

2020

## Optimizing the Use of Antibiotics: Evaluation of a Quality Improvement Project

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# Walden University

College of Health Sciences

This is to certify that the doctoral study by

Elaine M. Summers

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

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Walden University

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Abstract

Optimizing the Use of Antibiotics: Evaluation of a Quality Improvement Project

by

Elaine M. Summers

MS, Excelsior College, 2009

BS, University of Southern Colorado, 2003

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2020

## Abstract

The overuse and inappropriate use of antibiotics for residents in long-term care facilities (LTCFs) is associated with significant unintended treatment harm with 50% to 70% of residents prescribed an antibiotic at least once in 12 months. The purpose of this project was to evaluate data from a quality improvement initiative conducted at a 168-bed LTCF to implement a protocol of an antibiotic stewardship program (ASP) to reduce the overuse of antibiotics. The John Hopkins nursing evidence-based practice model guided this project to analyze health care provider compliance with implementation of protocol guidelines before and after the ASP program initiation. Evaluation of practitioner compliance over a 3-month period included measurement of the use of minimal diagnostic criteria for skin/soft tissue, urinary tract, and respiratory tract infections as part of the resident assessment prior to starting antibiotics; a 48-hour window used post initiation of antibiotics to evaluate the need for the continued and appropriate use of the drug; and the collection of specimens for diagnostic testing. Data analysis using descriptive statistics revealed a mean 43.7% improvement in compliance on the 3 measures of compliance with a range from 22.8% prior to the ASP to an increase to 72.4% after the ASP implementation. ASPs in LTCFs that improve compliance with evidence-based practice have the potential to promote positive social change in the health treatment of illness in and health promotion of individuals and the population overall by reducing the adverse outcomes from overuse of antibiotics.

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## Dedication

This entire journey is dedicated to the power of perseverance. I have come up against unimaginable obstacles throughout this journey. Situations have unfolded and things have happened that I would not ever have imagined and could not have ever predicted. I often thought of simply abandoning the effort either because I felt that I did not have the capacity to complete the requirements or the stamina to overcome the obstacles that presented themselves along the way. I managed to keep at it and learned that there is something to be said for simply digging in and getting it done.

## Acknowledgments

I would like to acknowledge my children and the quiet support they gave me along the way. They never doubted that I could get this done.

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## Section 1: Nature of the Project

In the United States, approximately 1.4 million people reside in more than 15,000 long-term care facilities (LTCFs; Mody & Crnich, 2015). LTCFs provide skilled nursing and custodial care for both permanent residents as well as post-acute patients needing short-term, skilled nursing and rehabilitative care and services. Approximately 3.3 million Medicare recipients are admitted to LTCFs for short stays each year, making LTCFs a crucial segment of the overall health care system within the United States (OIG, 2013). Antibiotics are among the most frequently prescribed medications in LTCFs, with an estimated 40% to 70% of all nursing home residents receiving at least one course of antibiotics annually; however, up to 75% of antibiotics prescribed in LTCFs may be unnecessary or inappropriate (Centers for Disease Control [CDC], 2017). Inappropriate antibiotic prescribing is credited with contributing to antibiotic resistance, which is and will continue to be a major threat to population health (Sloane et al., 2016). The inappropriate prescribing can include one or more of the following: prescribing the incorrect drug; prescribing the incorrect dosage; prescribing the drug for an inappropriate duration; or prescribing antibiotics when not clinically indicated in situations where there is no evidence of illness or infection, such as in cases of bacterial colonization (Smith et al., 2018).

The value of antibiotics is undeniable. When antibiotics are used appropriately, they save lives; however, when used inappropriately they pose significant risk to both resident health at the facility level and population health at large. Those risks include the development of health care-associated infections, specifically *clostridium difficile*

infections, which in the right patient under the right circumstances can be fatal, and an increase in the risk of colonization and infection with multidrug resistant organisms (Mody & Crnich , 2015).

### **Problem Statement**

Residents of LTCFs, like all patients, are at risk for complications associated with the inappropriate use of antibiotics. Many residents of LTCFs have individual conditions and contextual considerations that place them at an even higher risk for the untoward consequences of misuse of antibiotics. The misuse and overuse of antibiotics is associated with a number of potential treatment-related harms when assessed at the level of the individual LTCF resident, including *Clostridium difficile* infection, adverse drug reactions, and an increased risk of colonization and infection with multidrug-resistant organisms (Mody & Crnich, 2015). The risk of *Clostridium difficile* infections is 7 to 10 times higher than at baseline for 1 month after antibiotic use and 3 times higher than baseline in the 2 months after that (Hensgens Goorhyuis, Dekkers, & Kuijper, 2012). Antibiotic stewardship programs (ASPs) contribute to the judicious use of antibiotics and can have a positive impact on the negative consequences associated with inappropriate antibiotic use. ASPs have been proven to optimize antibiotic use as well as reduce the spread of antibiotic resistance and the incidence of *clostridium difficile* infections (Sloane et al. 2017). When antibiotics are prescribed appropriately, the spread of resistance and the incidence of treatment harms will decline.

The setting for this project is a 168-bed, post-acute LTCF providing skilled nursing care to long-term residents as well as short-stay, post-acute care services. The

facility did not have a structured program or guidelines in place to support evidenced-based best practices for the use of antibiotics. There was a great degree of variation in the prescribing practices of physicians and nurse practitioners in the facility. It was the practice of the facility physicians and nurse practitioners to prescribe antibiotics empirically without laboratory confirmation of a positive culture or clinical signs and symptoms of active illness. The facility infection control nurse maintained an infection control log in which she documented the collecting of specimens and the microbiology laboratory results for all residents on antibiotics. A 3-month review of the log demonstrated that antibiotics were ordered 64 times and specimens were collected and processed 24 times (34.3%).

Through their newly revised rules of participation, The Centers for Medicare and Medicaid Services (CMS) has mandated that all LTCFs have an ASP in place (Federal Register, 2016). The facility under study recognized the need to implement an ASP to optimize patient/resident outcomes and ensure compliance with federal regulations. The facility's desire for a change in practice was influenced by the need to improve patient/resident outcomes and the facility's performance and ratings in national benchmarking metrics as well as meet federally mandated rules of participation. The CMS created the Five-Star Quality Rating System to help consumers, their families, and caregivers compare nursing homes more easily. Immediately prior to the implementation of the quality improvement (QI) project, the project site LTCF had an overall star rating of 2, which is considered below average. In the 3-month review period, the facility shared with me that the QI department had documented six episodes of facility-acquired

clostridium difficile infections in patient who received a course of oral antibiotics as well as five facility-acquired infections with a multidrug resistant organism. Failure to achieve desired benchmarks and quality ratings can negatively impact the facility's inclusion in preferred provider relationships, membership in accountable care organizations, and ability to contract with commercial insurance companies (see CMS, 2019). In a highly competitive and saturated market, the facility's failure to achieve nationally recognized benchmarks will have a dramatic impact on their ability to remain fiscally solvent.

