Promoting Antibiotic Stewardship for UTIs in Skilled Nursing Facilities

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Abstract

Urinary tract infections (UTIs) can be hard to diagnose and treat in the resident who lives in a long-term care facility. Residents often do not have typical UTI symptoms, such as burning with urination or urinary hesitancy. UTIs can often mimic other conditions such as worsening dementia or even other infections, such as pneumonia. Asymptomatic bacteriuria without infection further complicates accurate diagnosis and can lead to unnecessary culture and use of antibiotics in this population. Appropriate nursing assessment of residents for possible UTI is key in order to communicate to providers to ensure the appropriate diagnosis is made and treatment can be started if indicated. This is due to the fact that UTIs carry a high risk of morbidity and mortality in this population. The purpose of this evidence-based quality improvement project was to determine the effects an antibiotic stewardship program in selected long-term care facilities utilizing the Loeb Criteria through an SBAR communication tool on the number of urine cultures and nursing knowledge and attitudes on UTIs and the Loeb Criteria. There was a statistically significant positive change between the pre- and post-test scores for nursing knowledge immediately following the educational intervention, however, this change in knowledge did not continue at six weeks post-intervention. Urine cultures were reduced by twenty-seven percent after the intervention; however, this was not statistically significant.

Introduction & Background

According to the Centers for Disease Control (CDC), there were over 1.3 million residents living in long-term care facilities (LTCFs) in the United States (U.S.) in 2015 (CDC, 2019). Urinary tract infections (UTIs) are the most common infection in this population (Haaijman et al., 2018; Healthy People 2030, 2021; Simmering et al., 2017). Reports vary, but the "prevalence of UTIs range from 0.6% to 21.8% and incidence between 0.3 and 0.8 cases per 1000 residence days" (Genao & Buhr, 2012). Older adults who develop these infections are at a high risk for morbidity and mortality as these infections can lead to bacteremia and sepsis (Healthy People 2030, 2021). The mortality rate of UTIs in LTCFs is 15 percent (Genao & Buhr, 2012) as compared to 2.3 percent in the general population (CDC, 2019).

A "urinary tract infection" is defined as an infection caused by bacteria that enters and infects the urinary tract, which can include the urethra (urethritis), bladder (cystitis), or kidneys (pyelonephritis) (CDC, 2021). These infections can lead to sepsis, bacteremia, and even death (CDC, 2021). UTIs are caused by gram-negative and gram-positive bacteria as well as fungi; UTIs are most commonly caused by the bacteria *Escherichia coli* (Flores-Mireles et al., 2015). In a typical adult, a UTI may present with dysuria or burning with urinating, increased urinary urgency and frequency, as well as urinary hesitancy.

The older adult may not exhibit the typical signs of UTI. The adult over age sixty-five is more likely to exhibit confusion, hematuria or blood in the urine, changes in mental status and low oxygen saturation levels (CDC, 2021). Given that older adults have more atypical symptoms for UTI, they can be harder to diagnose and treat. The symptoms they do have for a UTI can often mimic other infections such as pneumonia or worsening dementia and, therefore, the CDC recommends that LTCFs utilize antibiotic stewardship programs and employ one of many

diagnostic criteria before a urine culture is even obtained for evaluation in an effort to reduce the overuse of antibiotics (CDC, 2021).

There are other complicating factors in treating the older adult population as well. The men and women who reside in LTCFs are often frail and elderly with other comorbidities that place them at higher risk for UTIs, such as urinary incontinence, fecal incontinence, post-menopause status in women, enlarged prostate in men, diabetes, or the use of an indwelling urinary catheter (CDC, 2021). The occurrence of asymptomatic bacteriuria is also higher in older adults who reside in LTCFs (Nicolle, 2016). "Asymptomatic bacteriuria" occurs when bacteria is present in the urine, but the individual has no symptoms of a UTI (Colgan et al., 2006). Individuals with chronic indwelling catheters (CICs) always develop bacteriuria, which can complicate urine cultures' results (Nicolle, 2016). This is due to a biofilm that is formed on CICs that entrap bacteria and allow them to replicate (Genao & Buhr, 2012). It is important that LTCF providers further assess the older patient with a UTI criteria before culturing their urine to better differentiate between asymptomatic bacteria and a true UTI (Colgan et al., 2006).

The Infectious Disease Society of America (IDSA) specifically tells healthcare providers that it is not appropriate to perform screening urine cultures and treat elderly patients living in LTCFs who often experience asymptomatic bacteriuria (Haley & Fritz, 2019; Dellit et al., 2007). The American Geriatric Society (AGS) also advises healthcare providers not to treat older adult patients with antibiotics unless symptoms are present for UTI in addition to having a positive urine culture (Haley & Fritz, 2019). The CDC, through the National Healthcare Safety Network (NHSN), has helped LTCFs by publishing protocols and evidence-based practice guidelines for how to evaluate, diagnose and treat UTIs. Despite all this, the overuse of antibiotics for the

treatment of UTIs in LTCFs is a well-known and well-documented problem (Haaijman et al., 2018; Jump et al., 2018; NHSN, 2021; Nicolle, 2016).

Such overuse of antibiotics also comes with significant risks in the long-term care setting, including drug reactions, increased risk of resistant organisms, and secondary infections due to disruptions in the normal flora. Antibiotics can cause reactions in residents from mild skin rashes, upset stomach, short-term diarrhea, fungal infections such as vaginal yeast infections or thrush, and even allergic reactions, such as anaphylaxis (CDC, 2021).

The overuse of antibiotics can lead to antimicrobial resistance and the creation of multi-drug resistant organisms in LTCFs and the data show that there is an increasing number of UTIs being caused by antimicrobial-resistant pathogens in the setting (Backus, 2015). For example, *E. coli* and *K. pneumonia*, both common UTI bacteria, have now developed extended-spectrum β-lactamases (ESBLs) that have resistance to many common antibiotics such as third generation cephalosporins, sulfonamides and fluroquinolones (Flores-Mireles et al., 2015). Other UTI causing bacteria are developing resistance as well and antibiotic resistance within the LTCFs has significantly increased over the last ten years (Genao & Buhr, 2012). This makes UTIs caused by these resistant bacteria harder to treat and the problem will continue to get worse due to the increasing rate of inappropriate use of antimicrobial therapies (Genao & Buhr, 2012; Flores-Mireles et al., 2015).

An additional risk is the misuse and overuse of certain antibiotics is that they can cause *Clostridium difficile (C. diff)*, a drug-resistant bacterium that causes diarrhea and can easily spread from one resident to another in a LTCF (Jump et al., 2018). The residents in LTCFs are more susceptible to *C. diff* infections (CDI) due to old age, comorbid medical conditions that impair immune response, frequent hospitalizations, and frequent exposure to antibiotic therapies

(Yu et al., 2016). The rates of CDI are increasing in LTCFs and mortality rates are significant and range from six to thirty percent (Jump et al., 2018; Yu et al., 2016; Hota et al., 2012).

In response to these problems, research shows that comprehensive antibiotic stewardship programs that utilize UTI diagnostic criteria within LTCFs have been shown to significantly reduce the use of antibiotics, reduce rates of CDIs and multidrug-resistant bacteria as well as reduce costs (Jump et al., 2018; Nace et al., 2020). However, nurses are often not aware of the antibiotic stewardship programs within their facilities and additional education is urgently needed in addition to ensuring nursing buy-in (Backus, 2015; Haaijman et al., 2018; Nicolle, 2016).

The purpose of this evidence-based quality improvement (EBQI) scholarly practice project is to promote an antibiotic stewardship program in selected LTCFs to reduce the number of urine cultures and the overuse of antibiotics. Specifically, the project team will assist in educating nursing staff on appropriate assessment, documentation, and communication of possible UTIs and use of evidence-based approaches for urinary health in residents of LTCFs. The DNP student will spearhead the efforts to educate nurses on the evidence-based tool via a systematic approach and will serve as a champion to nursing staff as they implement the tool into clinical practice.

