PROMOTING ANTIBIOTIC STEWARDSHIP

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Dedication and Acknowledgements

Thank you to my loving husband, T.J., for his continued support throughout my completion of the FNP/DNP program and this project. I would not have been able to accomplish this without your love, support, and encouragement. I will forever be grateful to you for encouraging me to embark on this journey. Without your constant support, I would not be where I am today. Thank you for being my biggest fan in life!

Abstract

Background: Antibiotic resistance develops from inappropriate and overuse of antibiotics. Resistant infections lead to higher mortality rates, increased healthcare costs, and increased adverse effects.

Purpose: The goal of this quality improvement project was to determine if the implementation of an existing Situation-Background-Assessment-Request (SBAR) tool developed by the Agency for Healthcare Research and Quality (AHRQ) along with education provided to nursing staff and providers in a long-term care facility improved adherence to an antibiotic stewardship program.

Methods: A systematic approach to data collection was conducted regarding patients with suspected urinary tract, lower respiratory tract, or skin and soft tissue infections. The tool provided helped nursing staff collect information to discuss with providers regarding patients with suspected infections. The study was implemented over a three-month period. Retrospective chart reviews were conducted, and pharmacy medication dispensing reports were used to determine pre- and post- implementation data regarding antibiotic name, duration, indication, and culture results.

Results: The data collected for this project showed a decrease in antibiotics ordered by one (1) order. This does not show the implemented SBAR tool was successful or unsuccessful.

Recommendations and Conclusions: Future studies should be provided with a longer time frame and comparing data for the same patients to include inferential statistics in the data analysis.

Keywords: antibiotic use, antibiotic stewardship, antibiotic resistance, educational tool, urinary tract infection, lower respiratory tract infection, culture, educational tool

Background and Significance

Antibiotic resistance is a global health problem that impacts people of all ages as well as animals and overall environmental health (World Health Organization [WHO], 2020). The Centers for Disease Control and Prevention (CDC) reports over 2.8 million antibiotic resistant infections per year and more than 35,000 deaths occur due to antibiotic resistant infections (Centers for Disease Control and Prevention [CDC], 2020). Antibiotic resistant microorganisms can be extremely difficult to treat. Antibiotic resistance is a global problem, and an estimated 700,000 deaths internationally are due to these infections (Staa et al., 2020). The World Health Organization defines antibiotic resistance as one of the largest threats to global health (WHO, 2020). Inappropriate prescribing of antibiotics and overuse of broad-spectrum antibiotics are contributing to rising antibiotic resistant infections (Feiring & Walter, 2017). Antibiotic resistant infections can lead to higher healthcare costs, morbidity, and mortality. Antibiotic use is associated with the occurrence of community-associated Clostridium difficile infections (Zetts et al., 2018). Additionally, over 140,000 visits to the emergency department each year are due to adverse reactions from antibiotic use (Srinivasan, 2017).

Antibiotic stewardship is a program designed to improve how antibiotics are prescribed by providers (CDC, 2020). Antibiotic stewardship can reduce the emergence of antibiotic resistance (Chater & Courtenay, 2019). The goal of an antibiotic stewardship program is not to reduce antibiotic use, but to improve overall patient care by ensuring appropriate and safe usage (Srinivasan, 2017). It is estimated that 70% of all patients in a long-term care setting will receive a minimum of one course of antibiotics annually and up to 75% of those antibiotics are inappropriately ordered (Katz et al., 2022). The need for improvement of antibiotic prescribing and usage is a patient safety issue (American Nurses Association [ANA] & CDC, 2017).

Advanced practice nurses can be antibiotic stewards by following guidelines on appropriate antibiotic use (Knobloch et al., 2021).

Problem Statement

Bacteria are evolving and building resistance to antibiotics (Centers for Disease Control and Prevention [CDC], 2020). Antibiotic resistant microorganisms can be extremely difficult and sometimes impossible to treat. This global health problem results in higher rates of morbidity, mortality, prolonged hospital stays, and healthcare costs (Feiring & Walter, 2017). Bacteria that have become resistant to antibiotics may cause topical infections, urinary tract infections, meningitis, sexually transmitted infections, and pneumonia (United States Food and Drug Administration [FDA], 2022). Higher healthcare costs have also been reported as the CDC estimated over $4.8 billion in medical costs in 2017 related to antibiotic resistant infections (National Action Plan for Combating Antibiotic-Resistant Bacteria, 2020). The CDC has developed a global initiative, termed Antibiotic Stewardship, to reduce antibiotic resistance by promoting safe and appropriate antibiotic usage (CDC, 2021). The successful implementation of an antibiotic stewardship protocol can reduce the risk of antibiotic resistant infections (Zetts et al., 2018).

Purpose

The purpose of this quality improvement project was to determine if the implementation of a data collection tool will improve the adherence to an antibiotic stewardship program.

Specific Goals

Evidence based literature supports the implementation of antibiotic stewardship practices to improve patient care. The goal of this project was to improve an existing antibiotic stewardship practice in a long-term care setting. Educational tools have been shown to improve

clinical decision-making regarding antibiotic use. The Situation Background Assessment Request (SBAR) tools are specific for suspected urinary tract infections, lower respiratory infections, and skin and soft tissue infections. This project implemented three different SBAR tools developed by the Agency for Healthcare Research and Quality (AHRQ) to assist nursing staff in gathering patient information to discuss with providers.

Review of Literature

A review of literature was conducted using ProQuest and CINAHL with search terms as antibiotic resistance, urinary tract infection, stewardship, antibiotic stewardship promotion, and long-term care. Google searches were performed using keywords Agency for Research for Healthcare and Quality and antibiotic stewardship.

Antibiotic resistance occurs because of bacteria changing in response to the increased use of medications (WHO, 2020). This emergence of resistant organisms makes it more difficult to treat infections (WHO, 2020). The World Health Organization has created initiatives to promote stewardship programs to decrease antibiotic resistance (WHO, 2020). Recently, the COVID-19 pandemic has brought awareness to the issue of antibiotic resistant organisms. The Global Antibiotic Research and Development Partnership (GARDP) is a non-profit organization that partners with government agencies to research and develop new antibiotics for resistant infections (GARDP, 2021a). A study conducted by this nonprofit reported an outbreak of Klebsiella pneumoniae, a resistant bacterium, throughout the COVID-19 intensive care unit at a hospital in South Africa (GARDP, 2021b). The outbreak of this resistant bacterium is due to an overuse of antibiotics causing an increase in antibiotic resistant infections.