### **Purpose**

The focus of this project was an evaluation of the implementation of an ASP in a LTCF. The Association for Professionals in Infection Control and Epidemiology (APIC, 2017) defined antibiotic stewardship as a coordinated program that promotes the appropriate use of antibiotics, improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multidrug-resistant organisms. The APIC has identified a gap in the infection control practices in long-term care and antibiotic prescribing practices as well as an urgent need to improve the infrastructure related to the use of antibiotics and infection control practices. The implementation of an ASP in the LTCF will provide evidenced-based policies, procedures, and clinical guidelines to support clinical decision-making and inform both physician and nursing practice related to the use of antibiotics.

The ASP implemented by the study site LTCF included the following activities related to antibiotic use: nursing clinical assessment tools for urinary tract infections, skin/soft tissue infections, and respiratory infections to determine if a patient meets the

established minimal infection criteria; a standardized nurse-to-physician communication tool for patients being considered for antibiotics; and a 48-hour time out to review the patients on antibiotics for continued use. Evaluation of this ASP included data supporting the following activities:

- Minimal criteria for infection assessments be completed prior to a patient being treated with antibiotics for urinary tract, skin/soft tissue, and respiratory infections;
- A specimen collected for microbiological examination prior to the start of antibiotics; and
- A 48-hour time out conducted and formally documented to evaluate the resident's continued need for antibiotics and the appropriateness of the current antibiotic in use.

I reviewed de-identified patient information from the facility's infection control logs. Residents having received a course of antibiotics were reviewed and audited for the above quality indicators prior to the implementation of the ASP. Then, de-identified patient information from after the implementation of the ASP was reviewed from the facility's infection control logs and audited for the quality indicators. Optimizing the use of antibiotics through the implementation of an ASP in the LTCF study site will formally identify the important role that nurses play in antibiotic stewardship. Antibiotic stewardship is an extension of the nurses' role as a patient advocate. Recently, several editorials have advocated for the formal inclusion of nurses in antibiotic stewardship efforts (Olans, Olans & Demaria, 2015). This is due to nurses' widespread involvement in

activities that directly relate to antibiotic use and the belief that an absence of partnership with nurses limits the success of antibiotic stewardship programs. Nurse-driven antibiotic stewardship can involve a host of activities (e.g., effective assessments, antibiotic de-escalation, and timely culturing practices); however, nurses' perspectives on the specific stewardship activities that should be targeted and strategies of how to best engage nurses in stewardship efforts are limited (Carter et al., 2018). The practice question for this project was: Will the implementation of an ASP increase provider compliance with recommended guidelines for antibiotic use at the LTCF?

### **Nature of the Doctoral Project**

The nature of this doctor of nursing practice (DNP) project was the evaluation of a QI project designed to address overuse and misuse of antibiotics within the context of a LTCF. I gathered evidence to support this project through extensive searches of scholarly articles, databases, clinical guidelines, expert opinions, nationally recognized expert entities, and regulatory agencies. Literature related to the topic was located using the following databases and sources: CINAHL, Cochrane Systematic Reviews, PubMed, National Guideline Clearinghouse, Agency for Healthcare Research & Quality, CDC, Institute of Medicine, World Health Organization (WHO), APIC, Society for Healthcare Epidemiology of America, American Nurses Association, state operating manual for LTCFs, and federal licensing regulations for nursing homes. Keyword search terms used were *antibiotic resistance*, *antibiotic stewardship*, *healthcare acquired infection*, *antibiotic resistance*, *long term care*, *nursing home*, *infection prevention*, *attitudes of antibiotic prescribers*, *consequences of overuse of antibiotics*, and *contextual influences*



*in antibiotic prescribing*. Article inclusion criteria included a focus on antibiotic prescribing, antibiotic use in nursing homes, antibiotic use in LTCFs, contextual influences on antibiotic prescribing in long-term care/nursing homes, antibiotic stewardship guidelines, consequences of overuse and misuse of antibiotics in long-term care/nursing homes, and practice change in long-term care.

De-identified data were available from the LTCF before and after implementation of the ASP. The data included the incidence of infection, type of infection, and microbiology test results to determine if antibiotics were prescribed in response to a positive culture or whether antibiotics were prescribed empirically. Laboratory reports were also provided to check that the antibiotic prescribed was an antibiotic listed as one to which the infecting bacteria is sensitive. I audited de-identified practitioner practices regarding antibiotic prescribing to assess compliance with performance measures set forth in the ASP.

The purpose of the project was to evaluate a QI program of antibiotic stewardship specifically designed to address the barriers associated with prescribing practices and use of antibiotics in a LTCF. The goal of the program was to optimize antibiotic use and positively impact the emergence and spread of resistant bacteria. The optimization of antibiotic use in a LTCF has the potential to benefit residents of the LTCF facility, physicians, nurses, community members, and even those beyond the local population. Residents will benefit because they will receive quality care aligned with evidence-based best practices for the optimized use of antibiotics that will lessen the potential for treatment harms associated with overuse and misuse of antibiotics. Physicians will

benefit because they will have the support and structure of a well-established, evidence-based stewardship program to guide their clinical decision-making and support best practices. Nurses will benefit because they will have the needed support to strengthen their advocacy of patients through evidence-based, facility-supported policies and procedures. The health care delivery system will benefit because the costs associated with the consequences of the misuse of antibiotics will lessen, and the local and global community will benefit because optimized use of antibiotics reduces the emergence and spread of resistant infections (Chopra & Rivard, 2015).

The principles of antibiotic stewardship have been used in acute hospitals for some time, and while the general principles are transferrable to a LTCF, the implementation requires contextual adjustments. Antibiotic stewardship in LTCFs is transferrable to other clinical settings, specifically those settings in which the patient population may be older or chronically ill and resources maybe limited (Sloane et al. 2017).Antibiotic stewardship will facilitate positive social change in both the health of individuals and the overall population, the treatment of illness, and health promotion.

### **Significance**

According to the WHO (2017), antimicrobial resistance threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses, and fungi. An increasing number of governments around the world are devoting efforts to solve this problem that is so serious that it threatens the achievements of modern medicine: A post antibiotic era in which common infections and minor injuries can kill. Far from being an apocalyptic fantasy, this outcome is instead a real possibility

in the 21st century (WHO, 2014). The current project is important to the practice of nursing because it allows nurses to advocate for and support practice changes based on scientific evidence to improve patient outcomes in local LTCFs as well as community and global settings.