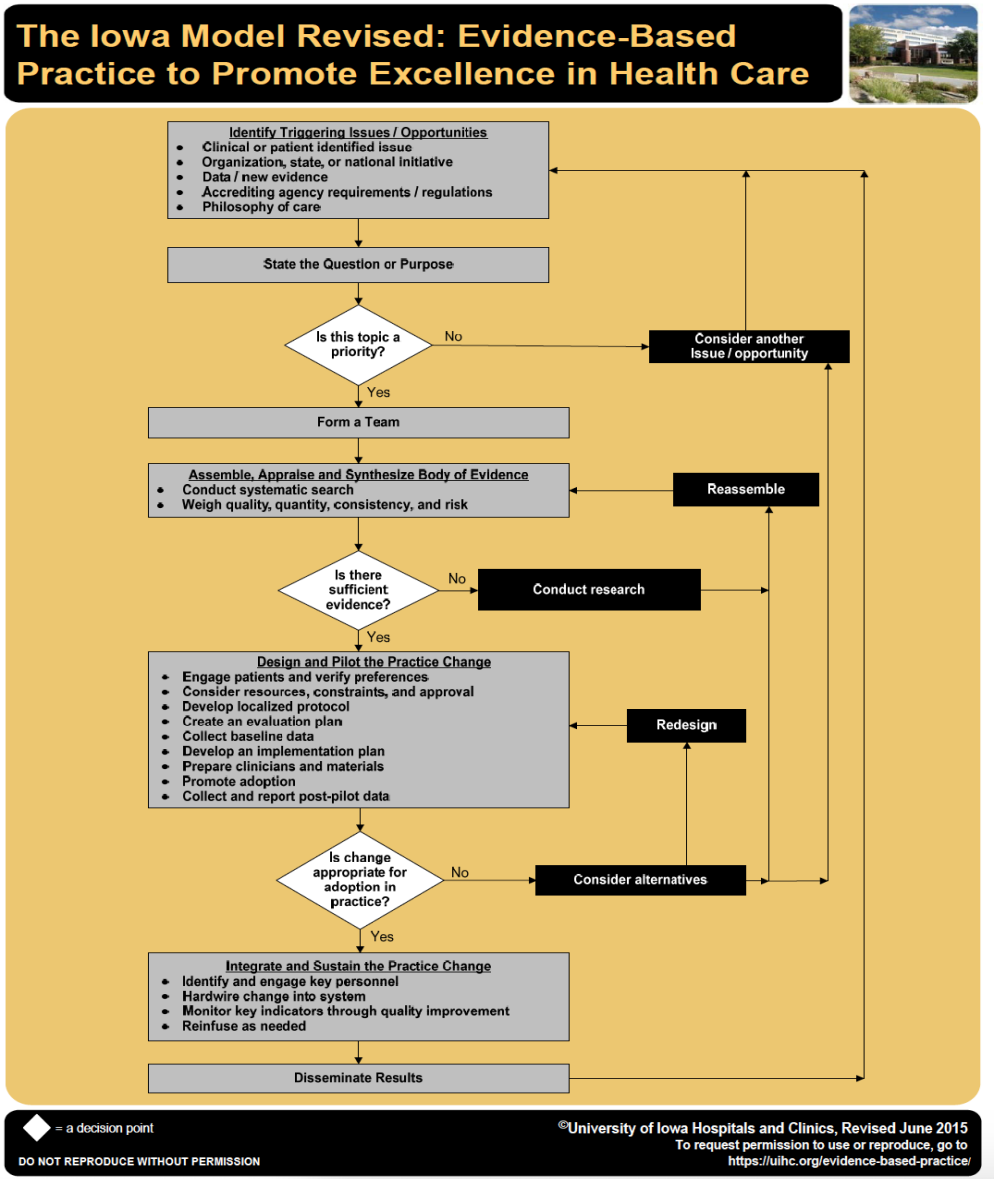
Review of the Literature

Conceptual Model for Evidence-Based Practice

This evidence-based quality improvement (EBQI) project utilized the Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care© (Iowa Model) as a conceptual framework (See Figure 1). The Iowa Model is a multiphasic model that provides guidance in making changes to a clinical practice with feedback loops in order to facilitate process improvement. The model was originally developed by nurses at the University of Iowa and it is one of the most common EBP tools used today in the US (Duff et al., 2020). This model was chosen for its' "applicability and ease of use" by healthcare teams (Melnyk & Fineout-Overholt, 2019, p. 389). Permission to reproduce the model was given by University of Iowa Hospitals and Clinics (see Appendix A).

Figure 1.

The Iowa Model



Note. The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care. Iowa Model Collaborative. (2017). Iowa model of evidence-based practice: Revisions and validation. *Worldviews on Evidence-Based Nursing, 14(3), 175-182. doi:10.1111/wvn.12223.* Reprinted with permission from the University of Iowa Hospitals and Clinics.

Purpose and Clinical Question

UTIs are the number one infection seen in LTCFs and are associated with a high risk of morbidity and mortality (CDC, 2021). Overuse of antibiotics within these facilities to treat UTIs increases the risk of microbial-resistant bacteria (Backus, 2015). Given that antibiotic stewardship programs are strongly recommended through the CDC, IDAS, and GMA, an opportunity exists to implement an EQBI project to improve clinical outcomes and nursing knowledge.

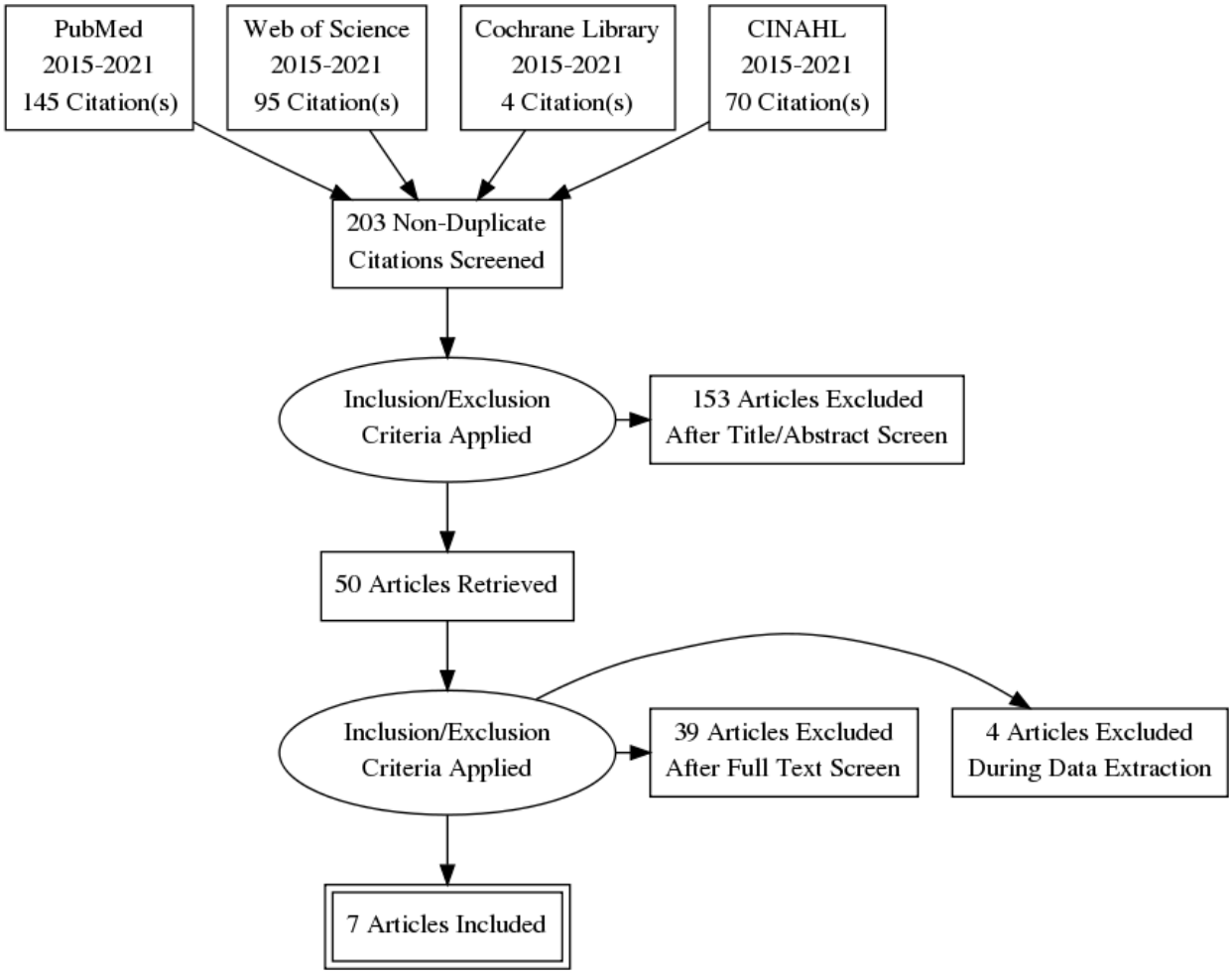
The purpose of this evidence-based review of the literature and project proposal is to answer the practice question: "What is the effect of a formal antibiotic stewardship program on the number of urine cultures and antibiotic prescriptions in LTCFs?"

Assemble, Appraise, and Synthesize Body of Evidence

This systematic literature review examined the literature between January 2016 and April 2021 to determine existing antibiotic stewardship programs for the management of UTIs in LTCFs. A Masters-prepared health sciences librarian was consulted to ensure accuracy and fidelity to the search process. Four databases were searched: PubMed, Web of Science, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and Cochrane Library. PubMed was the primary database and articles were compared against other database search results in order to remove duplicate research articles. Figure 2 shows the PRISMA diagram to illustrate the systematic approach to the literature search.

Figure 2.

PRISMA Flow Diagram



Note. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow diagram to illustrate the literature search process.

PubMed was initially searched with the key-words of "skilled nursing facility," "urinary tract infection," and "criteria," which resulted in eleven articles. In order to ensure that all applicable articles were being located through the database search, keywords and Boolean operators were used to create the following string search: ((skilled nursing facility OR nursing home OR long-term care) AND (urine culture OR urinary tract infection)) AND (criteria OR protocol). This search revealed one hundred forty-five articles for review from PubMed. The Web of Science search consisted of the same string search, and this revealed ninety-five articles. CINAHL was searched with the same string search resulting in seventy-four articles for review. Lastly, the Cochrane Library was searched with the same string search and produced four articles for review. Filters were used in all searches to limit articles to the English language, within a span of the last five years, and text full articles were organized using reference management software. Duplicates were removed. This resulted in two hundred and three articles for further review.

A title and abstract review was performed on all two hundred and three articles after duplicates were removed. Inclusion criteria included articles written in English and studies conducted in the United States. Studies were excluded if it did not relate to implementing a diagnosis criteria or protocol for when to culture urine, it did not discuss antibiotic stewardship programs as it relates to reducing the number of urine cultures in LTCFs or the number of antibiotics being prescribed in the SNFs, and if they were outside the established date range of the last five years. After applying inclusion and exclusion criteria, fifty articles remained.