Impact of Antibiotic Resistance

Antibiotic resistance affects all ages in all countries. Studies have found that global antibiotic usage increased 65% from 2000 to 2015. One in five antibiotics in the United Kingdom and one in three antibiotics in the United States are unnecessarily prescribed (GARDP, 2021). British research has estimated that 10 million deaths will occur in 2050 because of resistant bacteria (Wall, 2019). In their review article, Zetts and associates (2018) suggested poor antibiotic stewardship includes not only prescribing for viruses but also in making incorrect choices such as using second line medications for initial therapy (Zetts et al., 2018). The study estimated 80% of total patients should receive the recommended first-line therapy instead of a macrolide or second-line medication for urinary tract infections. The study concluded that at least 30% of total antibiotic prescriptions were unnecessarily prescribed in the outpatient setting. A literature review concluded that an individual is more likely to develop a resistant infection if they are prescribed an antibiotic for a respiratory or urinary infection in a primary care setting (Staa et al., 2020).

Risks with Antibiotic Usage

The emergence of antibiotic resistant bacteria is increasing with the overuse of antibiotics (CDC, 2021). As antibiotic resistant bacteria increase, the effectiveness of available antibiotics decreases resulting in uncontrolled infections. Clostridium difficile is a bacterium that causes colitis and diarrhea and is associated with antibiotic usage (CDC, 2021). The CDC reports over 223,900 infections of Clostridium difficile each year and 12,800 deaths per year due to this resistant bacterium. Acinetobacter is a resistant bacterium that can cause infections in the lungs, urinary tract, wounds, and bloodstream. This infection is associated with hospitalized patients and 8,500 cases were reported in 2017 (CDC, 2021).

Provider Education

Uncertainty concerning the risk of antibiotic use can lead providers to prescribe an antibiotic to cover symptoms that may present as bacterial or viral infections (Zetts et al., 2018). A study found that providers who believe antibiotic therapy is associated with minimal risk are significantly more likely to unnecessarily prescribe an antibiotic (Zetts et al., 2018).

A qualitative case study conducted in Norway used the AGREE II tool to assess the framework model used in the successful implementation of an antibiotic stewardship program (Feiring & Walter, 2017). The guidelines are designed to be a resource to assist providers in appropriate antibiotic selection and ordering. This study interviewed eight providers specifically on their perspectives of the guidelines for antibiotic stewardship within practice. All eight providers agreed that an antibiotic stewardship guideline would be relevant and appropriate (Feiring & Walter, 2017).

A study by Katz et al. (2022) supports the use of educational tools targeted towards nursing staff and providers to improve clinical decision making regarding antibiotic use. The study found educational tools assisted providers in recognizing signs and symptoms of infections and incorporated antibiotic stewardship principles in clinical decision making (Katz et al., 2022).

Antibiotic Usage in Long-Term Care Settings

Urinary tract infections are one of the most diagnosed infections in the long-term care setting and are the largest cause of antibiotic overuse in older adults (Kilgore, 2015). In their review article, Kilgore (2015) suggests prescribing shorter antibiotic duration with a re-evaluation can help reduce overuse of antibiotics for urinary tract infections in older adults (Kilgore, 2015). The review article continues to support the idea that long-term care facilities have the highest rates of antibiotic resistant infections.

Empiric antibiotics are suggested as first line treatment for uncomplicated urinary tract infections (Lopez et al., 2021). In long-term care settings, factors including difficulty in collecting urine samples, delay in culture and sensitivity results, and guardian pressure can lead to increased antibiotic prescribing (Shane, 2021).

Implementation of Antibiotic Stewardship Programs

In a study by Katz et al. (2022) and associates, education from the Agency for Healthcare Research and Quality (AHRQ) was provided to 439 long-term care facilities in the United States. Over the course of one year, the study showed a reduction in overall antibiotic use following the implementation of the educational programs. Fluoroquinolones were among the most prescribed antibiotics in the facilities and showed the greatest reduction in usage after education was implemented in these facilities.

The goal of antibiotic stewardship is to improve patient care rather than reduce antibiotic usage (Srinivasan, 2017). The CDC outlines specific guidelines as Core Elements of Antibiotic Stewardship which includes developing leadership teams of nurses, providers, pharmacy staff, and laboratory staff to support antibiotic stewardship goals (CDC, 2021). Tracking, reporting, and accountability should be implemented in successful antibiotic stewardship policies.

Conceptual Model

The foundation for this project is the Plan-Do-Study-Act (PDSA) model. This model served as a framework for identifying the problem and implementing a change within practice. This framework assisted in maintaining clear objectives for project goals. Utilizing this model allowed for reassessment of the plan and recognizing areas of improvement. The PDSA model is a widely accepted template that can be applied to any area where change is desired.

For this quality improvement project, the conceptual model developed by the Institute for Healthcare Improvement and the Centers for Disease Control and Prevention called the Antibiotic Stewardship Driver Diagram and Change Package was also applied (CDC, 2010). The driver diagram serves as a tool to help identify primary and secondary factors that can lead to successful antibiotic stewardship programs. The tool identifies specific change ideas to promote antibiotic stewardship. The tool supports including the pharmacy team in promoting antibiotic selection such as selecting the narrowest spectrum therapy indicated. The tool also recommends implementing a system to monitor administration and continuation of antibiotics. A key component of the model is to improve antibiotic knowledge among nurses and providers. This element was highly applicable to the site chosen for this project. The tool includes guidelines to measure the concepts within the framework. The measures include documenting the percentage of antibiotics discontinued or changed post-culture and percentage of cultures obtained (CDC, n.d.). The framework also suggests "developing a standardized process to identify patients who require antibiotics" (CDC, 2012). This project implemented a standardized SBAR tool to initiate a standardized process for identification of patients with suspected infections.

The Agency for Healthcare Research and Quality (AHRQ) Safety Program for Improving Antibiotic Use for Long-Term Care was also applied to this project. This conceptual model served as a foundation for creating a model of change that will be sustainable throughout everyday practice. The model focuses on leadership, culture, data collection, feedback, and assessment while improving antibiotic prescribing. Specifically, the data collection component was utilized throughout this quality improvement project to improve clinical decision-making regarding antibiotic use. The AHRQ Safety Program recommends reviewing antibiotic data to provide feedback and determine the need for additional changes. The implementation of a

standardized SBAR tool created by the AHRQ incorporates the 4 Moments of Antibiotic Decision Making to provide healthcare providers with a structured approach to prescribing antibiotics (Tamma et al., 2019).