This project has the potential to promote positive change at the local LTCF level and at the general population level through the judicious use of antibiotics with the implementation of an ASP program. Key stakeholders include the patients, their families, the LTCF direct care providers and administrators, and the community at large. This QI project has the potential for transferability to other LTCFs. The implementation of an ASP in the study site LTCF will promote and support the sustained responsible use of antibiotics. This project has the potential to improve clinical outcomes, help to decrease antibiotic resistance, and reduce health care costs associated with inappropriate prescribing practice and the treatment of resistant infections. The change will have both local and far-reaching effects on combating antimicrobial resistance, which poses a threat to both local and global health.

### **Summary**

The pervasive, often inappropriate use of antibiotics in health care settings has been identified as a major public health threat due to the resultant widespread emergence of antibiotic resistant bacteria (Dyar et al., 2015). It has been estimated that up to 75% of the antibiotics prescribed in LTCFs are inappropriate, and as a result, LTCFs can serve as reservoirs for resistant bacteria within a community (Rhee & Stone, 2014). The purpose of this DNP project was to evaluate the implementation of an ASP in a LTCF designed to

optimize the use of antibiotics. The practice question was: Will the implementation of an ASP increase provider compliance with recommended guidelines for antibiotic use at the LTCF? Providing an evidence-based ASP will increase prescriber knowledge and competence in the use of antibiotics. The threat of a post antibiotic era has given rise to advocacy at the highest levels for the widespread adoption of programs that promote the judicious use of antibiotics (Zanman et al., 2017). Antibiotic misuse and overuse have frequently been cited as one of the leading causes of the emergence and spread of antibiotic resistance (Alsan et al., 2015). In Section 2, I will explore the evidence relevant to the project; the model framing the project; and my role in developing, implementing, and evaluating the project.

## Section 2: Background and Context

The threat to resident and patient health associated with misuse of antibiotics is of the utmost significance to nurses and nursing as a profession. Nurses are antibiotic first responders, central communicators, coordinators of care, and 24-hour monitors of patient status, safety, and response to antibiotic therapy (Olans et al., 2016). The central role of nurses in the day-to-day care of patients and residents as well as the nurses around the clock presence at the bedside places them in key positions to act as gatekeepers to monitor and support the optimal use of antibiotics through an ASP.

The need for antibiotic stewardship in LTCFs is undeniable. The successful implementation of an ASP in LTCFs requires a total culture change and a collaborative, multidisciplinary approach (Sloane et al. 2017) A 2016 study found stewardship programs at acute-care hospitals, which have been required by the CMS since June 2016, demonstrating a 4.5% decrease in bacterial infection rates and length of stay by 8.9% (CDC 2015). The programs also resulted in cost savings (costs decreased by 33.9%) because of the fewer treatment costs associated with antibiotics (Plachorous & Hopkins, 2017).

### **Concepts Models and Theories**

I chose the John Hopkins nursing evidence-based practice (JHNEBP) model to inform and guide this project. This model is a problem-solving approach to clinical decision-making that is designed to meet the needs of nursing; however, the fundamental concepts can be easily extrapolated to other members of the health care delivery team (Dyar et al. 2015). This model is designed to simplify the implementation and integrations

of evidence-based practice in a health care setting (Dyar et al. 2015). The model uses a three-step process, practice question, evidence, and translation with a constant feedback loop of evaluation and recommended changes (Dang & Dearhold, 2017). The components of this model supported this project as follows:

- The practice question was: Will the implementation of an ASP increase provider compliance with recommended guidelines for antibiotic use at the LTCF?
- The practice change was supported by evidence from clinical practice guidelines and current, peer-reviewed journals.
- Translation of evidence was the implementation of the ASP at the LTCF.
- This project was part of the model's feedback loop to review the practice change and make any recommendations for continued improvement.

### **Local Background and Context**

The setting for this project was an ASP of a 168-bed LTCF. The facility is one of several independently owned LTCFs and is managed as a standalone facility without any centralized, corporately monitored or dictated guidelines for operation. The facility has six credentialed physicians and three nurse practitioners with prescribing privileges. De-identified data provided by the facility revealed that in the 3-month review period that informed this project, there were no facility-adopted guidelines or policies and procedures to inform the use of antibiotics. Information about infections and antibiotic use was collected by a dedicated nurse charged with overseeing infection control in the facility. A log of all facility-acquired infections was maintained to record the resident's

name, location in the facility, laboratory tests performed and results, antibiotics prescribed, and signs and symptoms of illness. This information was recorded and communicated to the quality assurance performance improvement committee monthly. There was no analytical assessment of the collected data or performance improvement initiatives associated with infection control or antibiotic use within the 3-month retrospective period. Incidences of infection are tracked through reporting done on Minimum Data Set (MDS) assessments. The MDS is part of the federally mandated process for clinical assessment of all residents in CMS-certified nursing homes (CMS 2019). This process provides a comprehensive assessment of each resident's functional capabilities and helps nursing home staff identify health problems. The information collected through MDS assessments was not ever considered as a means of infection control prevention or antibiotic prescribing practices (CMS, 2019). Information collected through mandatory submission of MDS assessments is compiled by the CMS and compiled in a facility-specific report called Certification and Survey Provider Enhanced Reports. (CASPERs). A facility's CASPER report contains information on demographic data compared with state and national averages as well as the facility's ranking based on CMS's 17 standard quality measures (CASPER, 2018). I used data reported on the facility's CASPER report as a source of information to identify the facility's standing within the state and nationally.

The facility nursing staff largely consists of licensed practical nurses with a registered nurse on staff a minimum of 8 hours out of every 24 hours. There is also a

part-time staff growth and development nurse available to provide onsite, in-service education and to coordinate employee education through an online educational system.

### **Role of the DNP Student**

I had a previous working relationship with the LTCF where I assisted them in developing an ASP based on current guidelines and evidence. I was asked to evaluate their recent ASPs as part of my DNP project. I compared de-identified data pre- and postimplementation of their program and submitted results to the QI committee with any recommendations for changes. This doctoral project was important to me because it supports positive social change for the clients and the providers as well as supports the role of nurses in providing safe care.

### **Summary**

In Section 2, I introduced the JHEBP model that supported this project. Evidence was presented to establish the importance of antibiotic stewardship. The translation of evidence for the practice change at this LTCF was evaluated and feedback was provided to the facility. The practice question was: Will the implementation of an ASP increase provider compliance with recommended guidelines for antibiotic use at the LTCF? In Section 3, I will present the planning, implementation, and evaluation plan for the project.