A full-text review was performed on the final fifty articles. Reasons for exclusion included articles related to SNF patients diagnosed with dementia only (n = 10), articles that focused on the treatment of candiduria (n = 1), consensus statements from conferences (n = 4),

articles focused only on CAUTI rates as an outcome (n = 3), articles found to have been produced outside of the United States (n = 9), and articles found to be written on other bacterial infections or infectious diseases (n = 4). Finally, some articles were found to be literature reviews only (n = 8), or were found to be outside of the date range of the original search (n = 2). A total of seven research articles were retained for the final analysis of the PICOT question.

Appraisal and Synthesis

A total of 203 articles were reviewed. Seven of these articles were found to answer the PICOT question. Three systematic reviews, two quasi-experiments, one quality improvement study and one consensus statement were included in this review. The literature review supports the utilization of an antibiotic stewardship program and UTI diagnostic criteria to reduce the number of antibiotics being utilized in LTCFs. With this data, an EBQI project can be implemented and evaluated for determining clinical effectiveness of an antibiotic stewardship program in LTCFs.

A comprehensive evaluation of seven articles was performed utilizing the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) worksheets to determine the evidence levels of the articles' claims (Dang & Dearholt, 2018) with copyright permission granted by the Institute for Johns Hopkins Nursing (see Table 1 and Appendix B). The final evidence sources retained for analysis are presented in Table 2.

Table 1

Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Level of Evidence and Quality

Evidence Levels	Quality Ratings
Level I Experimental study, randomized controlled trial (RCT) Explanatory mixed method design that includes only a level I quaNtitative study Systematic review of RCTs, with or without meta-analysis	**QuaNtitative Studies** **A High quality**: Consistent, generalizable results; sufficient sample size for the study design; adequate control; definitive conclusions; consistent recommendations based on comprehensive literature review that includes thorough reference to scientific evidence. **B Good quality**: Reasonably consistent results; sufficient sample size for the study design; some control, fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence. **C Low quality or major flaws**: Little evidence with inconsistent results; insufficient sample size for the study design; conclusions cannot be drawn.
Level II Quasi-experimental study Explanatory mixed method design that includes only a level II quaNtitative study Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis	**QuaLitative Studies** No commonly agreed-on principles exist for judging the quality of quaLitative studies. It is a subjective process based on the extent to which study data contributes to synthesis and how much information is known about the researchers' efforts to meet the appraisal criteria. *For meta-synthesis, there is preliminary agreement that quality assessments of individual studies should be made before synthesis to screen out poor-quality studies*[1]. **A/B High/Good quality** is used for single studies and meta-syntheses[2]. The report discusses efforts to enhance or evaluate the quality of the data and the overall inquiry in sufficient detail; and it describes the specific techniques used to enhance the quality of the inquiry. Evidence of some or all of the following is found in the report: • Transparency: Describes how information was documented to justify decisions, how data were reviewed by others, and how themes and categories were formulated. • Diligence: Reads and rereads data to check interpretations; seeks opportunity to find multiple sources to corroborate evidence. • Verification: The process of checking, confirming, and ensuring methodologic coherence. • Self-reflection and scrutiny: Being continuously aware of how a researcher's experiences, background, or prejudices might shape and bias analysis and interpretations. • Participant-driven inquiry: Participants shape the scope and breadth of questions; analysis and interpretation give voice to those who participated. • Insightful interpretation: Data and knowledge are linked in meaningful ways to relevant literature. **C Low quality** studies contribute little to the overall review of findings and have few, if any, of the features listed for high/good quality.
Level III Nonexperimental study Systematic review of a combination of RCTs, quasi-experimental and nonexperimental studies, or nonexperimental studies only, with or without meta-analysis Exploratory, convergent, or multiphasic mixed methods studies Explanatory mixed method design that includes only a level III quaNtitative study QuaLitative study Meta-synthesis	

Note. Level I-III, Dang, D., & Dearholt, S. (2017). *Johns Hopkins nursing evidence-based practice: model and guidelines.* 3rd ed. Indianapolis, IN: Sigma Theta Tau International. Reprinted with permission by the Institute for Johns Hopkins Nursing.

Table 2

Summary of Literature Review

Study Reference (Author, Year)	Design	Subjects and Setting and Data Collection Period	Intervention, Control/Comparison	Study Outcomes	Level of Evidence and Quality Grade (Johns Hopkins)	Limitations
Ashraf, et al. (2019)	Consensus statement	Consensus Statement from the AMDA- The Society of Post-Acute and Long-Term Care Settings	Not applicable	Recommend utilization of an antibiotic stewardship program in LTCFs to reduce the use of antibiotics	IV	Consensus Statement
Doernber, et al. (2015)	Prospective quasi-experiment with pre and post design	LTCF residents in three facilities in Northern California from April 2011-October 2012	Intervention was implementation of the antibiotic stewardship team utilizing Loeb's Criteria Control was usual treatment.	Immediate 26% decrease in antibiotics prescribed for UTI and 6% reduction continuing through the intervention period	II – B	Missed opportunity for intervention at two of the three facilities, low acceptance rate of providers/admin/nurses; study power was low; utilization of a clinical pharmacist which not all LTCFs have access to
Felsen, et al. (2020)	Quasi-experiment with pre and post-test design	Six LTCFs in Monroe County, NY	Intervention included implementation of the CDC Core recommendations for antibiotic stewardship programs Control was usual treatment.	Across all LTCFs, abx usage dropped by 9%, high risk abx use dropped by 39% in the post-intervention time frame; this study showed that high-risk abx continued to decline for 45 months after the intervention which showed sustainability of the intervention	II – A	Not all LTFCs utilized an in-house pharmacy and obtaining outside pharmacy data was difficult.
Meddings, et al (2017)	Systematic literature review	5794 records were reviewed through June 2015 and a total of 20 were kept for the final review			II – A	The studies were not able to be pooled as they were too varied in intervention and outcome.

Study Reference (Author, Year)	Design	Subjects and Setting and Data Collection Period	Intervention, Control/Comparison	Study Outcomes	Level of Evidence and Quality Grade (Johns Hopkins)	Limitations
Nace, et al. (2020)	Quality Improvement	LTCFs randomized into two groups N=25, convenience sample	Intervention included webinar and educational pocket card, tools for system change, monthly web-based calls. Control group was usual care.	Overall abx prescribing was reduced by 17% for any UTI or possible UTI, in the intervention sites. Study suggests that low-intensity, multifaceted interventions was associated with improved abx prescribing for UTIs/uncomplicated cystitis without an adverse association with other safety outcome	V - C	Quality improvement studies are hard to reproduce. The intervention facilities had higher number of prescribers and higher turn over of staff. The facilities were not blinded. They had to rely on self-report thus is affected by recall bias.
Raban, et al. (2020)	Systematic Review and meta-analysis	7006 articles were reviewed and 19 were kept for the final review		Insufficient evidence that interventions employed to date are effective in improving abx use in LTCFs.	II – C	Limitation: insufficient RTCs in the analysis; majority of studies were found to have high risk of bias; only 3 databases were searched.
Wu, et al. (2020)	Systematic Review	1614 articles were reviewed from January 2008-December 2018 and 4 were kept for the final review		The effectiveness of nurse-led interventions for reduction of UTI and reducing abx usage is unable to be determined	III – C	Only 4 studies were found to meet the inclusion criteria for review

Levels of Evidence

The articles retained for review were rated to be Evidence Level II-A to Level V. Two articles were found to be Level II-A evidence. One of these Level II-A evidence articles was a systematic review that only looked at research articles that were interventional studies that had a comparison group and reported at least one outcome for UTIs in the LTCFs (Meddings, et al, 2017). This was a robust systematic review that searched five databases. The other Level II-A article was a quasi-experimental study utilizing a pre-test, post-test evaluation once the researchers implemented their comprehensive antibiotic stewardship program involving administration, staff, providers, residents, and families (Felsen, et al. 2020).

The Level II-B article was a prospective quasi-experiment utilizing a pre- and post-intervention assessment of the use of antibiotics (Doernber, et al, 2015). Three articles were determined to be C-Level quality and were thus excluded from analysis and synthesis in accordance with JHNEBP methodology. The first of these was Level V evidence because it was a quality improvement study (Nace, et al 2020). The other two articles in this group were both systematic reviews analyzing both controlled and uncontrolled studies. They were deemed evidence insufficient and were ranked Level II-C (Raban et al, 2020) and Level III-C (Wu, et al, 2020). The final article in the review was a consensus statement and, therefore, Level IV evidence per the JHNEBP worksheets (Ashraf, et al, 2019).

Systematic Reviews

Although systematic reviews are typically defined as a high level of evidence, within this literature search only one of the systematic reviews was found to be Level II-A. The systematic review by Meddings, et al (2017) examined a review of studies featuring interventions of UTI prevention strategies ranging from improving the use of indwelling catheters, infection

prevention, and improvements to antibiotic usage. Meddings, et al found that several practices they reviewed appeared to reduce UTIs and CAUTIs in LTCFs (2017). This included greater antibiotic stewardship programs that included hand-hygiene, increasing oral fluid intake, treating urinary incontinence, vaginal hormone replacement therapy in female residents, and reducing the use of indwelling catheters. They did not find cranberry supplementation or the use of other vitamin/mineral supplements to reduce the risk of UTI. The study searched five databases and reviewed 5,794 articles but was limited by the fact that researchers could not pool the studies for review due to the variety of interventions and outcome measures thus precluding a meta-analysis. Of the final 20 articles they reviewed, only two of the studies mentioned specifically utilizing McGeer Criteria for diagnosing UTIs. The other studies mentioned using a "standardized UTI diagnosis" but not did not define this further.