Methodology

This three-month quality improvement (QI) project implemented an SBAR tool developed by the Agency for Healthcare Request and Quality (AHRQ). The purpose of the SBAR tool is to improve communication and data collection regarding patients with suspected urinary tract infections, lower respiratory infections, or skin and soft tissue infections in a long-term care setting. This tool includes all pertinent information necessary for the nursing staff to present to the provider when making notifications about suspected infections including vital signs, patient history, symptoms, and orders received. In person education was provided to each participating nurse regarding completion of the tool. By making an improvement in data collection for patients regarding suspected infections, healthcare providers can make a better clinical decision on whether an antibiotic is needed and promote adherence to an antibiotic stewardship program. The purpose of this QI project was to determine if the implementation of the SBAR tool will improve the adherence to an antibiotic stewardship program. The goal of this project was to improve appropriate antibiotic usage, improve the quantity of cultures obtained, and improve follow-up for the obtained cultures by creating a system change to promote adherence to the existing antibiotic stewardship policy.

Design and Population

This project was a three-month quality improvement project that implemented Situational-Background-Assessment-Request (SBAR) tools created by the AHRQ regarding suspected urinary tract infections, lower respiratory infections, and skin and soft tissue infections

in a long-term care setting. The SBAR tool assisted nursing staff in gathering clinical information to present to the provider in determining if antibiotic use is appropriate. Inclusion criteria included patients with suspected urinary tract, lower respiratory tract, or skin and soft tissue infections. Exclusion criteria included patients on long-term maintenance therapy of antibiotics and patients with symptoms of infections other than urinary, respiratory, or skin and soft tissue. Participants were included by presenting with signs and symptoms of suspected infections by nursing staff assessments. Nursing staff were asked to voluntarily participate in using the SBAR tool for data collection purposes. The sample size was forty-four patients presenting with suspected infections according to the SBAR tool. Retrospective chart reviews were conducted ongoing to determine the quantity and duration of prescribed antibiotics pre and post implementation of the SBAR tool. The quantity of cultures performed was determined pre and post implementation of the SBAR tool.

Setting

This project took place in a long-term care facility that serves 234 adult patients with a diagnosis of a neurodevelopmental disorder. This facility is in Western North Carolina.

Project Implementation

The facility has an Antibiotic Stewardship Program (ASP) which is guided by the Infection Prevention and Control Program (IPCP). The IPCP includes a clinical pharmacist and Infection Preventionist Registered Nurse. The core elements of the ASP include accountability, tracking, reporting, and educating. Tracking includes dose, duration, and indication of all antibiotics ordered. The appropriateness of all antibiotics ordered should be reviewed after the first 48 hours of therapy. The nurse is responsible for communicating the follow-up discussion with the physician and documentation in the patient chart. Additionally, the pharmacy generates

daily antibiotic reports and reports when a culture result is available. This QI project was supported by the IPCP group as an effort to support ASP protocols. The leadership and culture within the facility were a driving force in supporting the initiative to improve current antibiotic stewardship practices. The facility currently has a tracking system in place to monitor the dose, duration, and indication of all antibiotics prescribed. The IPCP group, Nursing Director, and Medical Director were supportive of the implementation of this project at this facility. The Nursing Director was a primary stakeholder in this project since it related directly to nursing job duties. In-person education meetings were conducted with each nurse on how to properly use the SBAR tool and the importance of appropriate antibiotic use. Follow-up in-person meetings occurred on a weekly basis throughout the duration of the study.

Instruments

The tool implemented in this project was a Situational-Background-Assessment-Request (SBAR) tool created by the AHRQ regarding suspected urinary tract infections, lower respiratory infections, and skin and soft tissue infections in a long-term care setting. As shown in Appendix B, C, and D, the SBAR tool is a two-page document which assists nursing staff in gathering clinical information to present to the provider in determining if antibiotic use is appropriate based on the clinical data. The tool is made public by the AHRQ and permission to reprint and use the tool is not necessary per the AHRQ disclaimer statement on the website.

Steps Implemented

The facility's current Antibiotic Stewardship Policy was reviewed and in person meetings with the Infection Prevention Registered Nurse, Clinical Pharmacist, and Nursing Director took place. The meetings included a discussion of the planned intervention, data collection methods, and project goals. Permission to conduct this project at the site was obtained by the Nursing

Director and Medical Director. The SBAR tool was selected from a publicly available toolkit on the AHRQ website. The principal investigator (PI) printed copies of the selected SBAR tools, made binders with each SBAR tool and directions, and developed an education plan for nursing staff. All nursing staff selected were provided with education on how to complete the tools. The project was implemented over a three-month period. The pharmacy provided daily antibiotic usage reports and an antibiotic usage report for three months prior to the project implementation for comparison. The information from the pharmacy reports was compared to the completed SBAR tools. Retrospective chart reviews were conducted on an ongoing basis to gather demographic data, culture results, and review antibiotic orders. The antibiotic reports were then disposed of in a confidential locked bin at the facility. The Nursing Director was kept informed of progress throughout the implementation of the project.

Data Collection

Permission was obtained from the Nursing Director and Medical Director to have access to the pharmacy generated antibiotic dispensing reports and conduct retrospective chart reviews for this project. The pharmacy provided copies of the antibiotic dispensing report daily. The information on the dispensing report was used to compare completed SBAR tool data. Retrospective chart reviews were conducted ongoing to gather demographic data, antibiotic usage data, and review culture results. Inclusion criteria included patients with suspected urinary tract, lower respiratory tract, or skin and soft tissue infections. Exclusion criteria included patients on long-term maintenance antibiotic therapy and patients with symptoms of infections other than urinary, respiratory, or skin and soft tissue. The completed SBAR tools and dispensing reports were placed in a locked confidential bin at the facility after data was collected. Specific variables used for data collection included age, gender, antibiotic name, indication, durations,

culture (yes/no), and culture results (if applicable). Patient identifiers were removed once data was stored into Intellectus Software. Intellectus Software has a password protected login and is accessed on the principal investigator's personal computer protected with a password. The data collected cannot be linked back to the patient to protect privacy.