### Section 3: Collection and Analysis of Evidence

The overuse and misuse of antibiotics has been clearly identified in scientific literature as an issue of great concern at both the local and global levels. A large percentage of antibiotics prescribed in LTCFs are prescribed inappropriately, which can include one or more of the following errors: incorrect drug, incorrect dose, incorrect duration, prescribed to treat illnesses not caused by bacterial infections, and/or prescribed in circumstances where the resident is colonized with bacteria and not in need of treatment with antibiotics (APIC 2017). Antibiotic stewardship is a way to optimize the use of antibiotics in a LTCF, which can have a positive impact and address the unintended consequences associated with inappropriate antibiotic use.

In Section 3, I describe the evidence provided by the facility, the practice problem and question, the participants, procedures, and protections for the project. The plan for analysis and a synthesis of results are also provided.

#### **Practice-Focused Question**

Antibiotic prescribing in LTCFs has included inappropriate prescribing and unintended associated treatment harms. Antibiotic stewardship is a proven method to optimize antibiotic prescribing (Mody & Crnich, 2015). The inappropriate prescribing of antibiotics in LTCFs can be influenced by many factors, including a knowledge deficit regarding appropriate antibiotic prescribing practices; a lack of understanding and acceptance of the consequences of inappropriate antibiotic prescribing practices; a lack of a formal ASP; a lack of guidelines or policies and procedures to guide antibiotic use; a lack of clearly established facility guidelines; a lack of oversight; a lack of accountability;

a lack of education; a lack of access to infectious disease professionals; a lack of around the clock physician availability; a lack of around the clock registered nurse availability; primarily a licensed practical nurse staff, resident, and family expectation; time constraints; and a general lack of acceptance that what was done at the facility level would have a significant impact on the problems associated with misuse and overuse of antibiotics (van Buul et al., 2014).

The project site was a 168-bed LTCF providing care to traditional nursing home residents as well as short stay, post-acute care residents. The problem was the overuse and misuse of antibiotics in the facility. An ASP was implemented by the facility, and this project was an evaluation of the program. The practice question was: Will the implementation of an ASP increase provider compliance with recommended guidelines for antibiotic use at the LTCF?

### **Sources of Evidence**

To evaluate the ASP at the LTCF study site, I was provided with de-identified data from facility infection control and patient records. As part of the QI project, audit tools were created to assess provider performance specifically related to the QI performance improvement measures established as part of the ASP. I audited the records for compliance with the following performance quality indicators:

- Minimal criteria for infection assessments completed prior to a patient being treated with antibiotics for urinary tract, skin/soft tissue, and respiratory infections;

- A specimen collected for microbiological examination prior to the start of antibiotics; and
- A 48-hour time out conducted and formally documented to evaluate the resident's continued need for antibiotics and the appropriateness of the current antibiotic in use.

Data collection for this project included a 3-month review prior to the implementation of the QI project and a 3-month review postimplementation of the QI project.

### **Analysis and Synthesis**

I was provided with de-identified data from the LTCF for a 3-month period before and after implementation of the ASP. Data analysis of de-identified chart reviews was conducted for the following information:

- Infection assessments completed prior to a patient being treated with antibiotics for urinary tract, skin/soft tissue, and respiratory infections;
- A specimen collection for microbiological examination prior to the start of antibiotics; and
- A formally documented 48-hour time out to evaluate the resident's continued need for antibiotics and the appropriateness of the current antibiotic in use.

I conducted descriptive analysis of the data using Statistical Package for the Social Sciences (SPSS). The results of the QI audits conducted based on the established performance quality indicators were collected and reported to the facility QI committee.

## **Summary**

In Section 3, I described the evaluation process for this QI project. The de-identified data provided by the facility were reviewed to answer the project question regarding whether the implementation of an ASP increased provider compliance with recommended guidelines for antibiotic use at the LTCF. De-identified information collected at the facility were also reviewed to audit adherence to QI performance measures focused on practitioner performance. The results of the QI project evaluation with any recommendations for changes were presented to the QI committee. In Section 4, I will present the evaluation findings and implications as well as provide recommendations. The strengths and limitations of this project will also be discussed.

#### Section 4: Findings and Recommendations

Antibiotics are among the most frequently prescribed medications in long-term care (CDC 2015). Antibiotic use is associated with a number of potential treatment-related harms when assessed at the level of the individual nursing home resident, including clostridium difficile infection, adverse drug reactions, and an increased risk of colonization and infection with multidrug-resistant organisms (Mody & Crnich, 2015). The CDC (2017) has estimated that 75 % of all antibiotics prescribed in long-term care are prescribed inappropriately. The unintended consequences of inappropriate antibiotic prescribing extend beyond the boundaries of the LTCF, they extend to the local community and sometimes well beyond.

Optimizing the use of antibiotics requires a systematic effort that promotes the appropriate use of antibiotics, improves patient outcomes, reduces antibiotic resistance, and decreases the spread of infections caused by multidrug-resistant organisms (CDC 2015). According to the CDC (2017), any action taken to improve antibiotic use is expected to reduce adverse events, prevent emergence of resistance, and lead to better outcomes for residents in this setting.

This DNP project was the evaluation of a QI program designed to optimize the use of antibiotics by increasing prescriber performance and competency as well as knowledge of the evidence-- based use of antibiotics through the implementation of an ASP. Upon receiving Walden University IRB approval (Approval No. 04-16-20-0433826) to conduct this study, I began collecting and analyzing data. Practitioner performance was measured by auditing practitioners' adherence to performance

improvement quality indicators. To measure the effectiveness of the QI indicators, I examined antibiotic use for a period of 3 months before and 3 months after the implementation of evidence-based antibiotic stewardship principles.

In preparation for implementation of the QI program, the facility used both qualitative and quantitative methods of data collection to assess organizational readiness. Qualitative stakeholder interviews while anecdotal, were valuable, because they revealed general opinion themes. Quantitative readiness surveys revealed specific focus areas and misalignment between leadership, stakeholders, and end-users. The data collected were used to strategically design interventions to remedy any identified barriers prior to implanting the QI intervention.. It is widely accepted that organizational readiness for change is necessary for implementation success (Eby et al. 2000).

### **Findings and Implications**

The primary goal of all ASPs is to optimize antibiotic use to yield the best possible clinical outcomes while minimizing unintended consequences and decreasing resistance (APIC 2017). There are universal core principles of antibiotic stewardship that guide ASPs; yet, all ASPs are not exactly alike (CMS 2015). This QI program under study introduced an ASP in small steps using the concept of micro productivity and task management. The quality committee for the facility explored the core concepts of antibiotic stewardship and decided to focus on three specific performance measures to optimize antibiotic use in the LTCF. Breaking down the large task of antibiotic stewardship into smaller manageable steps worked best for this QI project. The smaller

actionable tasks provided a foundation to build upon. Smaller steps can ensure that each step of a linear process can be mastered before moving on (Burnes, 2004).