The systematic review and meta-analysis done by Raban et al. (2020) studied the evidence of the effectiveness of interventions that were designed to reduce the use of antibiotics for UTIs and/or reduce the inappropriate use of antibiotics in LTCFs. A strength of this systematic review was that it analyzed 7,006 articles. However, the review was limited by using only three databases. Another limitation was the review focused on an insufficient number of randomized control trials and a majority of the studies were found to have a high risk of bias due to a lack of randomization. The vast majority of the studies they reviewed included some form of education strategy utilizing clinical practice guidelines targeted at healthcare workers to include nurses and clinicians. Of the nineteen total studies reviewed, fifteen utilized clinical guidelines for UTI diagnosing but did not specify which guidelines were used. The researchers found that the interventions being used to date are generally ineffective in reducing the use of antibiotics in LTCFs.

The last systematic review was completed by Wu et al. (2020) in an effort to determine the effectiveness of nurse-led interventions for the prevention of UTIs in LTCFs. This study reviewed a total of one thousand six hundred fourteen articles but only retained four articles for its final review. A strength of this study was it incorporated the work of all four authors to review the articles and utilized eight different databases. The final recommendation of this systematic review was that the effectiveness of nurse-led interventions for reducing UTIs and antibiotic usage could not be determined as only four studies met the inclusion criteria and were fully evaluated. One of the four studies mentioned they utilized the McGeer criteria and the other three studies did not mention the diagnostic criteria used.

Quasi-Experimental Studies

Two quasi-experiments were reviewed for this study. The first by Felsen, et al. (2020) tried to determine if the implementation of an antibiotic stewardship team within LTCFs would optimize the utilization of antibiotics and reduce the use of high-risk antibiotics. The study utilized a pre- and post-intervention assessment of the change in total days of antibiotic therapy (DOT). The researchers enlisted six nursing homes in Monroe County, New York, and implemented a comprehensive antibiotic stewardship program consisting of leadership commitment, accountability, drug expertise, improvement strategies, tracking and reporting and education of all stakeholders. The team did not utilize a published diagnostic criteria but instead implemented their own guidelines for testing UTIs. Felson et al. found that all six of the LTCFs in the study had an overall reduction of the use of antibiotics and had a significant reduction in the use of high-risk antibiotics. A significant strength of this study is that even forty-five months after the intervention, there was a continued decline in the use of high-risk antibiotics which showed sustainability of outcomes (2020). The study was limited by the fact that it was quality

improvement; they were not able to look at unintended outcomes of the study due to lack of access to data, and the project may not be easily reproducible for other facilities without the same resources.

The second quasi-experiment by Doernber, et al (2015) presents the feasibility and preliminary efficacy of an antibiotic stewardship program targeting UTIs in three LTCFs and reviewed a total of one hundred-forty antibiotic prescriptions for UTI. Within the study, the researchers implemented an antimicrobial team who utilized the Loeb Criteria to further evaluate patients exhibiting possible symptoms of UTI. From there, the researchers examined prescription use and calculated the change in days of antimicrobial therapy. The short-term success of this program was significant with a twenty-six percent drop in antibiotic prescriptions for UTI during the antibiotic stewardship program, but rates were only tracked for fourteen months after the intervention ($P = <0.001$). A limitation included the fact pharmacological data was unavailable at two of the three facilities. The study also utilized a clinical pharmacist for review of the urine cultures and antibiotics prescribed. Not all facilities would have access to this personnel for this type of clinical review. The study team also utilized Infection Control reporting of the antimicrobial prescriptions, and this would be limited by a recall bias. The study mainly used audit and feedback as part of its antibiotic stewardship program and felt that as other studies concluded, educational programs with nurses and providers would likely improve outcomes and buy-in from team members.

Quality Improvement

The one quality improvement study had similar results to the quasi-experimental studies. Nace et al. (2020) sought to determine if a multifaceted antibiotic stewardship quality improvement intervention would reduce the use of antibiotics in non-catheterized residents at

LTCFs. This study took twenty-five LTCFs and divided them into intervention and control groups. This was a convenience sample of LTCFs. The intervention was applied and consisted of webinar education, educational pocket-card, tools for system change within the organization, and monthly web-based calls. The intervention group utilized the Improving Outcomes of UTI Management in LTC Project (IOU) which are published UTI guideline that were developed by a modified Delphi survey of a panel of expert pharmacists and physicians. The control group had usual care, and no changes were made within these facilities. The outcome was the rate of change of the incidence of antibiotic treatment. Overall results showed that antibiotic prescribing was reduced by seventeen percent for UTIs or possible UTIs at all intervention sites. The study reveals that low-intensity, multifaceted interventions can reduce the use of antibiotics for UTI without compromising safety concerns. Limitations for this study include the fact that facilities were not blinded to the study since this could cause performance bias. Some of the facilities in the study had more prescribing providers and greater staff turnover during the intervention time frame and this could have had an impact on outcomes as well. There was more buy-in from the nurses and less from the prescribing providers by evidence of attendance at the monthly web-based calls and this could further impact outcomes.

Consensus Statement

Consensus statements are Level IV research. However, when large respected bodies of national or international authorities come together to make consensus statements or publish guidelines, it is through rigorous systematic review of the literature that decisions are made to publish evidence-based clinical guidelines (Kwong et al., 2016). The consensus statement comes from the AMDA - The Society of Post-Acute and Long-Term Care Medicine (Ashraf, 2019). The workgroup was divided into 5 subgroups to discuss the following topics: scope of the

problem/background, diagnosis, treatment, prevention, and antibiotic stewardship. Aware of the complexities of working with the frail and medically complex residents of LTCFs, the study considered all the evidence through an extensive literature review and made comprehensive recommendations for all LTCFs in the treatment, diagnosis and management of UTIs. Ultimately, their recommendations aligned with other guidelines and recommendations from the CDC, which concluded that there are still gaps in care, the utilization of EBP guidelines for the treatment of UTIs, and the recommendations will improve the safety of the residents, enhance the quality of care, and reduce the risk of multi-drug resistant organisms (Ashraf, 2019).

Publication Bias Check

To address the possibility of publication bias, a search of the grey literature was performed by searching: “long term care facility AND urinary tract infection AND protocol” in Google Scholar, and the first 25 results were reviewed. There was no evidence of publication bias based on the grey literature and findings were consistent with findings in the systematic review.

Summary

The overall strength of the evidence in this literature review is mixed. Although some findings suggest otherwise, ISDA, GAS and the CDC professional guidelines recommend an antibiotic stewardship program as the best evidence for the reduction of inappropriate urine cultures in order to reduce the overuse and misuse of antibiotics in LTCFs to improve resident health outcomes.

Implications for Practice

There are numerous implications for practice to include increasing leadership commitment and buy-in from all staff with an antibiotic stewardship program. Additionally,

there must be accountability standards, tracking and reporting of urine cultures, and evaluation of the records of antibiotic prescriptions. Crucial drug expertise, which can be found in utilizing a clinical pharmacist or infectious disease team members, is vital. There must be an action plan, such as utilization of an SBAR communication by nursing staff to the provider when there is concern for UTI. There must also be continuous education for nurses, prescribers, patients and their families to ensure that all are informed of the antibiotic stewardship program. Utilization of the best evidence-based practice within the antibiotic stewardship program should be an ongoing quality improvement project.

There were significant limitations to this literature review. The original randomized control trials done for UTI diagnostic criteria were done in the 1990s. This search time line was limited, as it was focused on the last five years of data. The number of quality studies being done and published during the last year has certainly been impacted by the COVID-19 pandemic. The idea of antibiotic stewardship in LTCFs is not a new idea, since it is recommended by the CDC. However, to implement these programs in the best way has yet to be determined. There are many models and frameworks for implementation that can and have been utilized for these programs, but each location is different, and resources can vary widely. Ultimately, more RCTs are needed to further assess the best way to utilize antibiotic stewardship programs, but these programs must actually be utilized, and they must be continuous quality improvement projects to follow the best-evidence in order to ensure optimal outcomes for all residents.

This literature review confirms the general medical consensus about the need to include the utilization of an antibiotic stewardship program, including a diagnostic criterion for UTIs for the resident at the LTCFs. Reflecting this fact, the CDC, the IDSA and the AGS all recommend utilization of antibiotic stewardship programs in LTCFs. Nevertheless, and despite all the

theoretical agreement, there is a need to integrate this practice into a clinical custom for improved outcomes of the residents at LTCFs. Therefore, the purpose of this EBQI scholarly practice project is to implement an antibiotic stewardship program to educate nursing staff on appropriate assessment, documentation, and communication of possible UTIs in an effort to reduce the number of urine cultures and thus reduce the overuse of antibiotics.

Project Methods

As previously stated, this EBQI project utilizes the conceptual framework of the Iowa Model to develop the methods for the project. The steps used in the Iowa Model are listed below:

Step 1: Identify triggering issues and opportunities

Step 2: State the question or purpose

Step 3: Form a team

Step 4: Assemble, appraise and synthesize the body of evidence

Step 5: Integrate the design and pilot the practice change

Step 6: Sustain the practice change

Step 7: Disseminate the results

For step 1, refer to the section on the background and significance of the problem. For step 2, as previously stated, the purpose of this project is to evaluate the use of an antibiotic stewardship program to determine its effect on urine cultures in LTCFs. For step 3, the team was already created and developed through the leadership at the LTCFs with representation from other pertinent departments from the hospital. For step 4, refer to the section on the literature review. For step 5, refer to the section on methods below. For step 6, if the pilot is deemed effective, the practice change will be implemented into annual nursing education. For step 7, the results of this scholarly project will be disseminated.