Data Analysis

A systematic approach to data collection was performed ongoing throughout the duration of this project. Data was collected from pharmacy medication administration reports and retrospective chart reviews. Intellectus software was used to input data, assign variables, and analyze descriptive statistical data. Variables included age, gender, name of antibiotic prescribed, duration of antibiotic prescribed, indication of antibiotic prescribed, culture performed (yes or no), and culture results (if applicable). Descriptive statistics were used to describe and interpret data and determine percentages within the data set (Intellectus Statistics, 2022).

Ethical Considerations

Approval was obtained by Lenoir-Rhyne University's Institutional Review Board on September 12, 2022. Informed consent was not necessary as this project had no patient interaction. Nursing staff were asked to voluntarily participate in the project intervention. There were no risks to participants or subjects in this project. All patient information was kept confidential, and no patient identifiers were used in data collection. The pharmacy generated reports and completed SBAR tools were disposed of at the facility in a locked confidential bin. Intellectus software was used to store data collected on a password protected computer with antivirus software and firewall protection. All Health Insurance Portability and Accountability (HIPAA) guidelines were followed closely throughout the duration of this project.

Results

Outcomes

A total of ten nursing staff consisting of four Registered Nurses (RN) and six Licensed Practical Nurses (LPN) voluntarily participated in the project intervention. The Nursing Director served as the stakeholder for this project. The pharmacist and Infection Prevention RN were also involved in the data collection and project implementation.

Descriptive statistics were used to interpret and describe the data collected. Over the three months prior to this project implementation or pre-interventional data, there were a total of forty-five (45) antibiotics (n = 45) ordered for urinary tract, lower respiratory tract, and skin and soft tissue infections. As shown in Table 1 below, the most common antibiotic class ordered in the pre-interventional data was cephalosporins (n = 15, 33.33%). During project implementation, or post-interventional data, there were a total of forty-four (44) antibiotics (n = 44) ordered for urinary tract, lower respiratory tract, and skin and soft tissue infections. The most common antibiotic class ordered in the post-interventional data was tetracyclines (n = 13, 28.89%) and cephalosporins (n = 13, 28.89%).

Table 1
Frequency Table for Classes of Antibiotics Ordered

Variable	*n*	*%*
PRE_ANTIBIOTIC_CLASS		
TETRACYCLINE	6	13.33
CEPHALOSPORIN	15	33.33
FLUOROQUINOLONE	8	17.78
PENICILLIN	4	8.89
MACROLIDE	5	11.11
CARBAPENEM	4	8.89
MISC.	3	6.67
Missing	0	0.00
POST_ANTIBIOTIC_CLASS		
CEPHALEXIN	1	2.22
MACROLIDE	2	4.44

CEPHALOSPORIN	12	26.67
TETRACYCLINE	13	28.89
CARBAPENEM	6	13.33
FLUOROQUINOLONE	2	4.44
PENICILLIN	6	13.33
MISC.	2	4.44
Missing	1	2.22

Note. Due to rounding errors, percentages may not equal 100%.

As shown in Table 2 below, the most common indication in both pre- and post-interventional data was pneumonia (n = 18, 40.00% and n = 20, 44.44%).

Table 2
Frequency Table for Indications for Antibiotics

Variable	*n*	*%*
PRE_INDICATION		
CELLULITIS	8	17.78
PNA	18	40.00
UTI	12	26.67
SKIN INFECTION	4	8.89
SKIN ABCESS	1	2.22
BRONCHITIS	2	4.44
Missing	0	0.00
POST_INDICATION		
PNA	20	44.44
UTI	15	33.33
CELLULITIS	9	20.00
Missing	1	2.22

Note. Due to rounding errors, percentages may not equal 100%.

The average duration for the pre-interventional data was 5.96 days (SD = 1.87) and 5.93 (SD = 2.02) days for post-interventional data as shown in Table 3 below.

Table 3
Summary Statistics Table for Duration of Antibiotic Therapy

Variable	*M*	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis
PRE_DURATION	5.96	1.87	45	0.28	1.00	10.00	-0.15	0.47

POST_DURATION	5.93	2.02	44	0.30	1.00	10.00	0.20	0.83

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

Females were the most common gender in both pre- and post-interventional data (n = 27, 60.00% and n = 25, 55.56%) as described in Figure 1 and 2.

Figure 1

Bar plot of Pre-Gender and Pre-Indication

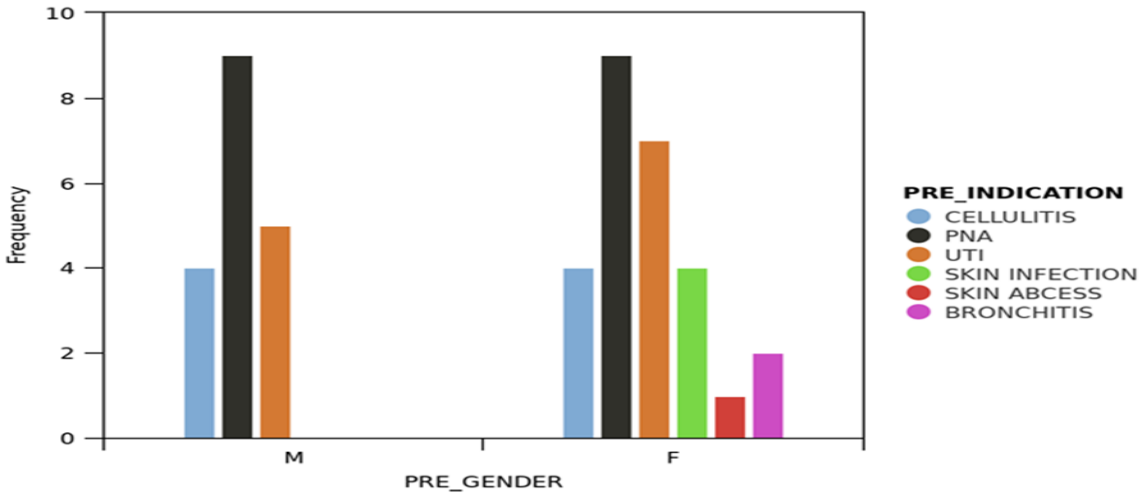
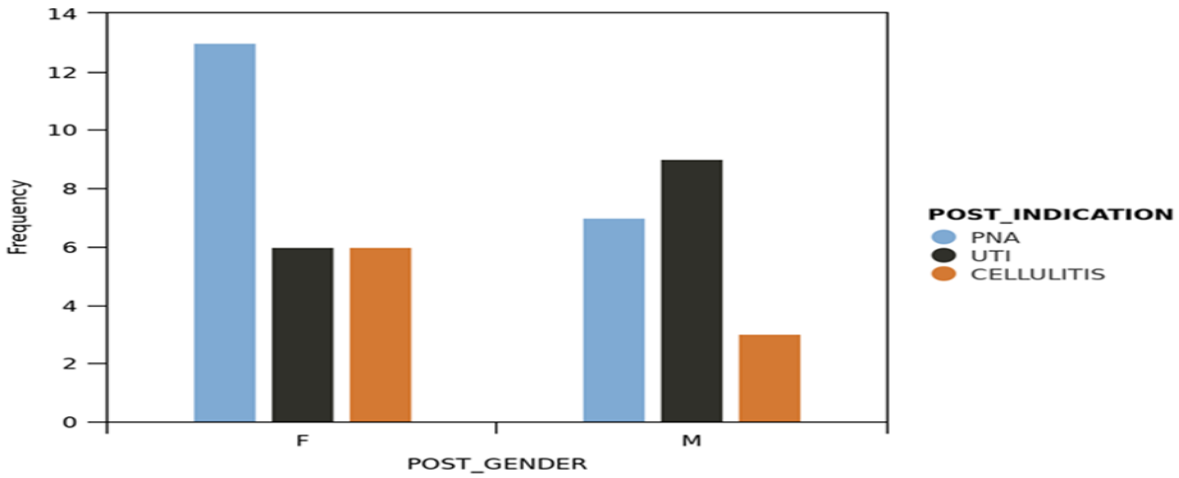