The quality committee developed the facility's ASP in accordance with the CDC's 92105) core elements of antibiotic stewardship and guidelines for antibiotic stewardship in nursing homes. The core elements included:

- Leadership support to provide consistent support for the safe use of antibiotics;
- Identifying key personnel/project champions responsible for driving the principles of antibiotic stewardship;
- Establish access to drug experts, such as consultant pharmacist/s and staff with special training and expertise;
- Take actions to improve the use of antibiotics;
- Tracking and monitoring antibiotic prescribing, use, and resistance as well as monitor performance measures and outcomes;
- Reporting information and providing feedback to clinical staff on improving antibiotic use and resistant infections; and
- Providing education and resources for staff, residents, and families.

The roles and responsibilities of key personnel, such as the director of nursing, the medical director, staff nurses, infection control nurse, and consultant pharmacist, were adjusted by the quality committee to include antibiotic stewardship responsibilities and duties. Clinical guidelines were established in accordance with evidence-based best practices. The facility medical director and director of nursing were empowered to set

and enforce performance standards for clinical providers. A consultant pharmacist was selected to provide oversight through medication regimen review and tracking and reporting of antibiotic use. A full-time, APIC-certified infection preventionist oversaw the use of antibiotics in the facility. The clinical laboratory that serviced the facility followed established protocols to support antibiotic stewardship activities, such as monitoring and notifying the facility if antibiotic resistant organisms were identified and the use of antibiograms to help inform the selection of antibiotics. The consultant pharmacist was specially trained in the principles of antibiotic stewardship. Systems were implemented to track, trend, and report on antibiotic use and multidrug-resistant infections.

I measured practitioner compliance with guidelines for antibiotic use for a period of 3 months before and after the implementation of the ASP program. The following three QI indicators were used to measure practitioner compliance with guidelines for antibiotic use: (a) use of minimal criteria for skin/soft tissue, urinary tract, and respiratory tract infections as part of the resident assessment prior to starting antibiotics; (b) a 48-hour time out after the start of antibiotics to evaluate the need for the continued use of antibiotics and to determine if the antibiotic in use was the most appropriate antibiotic; and (c) collection of specimens for diagnostic testing to aid in the selection of the appropriate antibiotic prior to the initiation of antibiotics.

The facility provided education for all clinicians through facility in-service education and outside certification through both the CDC and APIC. The facility education calendar was revised to include biweekly infection control and antibiotic



stewardship workshops. The facility offered outside certification for practitioners through the APIC at no cost to the employee. In addition to the education of staff, the facility provided ongoing education for residents and their families on the use of antibiotics and the associated consequences of misuse and overuse.

In the 3 months prior to the implementation of the QI program, the following data were collected:

Month 1: The average daily census was 156 patients. There were 24 antibiotic prescriptions written for 24 patients (15.3%), eight patients (33.3%) had specimens collected prior to the start of antibiotics, two patients (8.3%) had assessments that included minimal criteria for infection, and two patients (8.3%) had a 48-hour time out to reevaluate the use of antibiotics.

Month 2: The average daily census was 151 patients. There were 16 antibiotic prescriptions written for 16 patients (10.5%), three patients (18.7%) had specimens collected prior to the start of antibiotics, four patients (25%) had assessments that included minimal criteria for infection, and six patients (37.5%) had a 48-hour time out to reevaluate the use of antibiotics.

Month 3: The average daily census was 152 patients. There were 17 antibiotic prescriptions written for 17 patients (11.1%), four patients (23.5%) had specimens collected prior to the start of antibiotics, six patients (35.2%) had assessments that included minimal criteria for infection, and five patients (29.4%) had a 48-hour time out to reevaluate the use of antibiotics.

Table 1

*3-Month Preimplementation Data*

Month	Average Daily Census	RX Written	Specimens Collected	Assessments Completed	48-Hour Time Out Completed
1	156	24 (15.3%)	8 (33.3%)	2 (8.3%)	2 (8.3%)
2	151	16 (10.5%)	3 (18.7%)	4 (25%)	6 (37.5%)
3	152	17 (11.1%)	4 (23.5%)	6 (35.2%)	5 (29.4%)

In the 3 months after the QI project was implemented, the following data were collected:

Month 1: The average daily census was 149 patients. There were 16 antibiotic prescriptions written for 16 patients (10.7%), eight patients (50%) had specimens collected prior to the start of antibiotics, six patients (37.5%) had assessments that included minimal criteria for infection, and nine patients (56.2%) had a 48-hour time out to reevaluate the use of antibiotics.

Month 2: The average daily census was 154 patients. There were 21 antibiotic prescriptions written for 19 patients (12.3%), 14 patients (73.6%) had specimens collected prior to the start of antibiotics, 11 patients (58.7%) had assessments that included minimal criteria for infection, and 13 patients (68.4%) had a 48-hour time out to reevaluate the use of antibiotics.

Month 3: The average daily census was 156 patients. There were 14 prescriptions written for 14 patients (8.9%), 11 patients (78.5%) had specimens collected prior to the start of antibiotics, 14 patients (100%) had as

assessment that included minimal criteria for infection, and 13 patients (92.8%) had a 48-hour time out to reevaluate the use of antibiotics.

There was a marked difference in the pre- and post-QI project numbers in all three performance indicators, signifying a change in practitioner compliance with guidelines. In the 3 months prior to the QI project, specimens were collected before starting antibiotics an average of 36.6% of the time, and in the 3 months after the QI project specimens were collected before starting antibiotics an average of 65.4% of the time. After the QI program, specimens were collected 28.8% more often. Before initiating the QI program, minimal criteria for infections assessments were done prior to the start of antibiotics an average of 22.8% of the time and an average of 65.4% of the time 3 months after the QI program. The minimal criteria for infection assessment were done 42.6% more often prior to the start of antibiotics. In the 3 months prior to the QI program, a 48-hour review was conducted an average of 25% of the time, and in the 3 months after the QI program, an average of 72.4% of the time. The QI program 48-hour reviews were done 47.4% more often 3 months after the QI program.

