F		N	Y		1	Cipro	14	14	Y		Y			✓
1934	F	F	Y		Y		3	Cipro	14	14	Y		Y			✓
1934		M	Y			N	1	Cipro	14	10	Y		Y			
1934		M	Y		Y		2	Cipro	14		Y		Y			✓
1934	F	F		N	Y		3	Septra	14	10	Y		Y			
1935	F	F		N		N	2	TMP/SMX	14	7	Y		Y			
1935				N	Y		1	Cipro	14	10	Y		Y			
1935	F	F		N		N	1	Nitrofurantoin	14		Y		Y		✓	
1935		M	Y			N	1	Cipro	14	10	Y		Y			
1935		M	Y			N	3	Cipro	14	10	Y		Y			
1935	F	F	Y		Y		3	Nitrofurantoin	14	7	Y		Y			
1935	F	F		N		N	1	Cipro	14		Y		Y			
1935		M		N	Y		2	Septra	7	7	Y		Y		✓	
1936			Y			N	3	Septra	14	7	Y		Y		✓	
1936	F	F		N		N	1	Nitrofurantoin	14	7	Y		Y			
1936	F	F		N	Y		3	Septra	7		Y		Y			✓
1936	F	F		N	Y		1	Cipro	14	14	Y		Y		✓	
1936		M		N		N	1	Cipro	14	7	Y		Y			
1936		M		N		N	1	Cipro	7	7	Y		Y			✓
1937		M	Y		Y		0					N		N		

1937	F	F	Y		Y		0					N		N		
1937	F	F		N		N	2	Cipro	14	7	Y		Y		✓	
1938	F	F	Y			N	2	TMP/SMX	14	7	Y		Y			
1938	F	F	Y	N		N	2	Cipro	14	14	Y		Y		✓	
1938		M	Y		Y		1	Cipro	14	10	Y		Y			✓
1938		M		N		N	1	Cipro	14	10	Y		Y			✓
1938		M	Y			N	0					N		N		
1938	F	F	Y	N		N	0					N		N		
1938	F	F	Y	N	Y		0					N		N		
1938		M	Y		Y		2	Septra	14	7	Y		Y		✓	
1938		M		N	Y		2	Septra	14	7	Y		Y			
1938		M		N		N	1	Nitrofurantoin	14	14	Y		Y		✓	
1938		M	Y		Y		2	Septra	14	7	Y		Y		✓	
1938		M	Y		Y		0					N		N		
1938	F	F		N		N	3	Cipro	14	7	Y		Y			
1939	F	F	Y			N	2	Cipro	14	10	Y		Y		✓	
1939	F	F		N		N	2	Septra	14	7	Y		Y			
1939	F	F		N	Y		2	Nitrofurantoin	14	10	Y		Y		✓	
1939	F	F		N	Y		1	Cipro	14			N		N		
1939	F	F		N		N	1	TMP/SMX	14	14	Y		Y			
1940	F	F		N		N	1	Cipro	14			N		N		
1941		M	Y			N	2	TMP/SMX	14	7	Y		Y		✓	
1942		M	Y		Y		1	Septra	14	7	Y					
1942	F	F		N		N	1	Cipro	14	7	Y					
1942		M		N		N	1	Septra	14	7	Y					✓
1942	F	F	Y		Y		1	Cipro	14	7	Y					✓
1942	F	F		N		N	0					N		N		