Figure 2

Bar plot of Post-Gender and Post-Indication



The mean age in the pre-interventional data was 61.07 (min = 46.00, max = 93.00, SD = 11.71) and 57.45 (min = 42.00, max = 71.00, SD = 8.36) for the post-interventional data shown in Table 4.

Table 4
Summary of Descriptive Statistics for Age

Variable	*M*	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis
PRE_AGE	61.07	11.71	45	1.75	46.00	93.00	0.58	0.39
POST_AGE	57.45	8.36	44	1.26	42.00	71.00	-0.31	-0.96

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

Cultures were only performed for urinary tract infections during this selected project intervention. The most frequently observed culture results for both pre- and post-interventional data was Escherichia coli (n = 6, 13.33% and n = 7, 15.56%) as described in Table 5.

Table 5
Frequency Table for Culture Results

Variable	*n*	*%*
PRE-INTERVENTION_CULTURE		
ESCHERICHIA COLI	6	13.33
KLEBSIELLA PNEUMONIAE	2	4.44
ENTEROCOCCUS FAECALIS	4	8.89
Missing	3	73.33
POST-INTERVENTION_CULTURE		
KLEBSIELLA PNEUMONIAE	3	6.67

PSEUDOMONAS AERUGINOSA	2	4.44
ENTEROCOCCUS FAECALIS	1	2.22
ESCHERICHIA COLI	7	15.56
AEROCOCCUS VIRIDAN	1	2.22
ENTEROCOCCUS FAECALIS, PROTEUS MIRABILIS, ESCHERICHIA COLI, KLEBSIELLA PNEUMONIAE	1	2.22
Missing	3	66.67

Note. Due to rounding errors, percentages may not equal 100%.

Barriers to Success

A potential barrier to this project was the possibility that the minimum sample size of twenty-five (25) observations would not occur within the selected time frame. The project data exceeded the minimum sample size by the end of the implementation period. One possible barrier to the success of this project could be the selection of months for implementation. The project was implemented during the late Fall months which could have impacted the quantity of antibiotic orders. Another barrier that was to be expected was disregard for the existing antibiotic stewardship policy by nursing staff or providers. Cultures were routinely performed for urinary tract infections only. Retrospective chart reviews showed that the nursing staff and providers were following the Antibiotic Stewardship Policy guidelines when documenting urinary tract, lower respiratory tract, and skin and soft tissue infections.

Strengths to Overcome Barriers

The nursing staff that voluntarily participated in the project intervention helped to ensure the project was completed in the necessary timeframe. The completed SBAR tools were reviewed ongoing in comparison with the retrospective chart reviews. The support of the Nursing

Director, Infection Prevention RN, and pharmacist was a major strength during this project implementation. In-person education of the SBAR tools and routine follow-up with nursing staff was beneficial to ensuring the tools were utilized as planned during the implementation phase of this project.

Discussion

The data collected for this project showed a minimal decrease in antibiotics ordered by one (1) order. This is not a significant number to show the implemented SBAR tool was either successful or unsuccessful. The timing of the project implementation could have an impact on the quantity of antibiotics ordered. Future studies could be conducted over a longer time or over similar seasons to develop a more thorough review of data. The retrospective chart reviews confirmed the nursing staff and providers were following the existing Antibiotic Stewardship Policy. Cultures were performed for 100% of the urinary tract infections and the antibiotics ordered were appropriate for the susceptible organisms. Documentation was completed within the 48-hour follow-up as recommended by the Antibiotic Stewardship Policy.

Inferential statistics were not applicable to this study as the data collected was from independent groups of data. It would be beneficial for future studies to compare antibiotic orders over a longitudinal study using the same patients with recurrent infections. Descriptive statistics were applied to this project data and provided information to support this project goal.

Urinary tract infections are the most diagnosed infections in the long-term care setting and are the largest cause of antibiotic overuse in older adults (Kilgore, 2015). This study showed pneumonia was the most diagnosed infection at the project site. The selected time frame could have an impact on these results. Kilgore (2015) suggests prescribing shorter antibiotic duration to reduce antibiotic overuse in older adults with urinary tract infections (Kilgore, 2015). The

average duration of all antibiotics during this study was 5.96 and 5.93 days. Future studies could include only urinary tract infections and disseminate antibiotic therapy and duration more closely.

The Core Elements of Antibiotic Stewardship which supports tracking, reporting, and accountability were followed during this project implementation (CDC, 2021). The daily antibiotic reports generated by the pharmacy included specific criteria for antibiotic ordering. Providers were not held accountable for ordering cultures, however, all urinary tract infections over this project intervention had a corresponding culture report on the chart. Wound cultures and sputum cultures were not performed during this study. This could be due to cost, effectiveness, or difficulty in obtaining cultures from patients. Improvement in the knowledge of antibiotic stewardship can be included in future studies to determine the effectiveness of the information provided by the CDC.