Table 2

*3-Month Postimplementation Data*

Month	Average Daily Census	RX Written	Specimens Collected	Assessments Completed	48 Hour Time Out Completed
1	149	16 (10.7%)	8 (50%)	6 (37.5%)	9 (56.2%)
2	154	21 (12.3%)	14 (73.6%)	11 (58.7%)	13 (68.4%)
3	156	14 (8.9%)	11 (78.5%)	14 (100%)	13 (92.8%)

The QI program was clearly a success as evidenced by the increase in practitioner compliance with the QI indicators. Evaluation of this QI program has shown that

implementing an ASP program increased practitioner compliance with recommended guidelines for antibiotic use. Optimized antibiotic use in this LTCF has implications at the nursing home, community, and global levels. Antimicrobial-resistant infections that develop in a single healthcare facility, in a single patient, can affect society at large (Trivedi & Pollack 2014). According to Dr. Nimale Stone (DATE), a CDC medical epidemiologist, taking any evidence-based actions to improve antibiotic use in a nursing home will help to mitigate the negative consequences of inappropriate antibiotic use. The successful implementation of an ASP in a LTCF did have a positive impact on the optimization of antibiotic use.

### **Recommendations**

After the evaluation of this QI program, I learned several valuable lessons about organizational readiness, change implementation, and performance improvement. Organizational readiness for change is an essential first step in change management. It is important to conduct a proper readiness-for-change assessment and to address and mitigate any barriers to change implementation before moving forward with the project. Assessing readiness can be accomplished in many ways with varying degrees of complexity. A successful strategy for assessing employee readiness for change can occur with the use of informal interviews and discussions. Discussions allow individuals to express their opinions and concerns in ways that surveys, questionnaires, or existing readiness-for-change assessment tools may not.

QI programs should be manageable. A QI program for practice change or performance improvement should focus on a few specific performance measures or

clinical outcomes. In some circumstances it is advisable to introduce the change in a small more controlled environment, achieve a solid practice change, and then move to bring that change to scale.

Monitoring and measuring results to objectively assess progress towards targeted QI indicators is essential. The audit outcomes should be reported to the facility's QAPI committee, and the committee should make necessary recommendations for future action. It is important to be flexible and expect that QI will be a dynamic, iterative process through which what works is adopted, what needs to be changed is adapted, and what simply cannot be fixed is aborted.

Optimizing antibiotic use in LTCFs requires a formal ASP with clear, evidence-based practice guidelines. Antibiotic stewardship is an ongoing process requiring consistent reinforcement and education, and it is essential to have a well-developed method for tracking and reporting antibiotic use, resistant infections, secondary infections, practitioner prescribing practices, nursing performance, and infection control practices (CDC 2015). The data should be reported to the QAPI committee, analyzed and evaluated for performance improvement opportunities, and communicated to stakeholders and end-users. The need for continuing education to reinforce the principles of antibiotic stewardship cannot be overemphasized. Keeping a focus on optimizing antibiotic, setting expectations, and enforcing accountability will contribute to an organizational culture of clinical excellence.

### **Strengths and Limitations of the Project**

With this QI project, I aimed to increase prescriber knowledge of and competence in evidence-based antibiotic use in a LTCF. Postintervention results were encouraging with significant increases in the prescriber knowledge and competency evidenced by an increase in evidence-based antibiotic prescribing. The primary strength of this program was that goals of the program were achieved. Organizational readiness and change implementation resulted in a successful change in practitioners' antibiotic prescribing practices.

The QI indicators were a good measure of evidence-based antibiotic prescribing, and they provided appropriate information upon which to evaluate the success of the project. The project was designed in accordance with well-established principles of antibiotic stewardship and tailored to the very specific contextual considerations of a LTCF. Members of the facility staff involved in the project were consistently engaged and accommodating and freely offered their support in all ways. Motivation for the program was high and supported by the newly revised federal guidelines mandating that all LTCFs implement an ASP.

The program was viewed by the staff as a timely solution to a very real problem. An important strength of the program was the organization's commitment to provide the necessary resources to implement and sustain the practice change. The QI program highlighted the importance of judicious use of antibiotics and demonstrated that doable changes in practice can result in dramatic increases in evidence-based antibiotic prescribing. An unintended secondary gain of the program was the emergence of a new

trusting relationship between staff and administration. This was a likely consequence of the respectful way in which the facility administration received staff's feedback and constructive criticism during the organizational readiness-for-change assessment as well as the actions taken to concretely address concerns.

One potential limitation of the project was that the sample size included only one LTCF. Much of the education and information was provided to licensed staff, including nurses, nurse practitioners, physicians, and pharmacists. There was an unintended missed opportunity to reach a larger audience that included all members of the health care team.

Sustaining change can be difficult; it takes time to adopt change and successfully and consistently implement and sustain that change over time. It was clear that there was a practice change directly related to the QI program; however, the program did not include information about sustaining the change over time. The program outcome clearly showed an improvement in practitioner compliance with guidelines for antibiotic use in a LTCF, and it can be implied that this outcome will have a positive impact on infection rates, antibiotic resistance, and secondary infections; however, the program does not actually provide data to assess this.

## Section 5: Dissemination Plan

Translation of knowledge to practice is a dynamic, iterative process that moves along a continuum from awareness to expert (Titler, 2018). The uptake of evidence-based information to inform clinical decision-making is critical to optimal clinical outcomes. Bringing evidence to the point of care to change practice at the bedside is the goal of QI (AHRQ 2014). For this QI project to be considered a success, there had to be adoption of the new information that resulted in an actual change in the way patients were assessed prior to the start of antibiotics, reassessed 48 hours after the start of antibiotics, and the collection of specimens for culture and sensitivity before the start of antibiotics. The objective was to achieve a comprehensive, consistent practice change across all disciplines and not simply scattered pockets of excellence.

When deciding on dissemination strategies, it was important to consider the organizational context that influenced the use of knowledge in practice. The ability to successfully mitigate the context was in large part due to the open discussions that were part of the readiness-for-change assessments in which staff shared their insights about potential implementation barriers. It was very important to the staff that facility administration had a legitimate understanding of the barriers and limitations and that facility administration's expectations were in line with what was possible. Initially, I planned to disseminate the results of the QI program to the staff. During the evaluation process, in a discussion with practitioners as to the reason they prescribed antibiotics in situations where they knew that antibiotics were not going to help and would potentially contribute to unintended negative outcomes, they reported that pressure from patients and



their families was a significant reason the prescriptions were made. With this result in mind, it made sense to expand the target audience beyond just staff and to include residents and their families. Guidelines and best practice recommendations are often focused on professionals and not on LTC patients. As a result, patients and their families are often left without information that would help them make the best decisions for their care.