1942		M		N	Y		1	TMP/SMX	14	7	Y				✓
1942		M	Y		Y		1	Cipro	14	7	Y				✓
1943		M	Y			N	1	Septra	14	7	Y				
1943	F	F		N		N	1	TMP/SMX	14	7	Y			✓	
1943	F	F	Y			N	1	Septra	14	7	Y			✓	
1943	F	F		N		N	1	Cipro	14	7	Y				
1943		M	Y		Y		1	Septra	14	7	Y				✓
1943		M	Y		Y		0					N	N		
1943	F	F	Y			N	1	Nitrofurantoin	14	7	Y				
1943	F	F	Y			N	1	Cipro	14	10	Y			✓	
1944	F	F	Y		Y		1	TMP/SMX	14	10	Y				
1944	F	F		N	Y		1	TMP/SMX	14	7	Y				✓
1944		M	Y		Y		1	Cipro	14	10	Y				
1944		M		N	Y		1	Septra	14	7	Y				✓
1944	F	F		N		N	1	Septra	14	14	Y				✓
1945	F	F	Y			N	0					N	N		
1945	F	F	Y			N	1	Cipro	14	7	Y				
1945		M		N	Y		1	Cipro	14	7	Y			✓	
1945	F	F	Y			N	1	TMP/SMX	14	7	Y			✓	
1945	F	F		N	Y		1	TMP/SMX	14	7	Y				
1945	F	F	Y		Y		1	Cipro	14	7	Y			✓	
1945	F	F		N		N	0					N	N		
1945	F	F	Y			N	1	Cipro	14	7	Y			✓	
1945	F	F	Y			N	1	Nitrofurantoin	14	7	Y				
1945		M	Y	N	Y		1	Septra	14	7	Y				✓
1945	F	M		N		N	0				Y				
1945	F	F		N		N	1	Cipro	14	7	Y				✓

1945	F	F	Y			N	1	Septra	14	7	Y			✓	
1945	F	F	Y		Y		1	TMP/SMX	14	7	Y			✓	
1945	F	F	Y		Y		0					N	N		
1945	F	M	Y			N	1	Cipro	14	7	Y				✓
1945		M	Y		Y		1	TMP/SMX	14	7	Y			✓	
1946		M		N		N	0					N	N		
1946	F	F		N	Y		1	Cipro	14	7	Y			✓	
1946	F	F		N	Y		1	TMP/SMX	14	7	Y			✓	
1946	F	F		N		N	1	Cipro	14	7	Y				✓
1947	F	F	Y			N	1	Septra	14	7		N	N	✓	
1948	F	F	Y			N	1	TMP/SMX	14	7	Y			✓	✓
1948	F	F		N	Y		1	Cipro	14	7	Y			✓	
1948		M	Y			N	0					N	N		
1948	F	F	Y			N	1	TMP/SMX	14	7	Y			✓	
1948	F	F	Y		Y		1	TMP/SMX	14	7	Y			✓	
1948		M		N		N	1	Cipro	14	7	Y				✓
1948		M	Y		Y		0					N	N		
1948	F	F	Y			N	1	TMP/SMX	14	7	Y				✓
1948	F	F		N	Y		1	Cipro	14	7	Y				✓
1948	F	F	Y		Y		1	Septra	14	7	Y				✓
1948		M	Y		Y		1	Cipro	14	7	Y				✓
1948		M		N	Y		1	Nitrofurantoin	14	7	Y				✓
1949	F	F	Y			N	1	TMP/SMX	14	7	Y			✓	
1949	F	F		N		N	0		14	7	Y			✓	
1949	F	F	Y		Y		1	TMP/SMX	14	7	Y			✓	
1949		M		N		N	0					N	N		
1949		M	Y			N	1	Cipro	14	7	Y			✓	

1949		M		N	Y		1	TMP/SMX	14	7	Y				✓
1949		M		N		N	1	Cipro	14	7	Y				✓
1949		M		N		N	1	Septra	14	7	Y			✓	
1949	F	F		N	Y		1	TMP/SMX	14	7	Y			✓	
1949	F	F		N	Y		0					N	N		
1950		M		N		N	1	Cipro	14	7	Y			✓	
1950		M	Y		Y		1	Septra	14	7	Y				
1950	F	F		N	Y		1	TMP/SMX		7		N	N		
1950	F	F	Y		Y		1	Cipro	14	7	Y				✓
1950		M	Y			N	1	Septra	14	7	Y			✓	
1950		M	Y			N	1	Cipro	14	7	Y			✓	
1950	F	F	Y			N	1	Nitrofurantoin		7		N	N		
1950	F	F		N		N	1	TMP/SMX	14	7	Y				✓
1950	F	F	Y			N	1	Nitrofurantoin	14	7	Y				
1950	F	F		N		N	0					N	N		
1950		M		N		N	1	Cipro	14	7	Y			✓	
1950		M		N	Y		1	TMP/SMX	14	7	Y			✓	
1950		M		N		N	1	Cipro	14	7	Y				✓
1950	F	F		N		N	1	Nitrofurantoin	14	7	Y				✓
1951	F	F	Y		Y		1	TMP/SMX	14	7	Y			✓	
1951	F	F	Y			N	0					N	N		
1951	F	F	Y		Y		1	Cipro	14	7	Y			✓	
1951	F	F	Y		Y		1	TMP/SMX	14	7	Y				
1951		M	Y			N	1	Cipro	14	7	Y				
1951		M		N		N	1	Nitrofurantoin	14	7	Y				
1951	F	F	Y			N	0					N	N		