The Plan-Do-Study-Act (PDSA) model supports reassessing the plan and identifying areas for improvement in future studies. The SBAR tool implemented was not ineffective, however, more data is necessary to show significant changes with the use of this tool. The nursing staff were able to complete the tool without causing time constraints or an increased workload. The tool helped organize the information necessary to present to the provider. The SBAR tool is useful and can be used in future studies to determine its effectiveness and create a sustainable system change.

Conclusion

The implementation of the SBAR tool was effective in reducing the quantity of antibiotic orders. The tool was not time consuming and was useful to the nursing staff and providers who participated in the study. Future studies could lengthen the time frame and collect information on

the same patients over a period of time to gather more detailed results and include inferential statistics. Antibiotic Stewardship is a global program designed to improve how antibiotics are prescribed by providers (CDC, 2019). Adherence to the program guidelines and recommendations will help to improve the quality of healthcare patients receive.

References

Agency for Healthcare Research and Quality [AHRQ]. (2020). *Plan-Do-Study-Act (PDSA) Directions and Examples.* http://www.ahrq.gov/health-literacy/improve/precautions/tool2b.html

American Nurses Association & Centers for Disease Control and Prevention. (2017). *Redefining the antibiotic stewardship team: Recommendations from the American nurses' association / centers for disease control and prevention workgroup on the role of registered nurses in hospital antibiotic stewardship practices.* https://www.cdc.gov/antibiotic-use/healthcare/pdfs/ANA-CDC-whitepaper.pdf

Centers for Disease Control and Prevention. (n.d.). Antibiotic stewardship measurement framework. https://www.cdc.gov/antibiotic-use/healthcare/pdfs/Antibiotic_Stewardship_Measurement_Framework.pdf

Centers for Disease Control and Prevention. (July 2012). Antibiotic stewardship driver diagram and change package. Prepared by the Institute for Health Improvement. https://www.cdc.gov/antibiotic-

Centers for Disease Control and Prevention. (2020). Antibiotic/antimicrobial resistance (AR/AMR). https://www.cdc.gov/drugresistance/about.html use/healthcare/pdfs/Antibiotic_Stewardship_Change_Package.pdf

Centers for Disease Control and Prevention. (2021). *Core elements for antibiotic stewardship for nursing homes.* https://www.cdc.gov/antibiotic-use/core-elements/nursing-homes.html

Chater, A., & Courtenay, M. (2019). Community nursing and antibiotic stewardship: The importance of communication and training. *British Journal of Community Nursing, 24*(7).

Feiring, E. & Walter, A. (2017). Antimicrobial stewardship: A Qualitative study of the development of national guidelines for antibiotic use in hospitals. *BMC Health Services Research.*

Global Antibiotic Research and Development Partnership. (2021a). Antibiotic resistance response. https://gardp.org/what-we-do/antibiotic-resistance/

Global Antibiotic Research and Development Partnership. (20 April 2021b). *A young doctor faces the reality of antibiotic resistance during covid-19.* https://gardp.org/news-resources/young-doctor-faces-reality-antibiotic-resistance-during-covid/

Intellectus Statistics [Online computer software]. (2022). Intellectus Statistics. http://analyze.intellectusstatistics.com

Katz, M., Tamma, P., Cosgrove, S., Miller, M., Dullabh, P., Rowe, T., Ahn, R., Speck, K., Shah, S., & Jump, R. (2022). Implementation of an antibiotic stewardship program in long-term care facilities across the U.S. *JAMA Network Open*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8886516/

Kellar, S.P. & Kelvin, E.A. (2013). *Munro's statistical methods for health care research.* (6th Ed.) Wolters Kluwer Health.

Kilgore, C. (2015). *Antibiotic stewardship is important in reducing bacterial resistance in UTIs.* Caring for the Ages. https://www.caringfortheages.com/article/S1526-4114(15)00242-5/pdf

Knobloch, M.J., Musuuza, J., Baubie, K., Saban, K.I., Suda, K.J., & Safdar, N. (2021). Nurse practitioners as antibiotic stewards: Examining prescribing patterns and perceptions. *American Journal of Infection Control,* 1-6. https://www.sciencedirect.com/science/article/pii/S0196655321000523

Lopez, A., Tan, C., Yabon, A., & Masbang, A. (2021). Systematic treatment (using NSAIDS versus antibiotics in uncomplicated lower urinary tract infection: A meta-analysis and systematic review of randomized controlled trials. *BMC Infectious Diseases.*

National Action Plan for Combating Antibiotic-Resistant Bacteria 2020-2025. (2020). https://www.hhs.gov/sites/default/files/carb-national-action-plan-2020-2025/pdf

Polit, D.F. & Beck, C.T. (2017). *Nursing research: Generating and assessing evidence for nursing practice.* (10th Ed.). Wolters Kluwer Health.

Shane, M. (2021). Antimicrobial stewardship in long-term care facilities: Focus on suspected urinary tract infection. *Urologic Nursing (41),* 1. http://www.proquest.com/nahs/docview/2492331850/fulltextPDF/A296744A348F4358PQ/4?accountid=13505.

Srinivasan, A. (2017). Antibiotic stewardship: Why we must, how we can. *Cleveland Clinic Journal of medicine, 84* (9), 673-679. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6492617/

Staa, T.P.V., , Palin, V., Welfare, W., Felton, T.W., Dark, P., & Ashcroft, D.M. (2020). The effectiveness of frequent antibiotic use in reducing the risk of infection-related hospital admissions: Results from two large population-based cohorts. *BMC Medicine*.

Tamma, P.D., Miller, M.A., & Cosgrove, S.E. (2019). *Rethinking how antibiotics are prescribed incorporating the 4 moments of antibiotic decision making into clinical practice.* http://jamanetwork.com/journals/jama/article-abstract/2719862

United States Food and Drug Administration. (2021). *FDA's key initiatives for antimicrobial stewardship.* https://www.fda.gov/animal-veterinary/judicious-use-antimicrobials/fdas-cvm-key-initiatives-antimicrobial-stewardship

World Health Organization. (2020). *Antibiotic resistance: Key facts.* https://www.who.int/news-room/fact-sheets/detail/antibiotic-resistance

Zetts, R., Stoesz, A., Smith, B., & Hyun, D. (2018). Outpatient antibiotic use and the need for increased antibiotic stewardship efforts. *Pediatrics, 141* (6).