Setting

This project was conducted in Southwest Virginia, in a large health system that operates four LTCFs. Together, these facilities offer short- and long-term care to nearly 500 residents. Currently, these facilities are in the process of implementing their antibiotic stewardship program using the Loeb Minimum Criteria for Initiating Antibiotic Therapy for UTI (See Figure 3). This criterion lists the minimum number of symptoms a resident must have in order to initiate urine culture testing before antibiotic therapies can be prescribed. For a resident without an indwelling catheter, they would need to exhibit either acute dysuria or a fever over 100.0 degrees Fahrenheit and at least one of any of the following symptoms: urgency, frequency, suprapubic pain, gross hematuria, urinary incontinence or costovertebral tenderness. For a resident with an indwelling catheter, they would need to meet only one of the following symptoms: rigors, new-onset delirium, fever over 100.0 degrees Fahrenheit, or new costovertebral tenderness.

Figure 3.

Loeb's Minimum Criteria for Initiating Antibiotic Therapy for UTIs

Loeb's Minimum Criteria for Initiating Antibiotic Therapy **[Facility Logo]**

Patient Name: _____ **MRN:** _____ **Location:** _____

Date of Infection: _____ **Date of Review:** _____ **Reviewed by:** _____

UTI: □ evaluated □ criteria met **LRTI:** □ evaluated □ criteria met **SSTI:** □ evaluated □ criteria met **FUO:** □ evaluated □ criteria met

Suspected Infection Syndrome	Minimum Criteria for Starting Antibiotic Therapy
Urinary tract infection *without catheter*	Either one of the following criteria □ Acute dysuria, OR □ Temp >37.9 °C (100 °F) or 1.5 °C (2.4 °F) above baseline, AND ≥1 of the following new or worsening symptoms □ Urgency □ Frequency □ Suprapubic pain □ Gross hematuria □ Urinary incontinence □ Costovertebral angle tenderness
with catheter	At least one of the following criteria □ Rigors □ Temp >37.9 °C (100 °F) or 1.5 °C (2.4 °F) above baseline □ New onset delirium □ New costovertebral angle tenderness
Note: *Residents with intermittent catheterization or condom catheter should be categorized as 'without catheter'* *Urine culture should be sent prior to starting antibiotics* *Antibiotics should not be started for cloudy or foul smelling urine*	

Note. The Loeb's Criteria. (Loeb, et al, 2001)

The long-term goal would be to reduce the overuse and misuse of antibiotic drugs. To date, education on the new antibiotic stewardship program has only been partially initiated and more education is needed for nurses and providers. No formal nursing education or training has been done with the antibiotic stewardship program to date. A retrospective chart review was performed by the quality director and this indicated that many urine cultures done in the last calendar year at our LTCFs, did not meet the Loeb Criteria. This is important since inappropriate use of urine cultures impacts reporting to the CDC and the nursing homes' quality ratings as well as the overuse of antibiotics.

Permission was obtained to perform this EBQI project as part of the antibiotic stewardship program implementation in the fall of 2021. The project was completed with guidance and support from the project lead's faculty advisor, the facility advisor on-site and the quality director for the LTCFs.

Project Team

The four LTCFs and this quality metric were being managed by the antibiotic stewardship team. The project team set the groundwork for the implementation of the new policies and procedures as they relate to UTIs in LTCFs. This team included the quality director for the LTCFs, infectious disease physicians, clinical pharmacists, on-site clinicians, nursing staff, and administrators (Table 3). The implementation of the new policies and procedures has been in process for the last year. The antibiotic stewardship team already started work on the foundational contents of this project. The team already decided to use the Loeb Criteria for the assessment of residents as part of the antibiotic stewardship program. As seen in Figure 3, The Loeb Criteria was modified into an SBAR communication tool so the nursing team could appropriately and concisely communicate with the providers about their assessment findings.

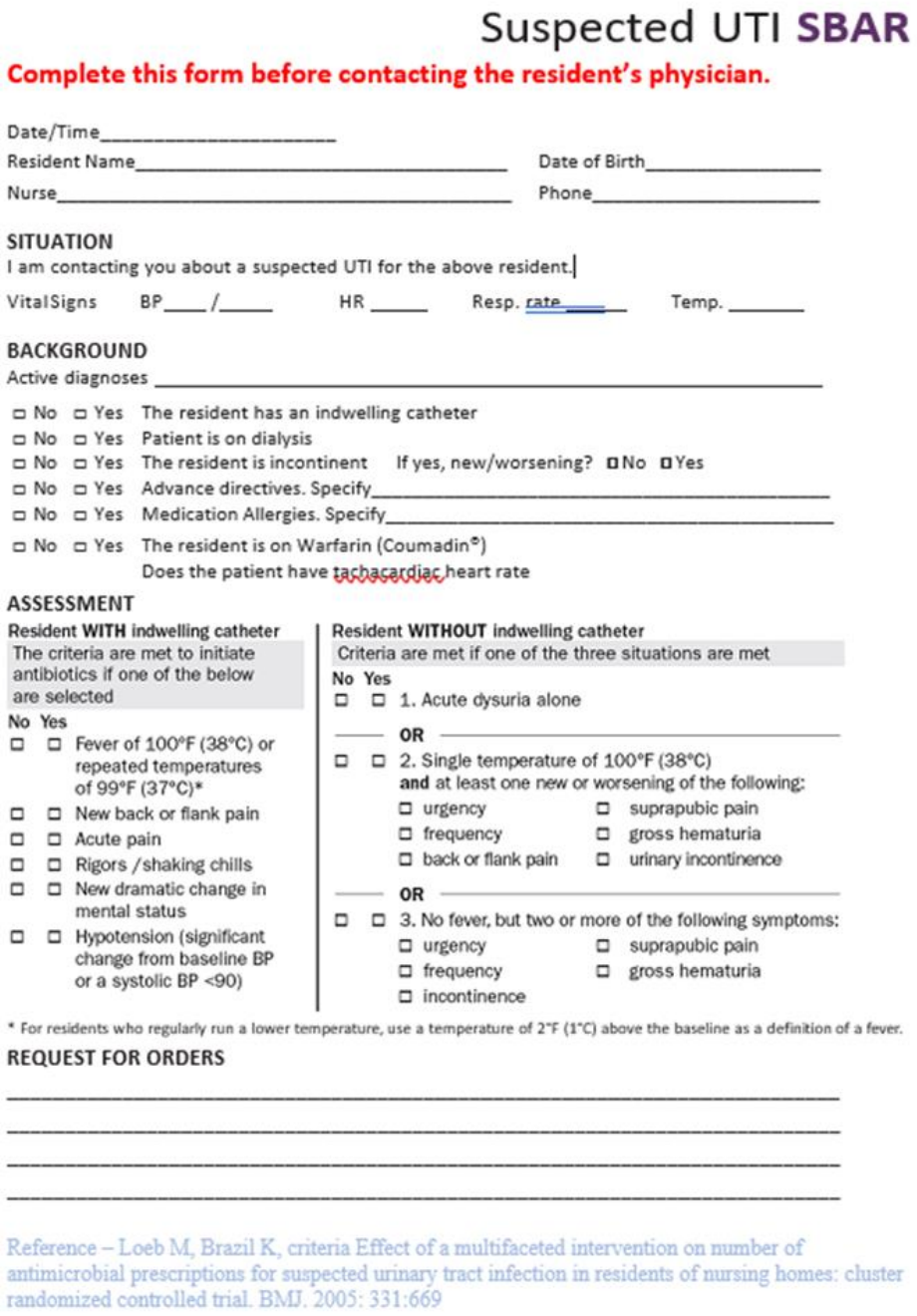
Table 3

List of team members on Antibiotic Stewardship Committee

Title	Committee
Quality Director for Long-Term Care Facilities	Project team lead
Clinical Pharmacist	Clinical pharmacy representation
Infectious Disease Physician	Infectious Disease representation
DNP Student/Urology Nurse Practitioner	Nursing Education/Urology representation
Lead Advanced Practice Provider for the Long-Term Care Facilities	Provider representation
Director of Nursing from each Long-Term Care Facility	Nursing Leadership representation

Figure 3.

SBAR Communication Tool



Suspected UTI **SBAR**

Complete this form before contacting the resident's physician.

Date/Time_____

Resident Name_____ Date of Birth_____

Nurse_____ Phone_____

SITUATION

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

VitalSigns BP____/____ HR _____ Resp. rate____ Temp. _____

BACKGROUND

Active diagnoses _____

☐ 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. Specify_____
☐ No ☐ Yes Medication Allergies. Specify_____
☐ No ☐ Yes The resident is on Warfarin (Coumadin®)
Does the patient have tachacardiac heart rate

ASSESSMENT

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 ☐ suprapubic pain
☐ frequency ☐ gross hematuria
☐ back or flank pain ☐ urinary incontinence

OR

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

* For residents who regularly run a lower temperature, use a temperature of 2°F (1°C) above the baseline as a definition of a fever.