My plan for the dissemination of the findings of this QI program started with a commitment to ongoing education. The facility education calendar was adjusted to include weekly antibiotic stewardship workshops and weekly lunch-and-learn sessions. Each workshop or lunch-and-learn session would focus on one key concept of antibiotic stewardship or infection control. The experience was designed to be interactive, small group learning that would include a brief presentation of information on the specific topic followed by a sharing discussion in which staff was asked to talk about situations where what was just learned could be applied. Staff were asked to drop their questions or suggestions for the weekly antibiotic stewardship workshops in the “I want to know” box stationed at the employee entrance. Weekly educational offerings always included several of the questions or topics taken from the box. Key points from the QI project were also posted in various highly visible areas throughout the facility. There was an education board in every break room, by each time clock, and on every unit where the QI project information was shared. The staff had a monthly Antibiotic Stewardship newsletter that briefly communicated some aspect of what was learned from the QI program. The newsletter included a question about what was contained in the newsletter, and staff

could answer the question and drop it into a raffle box for a weekly gift card give away. The QAPI committee roster was expanded to include a representative from each shift on every unit. The QI project target indicator audit results were shared, and staff was tasked with bringing the information back to other staff members. Unit staff were recruited to conduct the QI audits and report their findings to the QAPI committee. This was a hands-on way for the staff to participate in the QI project and to see firsthand how the facility was doing.

Sharing of the information for patients and families was done during interdisciplinary care conferences to which the patient and family were invited. Care conferences are scheduled in accordance with the mandatory assessment schedule dictated by the CMS. A family newsletter was sent to each patient's family on a quarterly basis to communicate information on upcoming events. The format of the newsletter was changed to include an education page on which information from the QI program on antibiotics was included. The information was presented in an easy-to-understand, lay version. The newsletter turned out to be a successful medium for communication and was used to spark interest in important topics related to the use of antibiotics. It successfully prompted questions and discussions that opened the door for discussions and information sharing with patients and their families.

The facility sponsored a community health fair that was attended by many members of the local community. There was a health screening booth where a short video about antibiotic use made by the facility staff was shown and blood pressure screening checks were done. The health screening was well received, and the facility had many

invitations to visit the older community in the area to share information on antibiotics at local senior centers, churches, and community events. Facility social workers also reported an increase in inquiries from families related to the topics contained in the newsletter.

The dissemination of the QI project results was a success; it made a definite change in practice on the use of antibiotics in the LTCF and raised awareness in the facility patient population and the community. Many of the facility's licensed staff worked at other LTCFs which presented opportunities for them to share their newly acquired information and evidence-based best practices in antibiotic use. The cognitively able residents were armed with information to participate more actively in their health care decision-making. Families were informed and able to actively advocate for their loved ones and share that information with others in their families and communities.

### **Analysis of Self**

Evaluating this QI project provided me with many opportunities for both personal and professional growth. I identified my weak points and strategically focused on ways to improve. I learned that my impatience, if left unchecked, can deprive me of the benefit of what others have to offer. Working with others during this DNP project showed me the value of harnessing the perspectives and expertise of others to produce the best iteration of the work. QI is fundamentally a team process that simply cannot be effectively accomplished as a solitary pursuit. The group was smarter and more effective as a team than anyone could have been independently.

As a DNP student, I took on the role of project coordinator and team leader during the evaluation of the QI project. I was able to use both my professional expertise and DNP education to lead a team of professionals through the analysis of research and facility performance data to evaluate the QI project. My many years of experience in long-term care allowed me to approach the contextual nuances and hidden complexities of the LTC environment, which informed the knowledge dissemination strategies. I focused on developing my skills in accordance with several AACN (2006) essentials for doctoral education.

This DNP project was a very positive experience. I grew as a person, as a nurse, and as a leader. This experience allowed me to work on my leadership skills and to gain a theoretical and practical understanding of how to translate knowledge to practice.

### **Summary**

The inappropriate use of antibiotics is a serious problem in LTCFs. The contextual considerations of a nursing home pose significant barriers to optimizing antibiotic use. The goal of this DNP project was the evaluation of a QI program to implement an ASP in a LTCF. The practice question considered in this project was: Will the implementation of an ASP increase practitioner knowledge and competence in evidence-based antibiotic use in a LTCF?

In this project, the facility established organizational readiness for change, implemented evidence-based performance guidelines for the use of antibiotics, and audited and measured practitioner use of antibiotics against three QI indicators. Pre- and post-QI implementation data were collected and analyzed. The data showed a dramatic

increase in practitioner adherence to evidence-based guidelines for the use of antibiotics in the LTCF under study. I then used the results from this project to educate staff, residents/patients, families, and members of the community. There was a definite change in practice that contributed to optimizing antibiotic use in the study site LTCF.

## References

- Agency for Healthcare Research & Quality. (2013). Approaches to Quality Improvement. Retrieved from <https://www.ahrq.gov/ncepcr/tools/pf-handbook/mod4.html>
- Alsan, M., Morden, N. E., Gottlieb, J. D., Zhou, W., & Skinner, J. (2015). Antibiotic use in cold and flu season and prescribing quality. *Medical Care*, 53(12), 1066-1071. doi:10.1097/mlr.0000000000000440
- American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced practice nurses*. Washington, DC: Author.
- Association of Professionals in Infection Control and Epidemiology. (2017).. Significant gaps in infection prevention impact long-term care residents. Retrieved from <https://apic.org/news/significant-gaps-in-infection-prevention-impact-long-term-care-residents/>
- Association of Professionals in Infection Control and Epidemiology (2017). Antibiotic stewardship. Retrieved from <https://apic.org/resources/topic-specific-infection-prevention/antimicrobial-stewardship/>
- Burnes, B. (2004), Kurt Lewin and the planned approach to change: A re□ appraisal. *Journal of Management Studies*, 41, 977-1002. doi:10.1111/j.1467-6486.2004.00463.x
- Carter, E. J., Greendyke, W. G., Furuya, E. Y., Srinivasan, A., Shelley, A. N., Bothra, A., & Larson, E. L. (2018). Exploring the nurse's role in antibiotic stewardship: A multisite qualitative study of nurses and infection preventionists. *American Journal of Infection Control*, 46(5), 492–497. doi:10.1016/j.ajic.2017.12.016

Centers for Disease Control and Prevention. (2015).. Core elements of antibiotic stewardship in nursing homes. Retrieved from

<https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html>

Centers for Disease Control and Prevention (2017). Antibiotic use in nursing homes.