Appendix A

Outline of education provided to nursing staff and providers at the long-term care facility

Step 1. Identify a patient with a suspected infection (urinary tract, lower respiratory tract, or skin and soft tissue).

Step 2. Complete the selected SBAR tool prior to contacting the provider.

- S- Situation: includes resident information and vital signs (blood pressure, heart rate, respiratory rate, and temperature).
- B- Background: pertinent medical history for the patient (indwelling catheter, incontinence, medication allergies, medications, etc.)
- A- Assessment: check the boxes that apply to the patient for antibiotic use criteria.
- R- Request for Orders: place prescriber orders.

Step 3. Questions/Feedback

Appendix B

SBAR Tool for Suspected Urinary Tract Infections

Suspected UTI **SBAR**

Complete this form before contacting the resident's physician.

Date/Time _____

Nursing Home Name _____

Resident Name _____ Date of Birth _____

Physician/NP/PA _____ Phone _____

Fax _____

Nurse _____ Facility Phone _____

Submitted by ☐ Phone ☐ Fax ☐ In Person ☐ Other _____

S Situation

I am contacting you about a suspected UTI for the above resident.

Vital Signs BP _____ / _____ HR _____ Resp. rate _____ Temp. _____

B Background

Active diagnoses or other symptoms (especially, bladder, kidney/genitourinary conditions)

Specify _____

☐ No ☐ Yes The resident has an indwelling catheter

☐ No ☐ Yes Patient is on dialysis

☐ No ☐ Yes The resident is incontinent **If yes,** new/worsening? ☐ No ☐ Yes

☐ No ☐ Yes Advance directives for limiting treatment related to antibiotics and/or hospitalizations

Specify _____

_____

☐ No ☐ Yes Medication Allergies

Specify _____

_____

☐ No ☐ Yes The resident is on Warfarin (Coumadin®)

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Appendix B

SBAR Tool for Suspected Urinary Tract Infections

Nursing Home Name _____ Facility Fax _____

Resident Name _____

A Assessment Input (check all boxes that apply)

Resident WITH indwelling catheter

The criteria are met to initiate antibiotics if one of the below are selected

No Yes

- ☐ ☐ Fever of 100°F (38°C) or repeated temperatures of 99°F (37°C)*
- ☐ ☐ New back or flank pain
- ☐ ☐ Acute pain
- ☐ ☐ Rigors /shaking chills
- ☐ ☐ New dramatic change in mental status
- ☐ ☐ Hypotension (significant change from baseline BP or a systolic BP <90)

Resident WITHOUT indwelling catheter

Criteria are met if one of the three situations are met

No Yes

- ☐ ☐ 1. Acute dysuria alone

OR

- ☐ ☐ 2. Single temperature of 100°F (38°C) **and** at least one new or worsening of the following:
  - ☐ urgency
  - ☐ frequency
  - ☐ back or flank pain
  - ☐ suprapubic pain
  - ☐ gross hematuria
  - ☐ urinary incontinence

OR

- ☐ ☐ 3. No fever, but two or more of the following symptoms:
  - ☐ urgency
  - ☐ frequency
  - ☐ incontinence
  - ☐ suprapubic pain
  - ☐ gross hematuria

Nurses: Please check box to indicate whether or not criteria are met

☐ **Nursing home protocol criteria are met.** Resident may require UA with C&S or an antibiotic.†

☐ **Nursing home protocol criteria are NOT met.** The resident does NOT need an immediate prescription for an antibiotic, but may need additional observation.††

R Request for Physician/NP/PA Orders

Orders were provided by clinician through ☐ Phone ☐ Fax ☐ In Person ☐ Other_____

☐ Order UA

☐ Urine culture

☐ Encourage _____ ounces of liquid intake _____ times daily until urine is light yellow in color.

☐ Record fluid intake.

☐ Assess vital signs for _____ days, including temp, every _____ hours for _____ hours.

☐ Notify Physician/NP/PA if symptoms worsen or if unresolved in _____ hours.

☐ Initiate the following antibiotic

Antibiotic: _____ Dose: _____ Route: _____ Duration: _____

☐ No ☐ Yes Pharmacist to adjust for renal function

☐ Other _____

Physician/NP/PA signature _____ Date/Time _____

Telephone order received by _____ Date/Time _____

Family/POA notified (name)_____ Date/Time _____

* For residents that regularly run a lower temperature, use a temperature of 2°F (1°C) above the baseline as a definition of a fever.
† This is according to our understanding of best practices and our facility protocols. Minimum criteria for a UTI must meet 1 of 3 criteria listed in box.
†† This is according to our understanding of best practices and our facility protocols. The information is insufficient to indicate an active UTI infection.

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Appendix C

SBAR Tool for Suspected Lower Respiratory Tract Infections

Suspected LRI **SBAR**

Complete this form before contacting the resident's physician.

Date/Time _____

Nursing Home Name _____

Resident Name _____ Date of Birth _____

Physician/NP/PA _____ Phone _____

Fax _____

Nurse _____ Facility Phone _____

Submitted by ☐ Phone ☐ Fax ☐ In Person ☐ Other _____

S Situation

I am contacting you about a suspected lower respiratory tract infection for the above resident.

Vital Signs BP _____ /_____ HR _____ Resp. rate _____

Temp. _____ O2 Sat _____

B Background

☐ No ☐ Yes The resident has COPD

☐ No ☐ Yes The resident has diabetes

☐ No ☐ Yes The resident is a current smoker

☐ No ☐ Yes The resident is a former smoker

☐ No ☐ Yes Resident uses nebulizer/inhaler

☐ No ☐ Yes The resident is on supplemental O2

☐ No ☐ Yes O2 requirements have increased specify O2 amount: _____

☐ No ☐ Yes Resident reports chest pain or difficulty breathing

☐ No ☐ Yes Other active diagnoses (especially, chronic lung disease, chronic bronchitis, emphysema)

Specify: _____

_____

☐ No ☐ Yes Advance directives for limiting treatment related to antibiotics and/or hospitalizations

Specify: _____

_____

☐ No ☐ Yes Medication Allergies

Specify: _____

_____

☐ No ☐ Yes The resident is on Warfarin (Coumadin®)