REQUEST FOR ORDERS

_____
_____
_____
_____

Reference – Loeb M, Brazil K, criteria Effect of a multifaceted intervention on number of antimicrobial prescriptions for suspected urinary tract infection in residents of nursing homes: cluster randomized controlled trial. BMJ. 2005: 331:669

Procedures

The EBQI project included all four LTCFs for the organization in the fall of 2021. The project team met on a quarterly schedule to review urine culture data from all facilities. The project champion led the efforts to advance the integration of the Loeb Criteria into practice through the SBAR tool. The project champion conducted a baseline learning needs assessment (pre-test) (See Table 4) of nursing staff to identify current practices and attitudes about UTIs. The educational efforts included: flyers and emails reinforcing the use of Loeb Criteria and SBAR tool and formal educational sessions for nursing staff. Nursing staff was recruited from all four LTCFs and educational sessions were offered during all working shifts to ensure that all would have an opportunity to participate. A post-test immediately following the intervention was conducted with nursing to determine changes in knowledge, attitudes, and satisfaction (See Table 4). In addition, urine culture numbers were reviewed post-intervention to assess for a reduction in urine cultures being performed. The pre-intervention urine culture data were already compiled for 2020 and used for comparison.

Table 4

Pre-test post-test utilized to assess nursing staff

Question 1. The Loeb Criteria is used as an assessment tool to assess when nursing home residents may have a UTI. **TRUE OR FALSE**
Question 2. The Loeb Criteria has different assessments for individuals with and without indwelling foley catheters. **TRUE OR FALSE**
Question 3. The Loeb Criteria says antibiotics should be started for cloudy or malodorous urine. **TRUE OR FALSE**
Question 4. The Loeb Criteria says antibiotics should be started after a urine culture has been obtained. **TRUE OR FALSE**
Question 5. I know where and how to access the Centra Laboratory policy on urine culture collection. **TRUE OR FALSE**
Question 6. Pick 3 risks of the overuse of antibiotics. a. increased risk of C. Diff infections b. increased B12 levels c. increased risk of drug reactions d. increased risk of multi-drug resistant bacteria e. increased risk of falls f. decreased risk of falls
Question 7. What is the correct way to take a urine sample from a patient with an indwelling foley catheter? a. Take urine from urine collection bag to send for sample b. Use syringe to collect urine from tubing c. Change foley and take sample from new foley tube if catheter has been in more than 7 days
Question 8. How would you rate the ease of use of the SBAR tool currently being used? 1. Very Good 2. Good. 3. Acceptable 4. Poor 5. Very Poor
Question 9. How would you rate the accuracy of using the SBAR tool to help with correct diagnosing of UTIs? 1. Very Good 2. Good 3. Acceptable 4. Poor 5. Very Poor
Question 10. If using the SBAR tool, how would you rate your overall satisfaction with utilizing the SBAR tool? 1. Very Good 2. Good 3. Acceptable 4. Poor 5. Very Poor 6. Not applicable

Data Collected

Demographic data was collected on all of the nursing staff who participated, including current nursing certification, number of years in nursing, number of years working in healthcare, number of years working in current role, and shift currently working. The participants were also assessed on their knowledge, attitudes, satisfaction and current usage of the SBAR tool and Loeb Criteria. This was done utilizing a pre-test and post-test questionnaire (see Table 4) that assessed for general knowledge, attitudes, and satisfaction utilizing a paper questionnaire before and after the intervention. The post-test was performed again at six weeks utilizing Qualtrics.

Urine culture data was reported for all four facilities and evaluated by the project team. Evaluation for each culture was done to ensure that the SBAR tool was utilized and the Loeb Criteria was met. The SBAR tools were to be turned in to the Director of Nursing at the facility each time it was utilized and it was reviewed in morning huddle with the care team. Urine culture results and testing frequency were reviewed starting two weeks after the completion of the nursing education to compare to the same twelve weeks the year prior to determine if there are changes in total numbers of cultures being performed and to determine if there are trends in the data. This included urine culture data from October, November, and December 2020 compared to the same months in 2021 to determine if there was a statically significant change.

Protection of Human Subjects

The University of Virginia (UVA) Internal Review Board (IRB) approval was obtained prior to initiating the DNP scholarly project. All patient urine culture data was protected by the Health Insurance Portability and Accountability Act of 1996 (HIPAA) which, among other guarantees, protects the privacy of patients' health information (Modifications to the HIPAA Privacy, Security, Enforcement, and Breach Notification Rules, 2013). All information collected

as part of evaluating the impact of this project was presented as aggregated data and did not include any potential resident identifiers. See Addendum C and D.

Data management security plan

All individual and institutional data were stored on the secure, cloud service UVA Box. These data were only accessed by research team members for this project. Data were de-identified prior to being saved.

Integrate and Sustain the Practice Change

This project is a high priority for the LTCFs antibiotic stewardship program. If the outcomes of this project's nursing interventions prove to be positive, the interventions will continue to be implemented as part of the annual competency education for the nursing staff at all four LTCFs in an effort to continue with sustainable EBP and quality improvement. The annual competency education for all nurses at the LTCFS for the facilities is managed through the professional development department. They will ensure that the antibiotic stewardship education is included in the competency database and reviewed annually by all nurses.

The Quality Director for all of the LTCFs will continue to be the local stakeholder who will continue to audit urine culture data for compliance and adherence to the SBAR communication tool using the Loeb Criteria. These data will be compiled and quarterly reports made for the utilization of the SBAR communication tool and whether or not this matches the number of urine cultures being sent to the lab to determine if the tool is being used. These data will continue to be presented at the quarterly antibiotic stewardship meetings.

Disseminate Results

Program information, project findings, and recommendations for sustainability were presented to the antibiotic stewardship team at the practice site. The project was completed,

reviewed, and published in the University of Virginia's Libra database and submitted to the University of Virginia School of Nursing as part of the requirements for completion of the Doctor of Nursing Practice program. A manuscript presenting study findings will be submitted to the *Urologic Nursing,* the official journal of the Society of Urologic Nurses and Associates (SUNA).

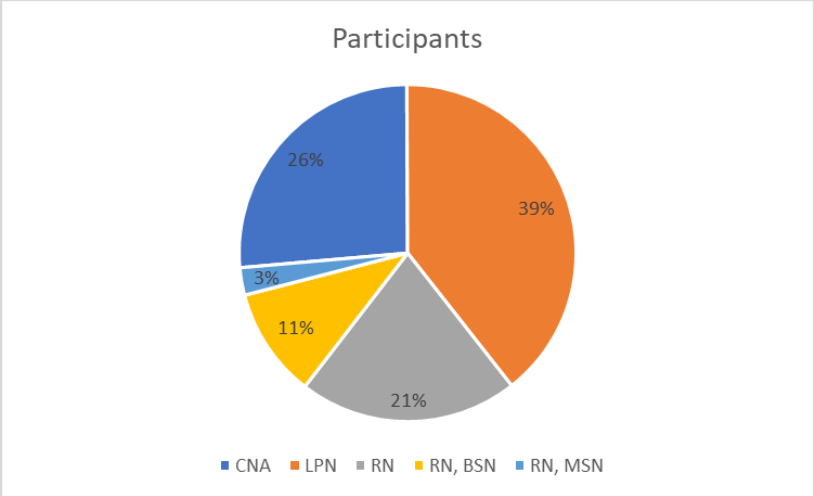
Results

All data were analyzed using the statistical software IBM SPSS version 28 and validated by the academic statistics support at the university. Descriptive statistics were calculated to illustrate the demographics of the study participants. The individual and aggregate data collected with the pre-test and post-test assessment were assessed for changes in knowledge, attitudes, satisfaction, and utilization of the SBAR tool.

There was a total of thirty-nine LTC staff members who took part in this scholarly project. The majority of the participants (39%) were licensed practical nurses (LPNs) (n = 15), followed by the registered nurses (RNs) (n = 14, 10%) and the rest (10%) were certified nurse assistants (n = 10). Of the fourteen RNs, four had a Bachelors of Science in Nursing (BSN) (14%) and two had a Masters of Science in Nursing (MSN). See Figure 4. These participants represented four separate LTCFs. The majority of the participants were from Site 1 (n = 18; 47%). Site 2 had twelve participants (32%) and Site 3 and 4 had four participants (11%). See Figure 5 for sample description.

Figure 4.

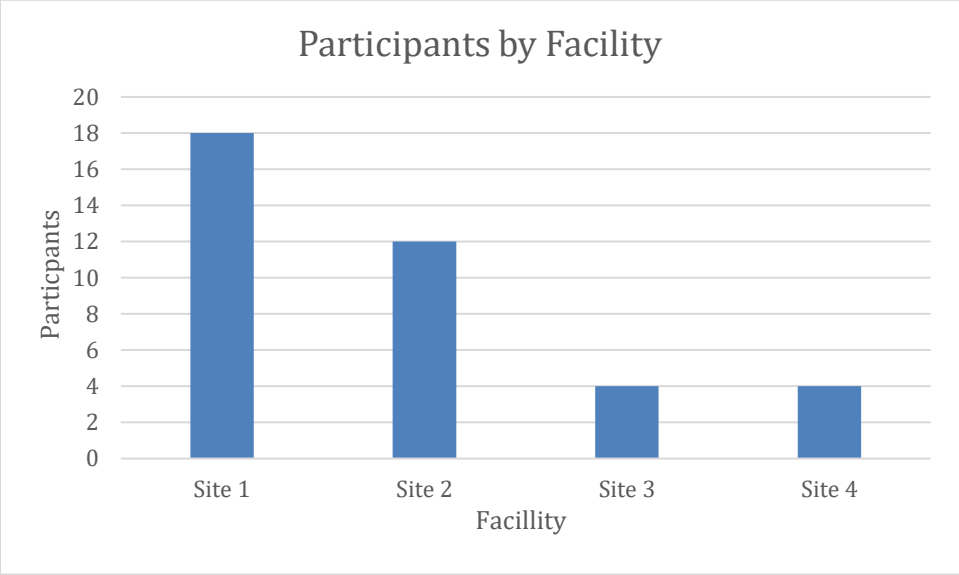
Licensure Levels of Study Participants



Note. This pie chart illustrates the certification levels of the study participants by percentage.