Retrieved from <https://www.cdc.gov/antibiotic-use/stewardship-report/nursing-homes.html>

Centers for Disease Control and Prevention. (2017). Making health care safer: Stop the spread of antibiotic resistance. Retrieved from

<https://www.cdc.gov/vitalsigns/pdf/2015-08-vitalsigns.pdf>

Centers for Medicare & Medicaid. (n.d.). CASPER: Reporting user's guide for MDS providers. Retrieved from <http://quso.cms.gov/reference-and-manuals//casper-reporting-users-guide-mds-providers>

Centers for Medicare & Medicaid (2019). Long Term Care Facility Resident Assessment Instrument 3.0 user's manual. Retrieved from [http://cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-](http://cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/MDS3.0RAIManual)

[Instruments/NursingHomeQualityInits/MDS3.0RAIManual](http://cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/MDS3.0RAIManual)

Centers for Disease Control and Prevention. (2015) Antibiotic stewardship in long-term care. Retrieved from <https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html>

Centers for Disease Control and Prevention. (2016). Winnable Battles. Retrieved from <https://www.cdc.gov/winnablebattles/report/hais.html>

Centers for Medicare and Medicaid Services. (2019). Five Star Quality Rating System.

Retrieved from <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/CertificationandCompliance/FSQRS>

Centers for Medicare & Medicaid Services. (2019). Medicare and Medicaid programs:

Reform of requirements for long-term care facilities. Retrieved from <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/GuidanceforLawsandRegulations/NursingHomes.html>

Chopra, T., & Rivard, C. (2015). Effective antibiotic stewardship programs at long term

care facilities: A silver lining in the post antibiotic era. *Annals of Long-Term Care: Clinical Care and Aging*, 18–23. Retrieved from

<https://www.managedhealthcareconnect.com/articles/effective-antibiotic-stewardship-programs-long-term-care-facilities-silver-lining-post>

Crnich, C. J., Jump, R., Trautner, B., Sloane, P. D., & Mody, L. (2015). Optimizing

antibiotic stewardship in nursing homes: A narrative review and recommendations for improvement. *Drugs & Aging*, 32(9), 699–716.

doi:10.1007/s40266-015-0292-7

Dang, D., & Dearholt, S. (2018). *Johns Hopkins nursing evidence-based practice: Model*

*and guidelines*. Indianapolis, IN: Sigma Theta Tau International.

Dyar, O., Pagani, L., & Pulcini, C. (2015). Strategies and challenges of antimicrobial

stewardship in long-term care facilities. *Clinical Microbiology and Infection*, 21(1), 10–19. doi:10.1016/j.cmi.2014.09.005



- Eby, L. T., Adams, D. M., Russell, J. E., & Gaby, S. H. (2000). Perceptions of organizational readiness for change: Factors related to employees' reactions to the implementation of team-based selling. *Human Relations, 53*(3), 419-442.
- Golkar, Z., Bagasra, O., & Pace, D. G. (2014). Bacteriophage therapy: A potential solution for the antibiotic resistance crisis. *The Journal of Infection in Developing Countries, 8*(02), 129–136. doi:10.3855/jidc.3573
- Hensgens, M. P. M., Goorhuis, A., Dekkers, O. M., & Kuijper, E. J. (2011). Time interval of increased risk for clostridium difficile infection after exposure to antibiotics. *Journal of Antimicrobial Chemotherapy, 67*(3), 742–748. doi:10.1093/jac/dkr508
- Infection Control Today. (2015, September 15). CDC recommends all nursing homes implement core elements to improve antibiotic use. *Infection Control Today*. Retrieved from <https://www.infectioncontrolday.com/antibiotics-antimicrobials/cdc-recommends-all-nursing-homes-implement-core-elements-improve>
- Kotter, J. P. (1996). *Leading change*. Boston, MA: Harvard Business Press.
- Lewin, K. (1945). The research center for group dynamics at Massachusetts Institute of Technology. *Sociometry, 8*(2), 126–136.
- Martínez, J. L. (2012). Natural antibiotic resistance and contamination by antibiotic resistance determinants: The two ages in the evolution of resistance to antimicrobials. *Frontiers in Microbiology, 3*. doi:10.3389/fmicb.2012.00001

- Mody, L., & Crnich, C. (2015). Effects of excessive antibiotic use in nursing homes. *JAMA Internal Medicine, 175*(8), 1339.  
doi:10.1001/jamainternmed.2015.2774
- Olans, R. N., Olans, R. D., & Demaria, A. (2015). The critical role of the staff nurse in antimicrobial stewardship—unrecognized, but already there: Table 1. *Clinical Infectious Diseases, 62*(1), 84–89. doi:10.1093/cid/civ697
- Plachouras, D., & Hopkins, S. (2017). Antimicrobial stewardship: We know it works; time to make sure it is in place everywhere. *Cochrane Database of Systematic Reviews*. doi:10.1002/14651858.ed000119
- Puchalski Ritchie, L. M., & Straus, S. E. (2019). Assessing organizational readiness for change comment on “development and content validation of a transcultural instrument to assess organizational readiness for knowledge translation in healthcare organizations: The OR4KT.” *International Journal of Health Policy and Management, 8*(1), 55–57. doi:10.15171/ijhpm.2018.101
- Rhee, S. M., & Stone, N. D. (2014). Antimicrobial stewardship programs in long term care facilities. *Infectious Disease Clinics of North America, 28*, 237–246.
- Sloane, P. D., Huslage, K., Kistler, C. E., & Zimmerman, S. (2016). Optimizing antibiotic use in nursing homes through antibiotic stewardship. *North Carolina Medical Journal, 77*(5), 324–329. doi:10.18043/ncm.77.5.324
- Smith, D. R. M., Dolk, F. C. K., Pouwels, K. B., Christie, M., & Robotham, J. V. (n.d.). The growing importance of nursing home 5 star ratings and how they are

impacted by survey findings. Retrieved from <https://thegreenfields.org/growing-importance-nursing-home-5-star-ratings-impacted-survey-findings/>

Titler, M.G., (May 31, 2018) "Translation Research in Practice: An Introduction" *OJIN: The Online Journal of Issues in Nursing* Vol. 23, No. 2, Manuscript 1.

Trivedi, K. K., & Pollack, L. A. (2014). The role of public health in antimicrobial stewardship in healthcare. *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America*, 59(Suppl 3), S101–S103.  
doi:10.1093/cid/ciu544

World Health Organization. (n.d.). Antimicrobial resistance: Global surveillance report 2014. Retrieved from <https://www.who.int/drugresistance/documents/surveillance-report/en/>

Van Buul, L. W. V., Steen, J. T. V. D., Doncker, S. M., Achterberg, W. P., Schellevis, F. G., Veenhuizen, R. B., & Hertogh, C. M. (2014). Factors influencing antibiotic prescribing in long-term care facilities: A qualitative in-depth study. *BMC Geriatrics*, 14(1). doi:10.1186/1471-2318-14-136

Zaman, S. B., Hussain, M. A., Nye, R., Mehta, V., Mamun, K. T., & Hossain, N. (2017). A review on antibiotic resistance: Alarm bells are ringing. *Cureus*. doi: 10.7759/cureus.1403