1951	F	F	Y			N	1	TMP/SMX	14	7	Y				✓	
1951	F	F		N		N	1	Cipro	14	7	Y					
1951	F	F	Y			N	1	Nitrofurantoin	14	7	Y					
1951		M	Y			N	1	Cipro	14	7	Y				✓	
1952		M	Y			N	1	TMP/SMX	14	7	Y					
1952	F	F		N	Y		1	Nitrofurantoin	14	7	Y					✓
1952	F	F	Y			N	1	TMP/SMX	14	7	Y					
1952		M	Y		Y		1	TMP/SMX	14	7	Y					✓
1952	F	F	Y		Y			Nitrofurantoin	14	7	Y					✓
1952	F	F		N	Y		0					N		N		
1952		M		N	Y		1	Cipro	14	7	Y				✓	
1952	F	F	Y			N	1	Nitrofurantoin	14	7	Y				✓	
1952		M	Y			N	1	Septra	14	7	Y					✓
1952		M	Y			N	0					N		N		
1952	F	F	Y			N	1	Cipro	14	7	Y				✓	
1952		M		N		N	1	Septra		7		N		N		
1952		M	Y		Y		1	Nitrofurantoin	14	7	Y				✓	
1952	F	F	Y			N	1	Cipro	14	7	Y				✓	
1952	F	F	Y		Y		1	Nitrofurantoin	14	7	Y			✓		
1952		M		N	Y		1	Nitrofurantoin	14	7	Y			✓		
1952	F	F	Y			N	0					N	N			
1952		M	Y		Y		1	Cipro	14	7	Y			✓		
1952	F	F	Y			N	1	Cipro	14	7		N	N			
1952	F	F	Y			N	1	Nitrofurantoin	14	7	Y				✓	
1952		M	Y		Y		1	Cipro	14	7	Y				✓	
1952	F	F		N	Y		0			7		N	N			

1952	F	F	Y		Y		1	Cipro	14	7	Y				✓	
1952	F	F	Y			N	1	Nitrofurantoin	14	7	Y				✓	
1953	F	F	Y			N	1	Nitrofurantoin	14	7	Y				✓	
1953	F	F		N		N	1	Cipro	14	7	Y					✓
1953	F	F		N		N	1	Nitrofurantoin		7		N	N			
1953		M		N		N	1	Nitrofurantoin	14	7	Y			✓		
1953		M	Y			N	1	TMP/SMX	14	7	Y				✓	
1953		M	Y		Y		0									
1953	F	F	Y			N	1	Cipro	14	7	Y				✓	
1953	F	F		N	Y		1	Nitrofurantoin	14	7	Y				✓	
1953	F	F	Y			N	1	Nitrofurantoin	14	7	Y				✓	
1953		M		N	Y		0					N	N			
1953	F	F		N		N	1	TMP/SMX	14	7	Y					✓
1953	F	F		N		N	1	Septra	14	7	Y				✓	
1954		M	Y		Y		1	Nitrofurantoin	14	7	Y				✓	
1954	F	F	Y		Y		1	Cipro	14	7	Y					✓
1954		M		N	Y		0			7	Y					✓
1954	F	F	Y			N	1	Nitrofurantoin	14	7	Y				✓	
1954		M	Y		Y		0					N	N			
1954	F	F	Y			N	0					N	N			
1954	F	F	Y			N	1	Cipro	14	7	Y				✓	
1954		M	Y			N	1	Nitrofurantoin	14	7	Y				✓	
1954	F	F	Y			N	1	Septra	14	7	Y					✓