Figure 5.

Participation breakdown by facility



The majority of the participants (90%) worked 40 hours per week (n = 24). The average number of years in healthcare was 19.1 (SD = 1.3) with a range of 0 to 44 years. The average number of years in nursing was 17.4 (SD = 10.4) with a range of 0.5 to 44 years. And lastly, the average number of years in the current role was 10.8 (SD = 10.1) with a range of 0.5 to 44 years. See Table 3.

Table 3

Demographic Characteristics of Participants

Variable	*n*	%	*M* (SD)	Range
Licensure				
CNA	10	23.3		
LPN	15	34.9		
RN	14	30.2		
RN, BSN	4	9.3		
RN, MSN	2	2.3		
Facility				
Site 1	18	47.4		
Site 2	12	31.6		
Site 3	4	10.5		
Site 4	4	10.5		
Hours Worked				
40 per week	24	90		
36 per week	2	5		
24 per week	1	3		
As needed	1	3		
Years in Healthcare			19.1 (10.3)	0 - 44
Years in Nursing			17.4 (10.4)	0.5 - 44
Years in Current Role			10.8 (10.1)	0.5 – 44

The scores for the thirty-nine participants who completed the pre-test and post-test were found to be normally distribution through utilization of the Shapiro-Wilk and Klomogorov-Smirnov test. A paired samples t-test was conducted to compare the pre-test and post-test scores. There was a statistically significant difference in the pre-test (M = 7.37, SD = 1.08) and post-test

(*M* = 8.95, *SD* = .226 scores (*t* = 9.7, *df* = 37, *p* < .05). See Table 4. The Cohen's *d* was 1.58, which is large.

Table 4

Comparison of Pre-test and Post-test Scores (N = 39)

	Pre-test		Post-test					
Variable	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	95% CI
Score	7.37	1.08	8.95	.23	9.7	37	<0.05	[1.25 - 1.91]

Note. CI = confidence interval.

A paired-samples t-test was conducted to compare the pre-test scores and scores of the participants (*n* = 11) who completed the 6-weeks post-test. There was no significant difference in the pre-test (*M* = 7.55, *SD* = .93) and 6-weeks post-test (*M* = 8.00, *SD* = 1.00) scores (*t* = 1.34, *df* = 10, *p* = .106) A Chi-Square test was performed on each demographics section to ensure the participates in the 6-weeks post-test were not statistically different than those who did not participate (see Table 5).

Table 5

Comparison of Pre-test and Post-test Scores (N = 11)

	Pre-test		6 Weeks Post-test					
Variable	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*	95% CI
Score	7.55	.93	8.00	.24	1.3	10	.106	[-0.34 – 1.21]

Note. CI = confidence interval.

A Likert scale was used to determine the attitudes around the SBAR tools. Only thirty-seven participants answered this section of the pre-test and post-test. The scale was from 1 to 5 with 5 equaling “very good” and 1 equaling “very poor.” A Wilcoxon Signed Rank test was

performed on each Likert scale question and none of these were found to be statistically significant (see Table 6).

Table 6

Evaluation Related-Samples Wilcoxon Signed Rank Test Pre- and Post and Pre-Six Weeks Post Intervention

Pre and Post Intervention	N	Pre Median (IQR)	Post Median (IQR)	*p*
How would you rate the UTI SBAR tool? - How would you rate the ease of use of the SBAR tool?	37	4 (3 - 5)	4 (3 - 5)	1.00
How would you rate the UTI SBAR tool? - How would you rate the accuracy of the SBAR tool in helping correctly diagnosis a UTI?	37	4 (3 - 4)	4 (3 - 5)	0.32
How would you rate the UTI SBAR tool? - If using the SBAR tool, how would you rate your overall satisfaction with the tool?	37	4 (3 - 4)	4 (4 - 4.5)	0.08

Pre and 6 Weeks Post Intervention	N	Pre Median (IQR)	6 Weeks Post Median (IQR)	*p*
How would you rate the UTI SBAR tool? - How would you rate the ease of use of the SBAR tool?	11	4 (4 - 5)	4 (4 - 5)	0.18
How would you rate the UTI SBAR tool? - How would you rate the accuracy of the SBAR tool in helping correctly diagnosis a UTI?	11	4 (4 - 5)	4 (4 - 5)	0.18
How would you rate the UTI SBAR tool? - If using the SBAR tool, how would you rate your overall satisfaction with the tool?	11	4 (4 - 5)	4 (4 - 5)	0.10

Urine cultures from each of the four facilities were reviewed during the fourth quarter of 2020 which was before the intervention and then again in 2021 for comparison. Each facility decreased their number of urine cultures after the nursing educational intervention (see Figure 6

and Table 7). There was an overall reduction in urine cultures by twenty-seven percent. A chi-square test of independence showed that there was no statistically significant change in total number of urine cultures between 2020 and 2021, X^2 (3, n = 230) = 1.13, p = .77.

Figure 6.

Urine culture bar chart by facility

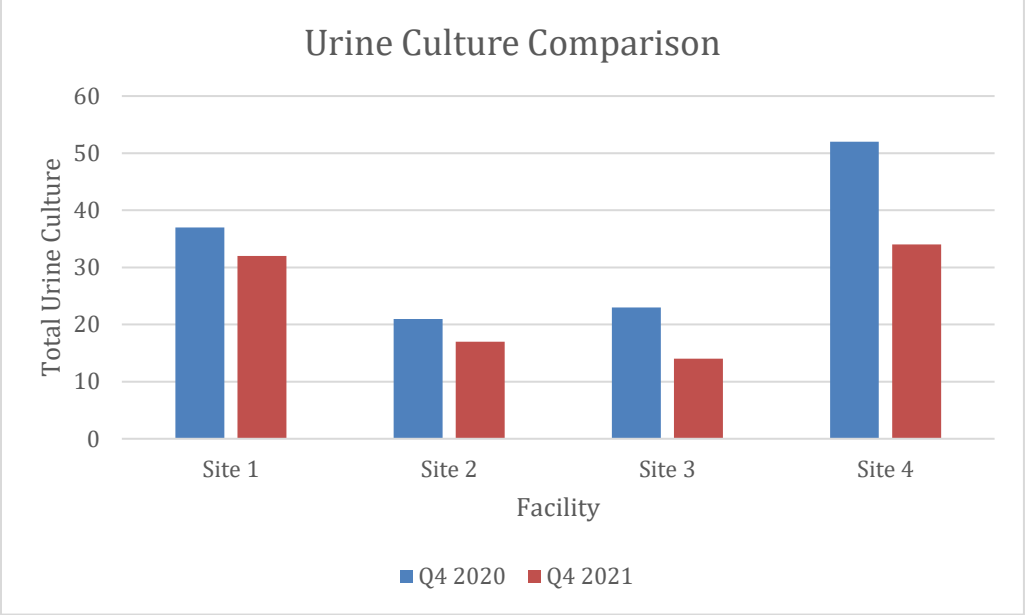


Table 7

Urine culture totals by facility.

Facility	*Q4 2020*	Q4 2021	Difference	Percent Decrease
Site 1	37	32	5	14
Site 2	21	17	4	19
Site 3	23	14	9	39
Site 4	52	34	18	34
Total	**133**	**97**	**36**	**27**

Discussion

Interpretations of the Results

The results of this project reflect the importance of EBQI. Although there was a statistically significant change in pre-test and post-test scores immediately following the nursing educational intervention, this change was not sustained at the six-week post-test indicating a decline in retention of new knowledge. The Cognitive Load Theory (CLT) supports the idea that short term memory is time-limited as the human mind is only able to process so much data at once; and healthcare workers are limited due to the constant influx of new information and the need to process it quickly within a high-demand job (Ghanbari, Haghani, Barekatain, & Jamali, 2020). Therefore, it is important to optimize learning with healthcare workers in order to have retention of the new information so that this new information can be implemented into clinical practice.

Given there was a reduction in participation at the six-week post-test, one would have to consider if the outcomes would have been significant if all participants had submitted responses. Attrition is always expected in long-term studies and even though this study was only six weeks, there were a lot of reasons for attrition. It was announced shortly before the implementation of the SBAR tool and antibiotic stewardship interventions that the facilities were changing ownership. This caused a freeze on new hires and a high percentage of travel nurses to be utilized due to turnover. Burn-out rates were already high across all healthcare staff given that at the time of implementation the world was in year two of the global COVID-19 pandemic.

The research shows that comprehensive antibiotic stewardship programs that utilize a UTI diagnostic criteria like the SBAR tool the team created, have been shown to significantly reduce the use of antibiotics, reduce rates of CDIs and multidrug-resistant bacteria as well as

reduce costs (Jump et al., 2018; Nace et al., 2020). It is also understood that often, nurses are not aware of the antibiotic stewardship programs within their facilities, and additional education is needed in addition to ensuring nursing buy-in (Backus, 2015; Haaijman et al., 2018; Nicolle, 2016). It is this author's goal that the nursing education helped to better inform nursing staff on the complexities of UTIs in the LTC resident and better inform them of the importance of using the SBAR tool. Hopefully, this created some clinical significance with the participants and possibly increased buy-in as well. Unfortunately, the number of urine cultures after the intervention did not have statistical significance, however, by reducing the total number of cultures by twenty-seven percent, this has much clinical significance. Assuming an antibiotic would have been given for every culture, there was potentially a reduction in antibiotics being prescribed as well. The antibiotic stewardship team will need to continue to assess the UTI numbers within each facility and continue with regularly scheduled education in order to cement the change into clinical practice for better resident assessment for UTI to determine if a culture is clinically indicated.