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Appendix C

SBAR Tool for Suspected Lower Respiratory Tract Infections

Nursing Home Name _____ Facility Fax _____

Resident Name _____

A Assessment Input (check all boxes that apply)

Criteria are met if one of the four situations are met

Resident with a fever of 102°F (38.9°C) or higher and one of the following

No Yes

- ☐ ☐ Respiratory rate of >25 breaths per minute
- ☐ ☐ New or worsened cough
- ☐ ☐ New or increased sputum production
- ☐ ☐ O2 saturation <94% on room air or a reduction in O2 saturation of >3% from baseline

Resident with a fever of 100°F (37.9°C) and less than 102°F (38.9°C)

No Yes

- ☐ ☐ Cough and at least one of the following
  - ☐ Pulse >100
  - ☐ Delirium (sudden onset of confusion, disorientation, dramatic change in mental status)
  - ☐ Rigors (shaking chills)
  - ☐ Respiratory rate >25 breaths per minute

Afebrile resident with COPD and age >65

No Yes

- ☐ ☐ New or increased cough with purulent sputum production

Afebrile resident without COPD and age >65

- ☐ ☐ New or increased cough with purulent sputum production **and** at least one of the following
  - ☐ Respiratory rate >25
  - ☐ Delirium (sudden onset of confusion, disorientation, dramatic change in mental status)

Nurses: Please check box to indicate whether or not criteria are met

- ☐ **Nursing home protocol criteria are met.** The resident may have a lower respiratory tract infection and need a prescription for an antibiotic agent.†
- ☐ **Nursing home protocol criteria are NOT met.** The resident does NOT need an immediate prescription for an antibiotic, but may need additional observation.††

R – Request for Physician/NP/PA Orders

Orders were provided by clinician through ☐ Phone ☐ Fax ☐ In Person ☐ Other _____

- ☐ Chest X-Ray
- ☐ For cough, consider using a cough suppressant Dose _____ Route _____ Duration _____
- ☐ For cough, consider using an inhaler/nebulizer Dose _____ Duration _____
- ☐ Acetaminophen _____ mg. Route _____ Duration _____
- ☐ Raise upper body (use multiple pillows) to sleep/rest
- ☐ Encourage _____ ounces of fluid by mouth or G-Tube for _____ hours
- ☐ Record fluid intake
- ☐ Encourage salt water gargles
- ☐ Assess vital signs, including temp, every _____ hours for _____ hours
- ☐ Notify Physician/NP/PA if symptoms worsen or if unresolved in _____ hours
- ☐ Initiate intravenous fluid hydration and/or ☐ initiate hypodermoclysis.
- ☐ Initiate the following antibiotic(s)

  Antibiotic 1 _____ Dose _____ Route _____ Duration _____

  Antibiotic 2 _____ Dose _____ Route _____ Duration _____

  ☐ No ☐ Yes Pharmacist to adjust for renal function
- ☐ Other, specify: _____

Physician/NP/PA signature _____ Date/Time _____

Telephone order received by _____ Date/Time _____

Family/POA notified (name) _____ Date/Time _____

† This is according to our understanding of best practices and our facility protocols.

†† This is according to our understanding of best practices and our facility protocols. The information is insufficient to indicate an active lower respiratory tract infection.

Appendix D

SBAR Tool for Suspected Skin and Soft Tissue Infections

Suspected SST **SBAR**

Complete this form before contacting the resident's physician.

Date/Time _____

Nursing Home Name _____

Resident Name _____ Date of Birth _____

Physician/NP/PA _____ Phone _____

Fax _____

Nurse _____ Facility Phone _____

Submitted by ☐ Phone ☐ Fax ☐ In Person ☐ Other _____

S Situation

I am contacting you about a suspected SST infection for the above resident.

Vital Signs BP _____/_____ HR _____ Resp. rate _____ Temp. _____

B Background

☐ No ☐ Yes The resident has diabetes

☐ No ☐ Yes Other active diagnoses (especially, chronic venous insufficiency, edema or peripheral vascular disease)

Specify _____

_____

☐ No ☐ Yes History of skin infections

Specify _____

_____

☐ No ☐ Yes Advance directives for limiting treatment related to antibiotics and/or hospitalizations

Specify _____

_____

☐ No ☐ Yes Medication Allergies

Specify _____

_____

☐ No ☐ Yes The resident is on Warfarin (Coumadin®)

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Appendix D

SBAR Tool for Suspected Skin and Soft Tissue Infections

Nursing Home Name _____ Facility Fax _____

Resident Name _____

A Assessment Input (check all boxes that apply)

Minimum Criteria for Initiating an Antibiotic

The criteria are met to initiate antibiotics if one of situations below are met

No Yes

☐ ☐ 1. New or increasing pus at a wound, skin, or soft-tissue site

OR

☐ ☐ 2. At least two of the following:

- ☐ Fever of 100°F (38°C) or repeated temperatures of 99°F (37°C)*
- ☐ redness
- ☐ pain
- ☐ warmth
- ☐ swelling that is new or increasing

Nurses: Please check box to indicate whether or not criteria are met

☐ **Nursing home protocol criteria are met.** The resident may have a skin and soft tissue infection and need a prescription for an antibiotic agent.†

☐ **Nursing home protocol criteria are NOT met.** The resident does NOT need an immediate prescription for an antibiotic, but may need additional observation.††

R Request for Physician/NP/PA Orders

Orders were provided by clinician through ☐ Phone ☐ Fax ☐ In Person ☐ Other_____

☐ Assess vital signs, including temp, every _____ hours for _____ hours

☐ Notify Physician/NP/PA if symptoms worsen or if unresolved in _____ hours

☐ For discomfort or prior to cleaning/dressing changes, consider using acetaminophen or other pain reliever as needed

☐ Initiate the following antibiotic

Antibiotic 1 _____ Dose _____ Route _____ Duration _____

Antibiotic 2 _____ Dose _____ Route _____ Duration _____

☐ No ☐ Yes Pharmacist to adjust for renal function

Other _____

Physician/NP/PA signature _____ Date/Time _____

Telephone order received by _____ Date/Time _____

Family/POA notified (name) _____ Date/Time _____

* For residents that regularly run a lower temperature, use a temperature of 2°F (1°C) above the baseline as a definition of a fever.
† This is according to our understanding of best practices and our facility protocols.
†† This is according to our understanding of best practices and our facility protocols. The information is insufficient to indicate an active skin or soft tissue infection.