Implications for Nursing Practice

This EBQI scholarly project added to the nursing body of knowledge on the use of the Loeb Criteria utilizing an SBAR communication tool for nursing staff in LTCFs. It validates that more education is needed on a consistent basis to help nursing staff, who already have many competing demands throughout their workday transition this new knowledge from short-term to long-term memory as suggested by the CLT (Ghanbari, Haghani, Barekatain, & Jamali, 2020). Nursing education creates a high cognitive load on nursing staff due to the complexity of the concepts and high demands of their jobs. It is important that healthcare leadership and educators optimize the learning experiences so their staff members maintain the knowledge over time.

The DNP-prepared nurse is especially skilled at implementing EBQI projects in all settings throughout healthcare. Through the DNP essentials, the DNP nurse is able to review the literature, analyze the clinical situation, utilize interprofessional collaboration and other resources in order to implement the evidence into practice to improve patient care and outcomes.

Strengths and Limitations

The Iowa Model provided an organized and systematic approach to the design of this scholarly project and would be considered a strength. The leadership team and organization had significant buy-in to this project as well given that they were motivated to maintain high quality measure scores within CMS by reducing their urine culture numbers. The program itself did not require nursing staff to devote significant time to the intervention.

There were many limitations of the study. The project was time-limited due to the nature of the DNP program and therefore only allowed for one day of education at each facility. This project was further limited due to the ongoing COVID-19 pandemic as our facilities were recovery units for individuals being discharged from the hospital and this likely affected the total number of urine cultures in 2021. These facilities also had their own staffing and resident COVID-19 outbreaks that put additional strain on all staff and forced the facilities to hire a large amount of travel nursing staff during the implementation time. Also, during the implementation of the project, it was announced that the facilities had been sold and the transition process impacted hiring new nurses and the number of travel nurses in the facilities. This likely affected the attrition rates at the six-week post-test.

Another limitation was that this scholarly project was unable to complete a cost analysis to determine if the cost of positive urine cultures has a negative impact on the facility. A systematic review completed by Cohen, Choi, and Stone (2016) was not able to determine the

true cost of a UTI in LTC; however, they did determine that the estimated annual cost of all healthcare-associated infections (HAI) in LTCFs to be $38 to 137 million for the use of antimicrobial therapies and $637 million to $2 billion for hospitalizations for infections alone. It would be important for the facilities to continue to invest in its antibiotic stewardship program as these programs have been shown to not only reduce costs, but also morbidity and mortality (Cohen, Choi, & Stone, 2016).

Conclusion

Although there was a statistically significant change between the pre- and post-test scores immediately following the educational intervention, this change in knowledge was not sustained at six weeks post-intervention. This further supports the CLT that suggests short-term memory is limited and therefore healthcare educators should create experiences to help learners transition new knowledge into long-term memory. Hopefully, the nursing staff who participated in the educational intervention and improved their scores and knowledge on how to better assess patients for UTI. Even though there was not a statistically significant difference in urine cultures for this project, a reduction in total urine cultures by twenty-seven percent is clinically significant. Overall, it is recommended that LTCFs utilize an evidence-based UTI diagnostic criteria such as the Loeb Criteria as part of an antibiotic stewardship program to improve assessment and treatment of residents for UTI in order to improve the quality of care and outcomes.

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Appendix A

Email permission to use the Iowa Model Revised

Permission to Use The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care

Inbox ×

Kimberly Jordan - University of Iowa Hospitals and Clinics <surve… Jun 8, 2021, 1:56 PM (5 days ago)

to me

You have permission, as requested today, to review and/or reproduce *The Iowa Model Revised: Evidence-Based Practice to Promote Excellence in Health Care.* Click the link below to open.

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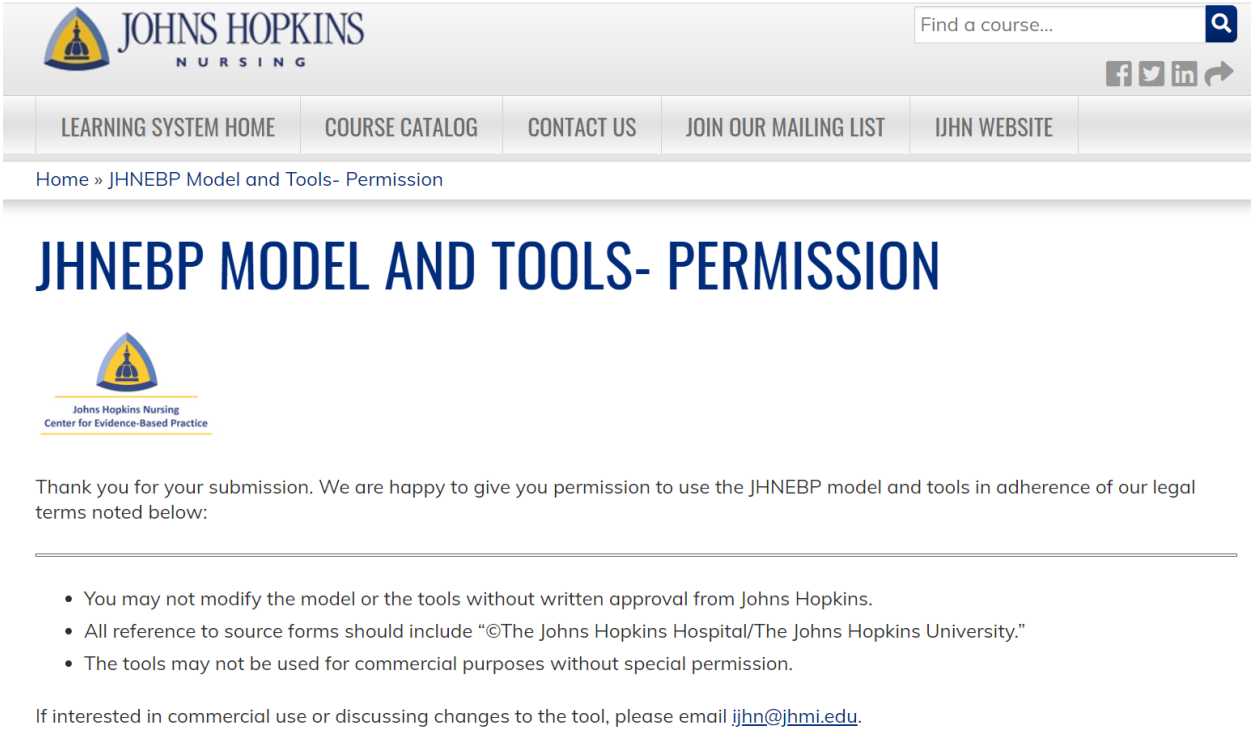
Please contact UIHCNursingResearchandEBP@uiowa.edu or 319-384-9098 with questions.

Appendix B

Permission to use the Johns Hopkins Nursing Evidence Based Practice Model and Tools



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JHNEBP MODEL AND TOOLS- PERMISSION

Johns Hopkins Nursing Center for Evidence-Based Practice

Thank you for your submission. We are happy to give you permission to use the JHNEBP model and tools in adherence of our legal terms noted below:

- You may not modify the model or the tools without written approval from Johns Hopkins.
- All reference to source forms should include "©The Johns Hopkins Hospital/The Johns Hopkins University."
- The tools may not be used for commercial purposes without special permission.

If interested in commercial use or discussing changes to the tool, please email ijhn@jhmi.edu.

Appendix C

Letter from Facility IRB exempt committee

Morgan McDowell, MSN, (DNP Student at UVA)

CHIRB0539e Promoting Antibiotic Stewardship in Long Term Care

Dear Ms. McDowell,

The [redacted] Institutional Review Board exempt committee has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB exempt application.

Your study does not classify as human subjects research because evidence-based practice projects and process improvement initiatives are considered quality improvement activities, which are not considered "research" according to 45 CFR 46.102(d).

The data research will need to be completed by ***September 30, 2021***. [redacted] will no longer be the owner of:

- [redacted] Health & Rehab Center
- [redacted] Health & Rehab Center
- [redacted] Health & Rehab Center
- [redacted] Health & Rehab Center

In the event your research cannot be completed by September 30, 2021, please prepare correspondence which [redacted] counsel will share with the buyer of the above-mentioned facilities for purposes of securing permission for you to complete your research after that date. Amanda [redacted] will be in touch with you about details associated with this correspondence.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the [redacted] IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB exempt committee and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at [redacted]

Sincerely,

Amanda [redacted]
IRB Exempt Committee Chair

Appendix D

UVA IRB-HSR Office Final Decision

FOR IRB-HSR OFFICE USE ONLY

☒ UVA personnel are not considered to be conducting research as an Agent for UVA on this project.
No approvals from the UVA IRB-HSR are required.
No data may be brought back to UVA for any purpose except as described above.
If you wish to collect and use data from the original study for an additional research project you must obtain IRB approval/determination from the IRB-HSR before taking data outside of the non-UVA institution.

UVA Study Tracking # 23417

☐ UVA personnel are considered to be conducting research as an Agent for UVA on this project.
Submit a research application to the UVA IRB-HSR.

_Kristin_Shelby_____ _9-10-21_____
Name of IRB Chair, Director or Designee Date