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Prescriber Education of Current Clinical Practice Guidelines for Urinary Tract Infections

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PRESCRIBER EDUCATION OF CURRENT CLINICAL PRACTICE GUIDELINES
FOR URINARY TRACT INFECTIONS

by

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Abstract

Urinary tract infections are one of the most common illnesses and inappropriate treatment of a urinary tract infection can have severe implications for the patient, including development of antibiotic resistance, increases in illness and health care costs. Discrepancies exist between provider practice behaviors and use of current clinical practice guidelines. This capstone project was to present clinical practice guidelines to emergency department providers to educate and improve the use of first-line antibiotics for the treatment of uncomplicated urinary tract infections. The review of the literature supported the use of education to increase adherence to guidelines. The providers at the emergency department were given a pre-education questionnaire of clinical knowledge followed by education with the current clinical guidelines. A post-education questionnaire was given in one month after the educational program. The questionnaires were compared for improvement in prescribing habits. A retrospective chart review was conducted using the emergency department's computer system one month before and one month after the education and distribution of the clinical guideline. Increased knowledge was demonstrated by an increase in the pre to post education questionnaire scores. Provider adherence to current clinical practice guidelines rose from 5% to 58%.

Keywords: Urinary tract infection, Urinary tract infection treatment, Antibiotic resistance, Guideline adherence, Antimicrobial stewardship

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Chapter One: Introduction and Overview of the Problem of Interest

A urinary tract infection is a common indication for prescribing an antibiotic (Gupta et al., 2011). Bacteria are the most common cause of urinary tract infections. Urinary tract infections are one of the most common illnesses and represent an important public health issue if not treated properly. According to the Center for Disease Control and Prevention (2013) prescribing antibiotics when they are not needed or prescribing the wrong antibiotic is common. Less than 25% of patients received empirical treatment as suggested by published guidelines (Grover et al., 2007). Discrepancies exist between physician practice behaviors and published guidelines (Grover et al., 2007). The literature reveals that establishing a cost-effective strategy for the diagnosis and treatment of UTI is important because of its high incidence (Agency for Healthcare Research and Quality, 2014). Inappropriate treatment of a urinary tract infection can have severe implications for the patient, including development of antibiotic resistance, and increases health care costs. The goals of pharmacotherapy are to eradicate the urinary tract infection, prevent complications, and provide symptomatic relief to patients. Early first-line treatment is recommended to reduce the risk of progression to pyelonephritis (Center for Disease Control and Prevention, 2013). Improvement in following current clinical guidelines can be achieved with a simple intervention that requires minimal resources such as, education and surveillance.

Background

A urinary tract infection involves all or part of the urinary tract and is diagnosed by the presence of bacteria in the urine and by clinical symptoms experienced by the

patient. Classic symptoms of a urinary tract infection are dysuria, frequency, urgency

and suprapubic discomfort. Urinary tract infections may be defined as acute versus

chronic, and complicated versus uncomplicated.   Uncomplicated urinary tract infections

are infections that do not involve structural abnormalities in the urinary tract system. Not

prescribing the first-line antibiotic for an uncomplicated UTI happens too frequently.

According to the Center for Disease Control and Prevention (2013) prescribing

antibiotics when they are not needed or prescribing the wrong antibiotic in outpatient

settings such as doctors' offices is common. Physician adherence to clinical practice

guidelines may be affected by barriers such as, lack of awareness, and familiarity and

agreement to the guideline (Cabana at al., 1999). Other barriers may be patient

preferences, needs and abilities (Lugtenberg, Burgers, Besters, Han, & Westert, 2011).

Another barrier the prescriber must consider is the cost to the patient. The most common

pathogens of uncomplicated urinary tract infections are similar all over the world and

include Escherichia coli 80% to 90%, Staphylococcus saprophyticus 5% to 10%, and the

remaining infections are caused by Proteus species and other Gram negative rods

(Trestioreanu, Green, Paul, Yaphe, & Leibovici, 2010). Optimal treatment reduces

antibiotic resistance and health care costs. Evidence-based guidelines have been

developed, translating research into practice and are based on evidence and expert

opinion. Arnold and Straus (2009) concluded that small changes in prescribing may be

achieved using scalable interventions such as guideline publication and distribution.

Meetings to educate and remind providers of current guidelines improved their

prescribing patterns (Arnold & Straus, 2009). The simple, single-intervention studies

such as printed educational materials, audit and feedback generally resulted in small to statistically significant changes in prescribing behavior. Arnold and Straus (2009) determined that the selection of the most effective intervention to improve the prescribing of antibiotics appears to be condition and situation specific and local barriers must be identified and addressed. These low cost interventions may result in cost savings to insurers even if the results are marginal given the high cost of prescription medications (Arnold & Straus, 2009).

The International Clinical Practice Guidelines for the treatment of acute uncomplicated urinary tract infections in women were updated in 2010 by a panel of international experts. The panel consisted of representation from the Infectious Disease Society of America and the European Society for Microbiology and Infectious Diseases. Co-sponsoring organizations included the American Congress of Obstetricians and Gynecologists, American Urological Association, the Association of Medical Microbiology and Infectious Diseases-Canada and the Society for Academic Emergency Medicine (Gupta et al., 2011). The idea was to assemble an expert panel from diverse geographic areas with a goal of finding the optimal and most accepted recommendations for the treatment of urinary tract infections. The expert panel completed a review and analysis of data published since 1999 before making their recommendations. The guidelines approach to choosing an optimal antimicrobial agent for empirical treatment of acute uncomplicated urinary tract infections was to use Macrobid 100 mg twice a day for 5 or Bactrim DS 160/800 mg twice a day for 3 days or Fosfomycin trometamol 3 g in a single dose or Pivmecillinam 400 mg twice a day for 3 to 7 days. The provider would

have a choice between these antibiotics based on patient allergies, compliance history, local patterns, local community resistance prevalence, availability, cost and patient and provider threshold for failure (Gupta et al., 2011). Clinical practice guidelines recommend first-line antibiotics by selecting the correct drug, dose, and shortest clinically effective duration of therapy (Appendix A).

Improving provider adherence to clinical practice guidelines is of the utmost importance. Developing responsible antibiotic use or antimicrobial stewardship for urinary tract infections by providers can maximize the use of first-line antibiotics recommended by current clinical practice guidelines. Hecker et al. (2014) found that an antimicrobial stewardship initiative for uncomplicated urinary tract infections was associated with a significant and sustained improvement in adherence to treatment guidelines. An intervention which included implementation of an electronic urinary tract infection order set followed by a two month period of audit and feedback in an urban emergency department resulted in an increase to guideline adherence from 44% to 82% (Hecker et al., 2014).

Significance

Antibiotic resistance has become more prevalent and threatens our ability to treat common community-acquired infections in both the developing and developed world (Arnold & Straus, 2009). On September 18, 2014, President Obama issued an executive order establishing a task force for combating antibiotic-resistant bacteria, to be co-chaired by the secretaries of defense, agriculture, and health and human services (The White House, 2014). Health care costs and antimicrobial resistance are public health concerns.

Prescribing inappropriate antibiotics may be decreased by the adoption of current clinical practice guidelines. According to the Center for Disease Control and Prevention (2013) the use of inappropriate antibiotic is the single most important factor leading to antibiotic resistance around the world. Also, up to 50% of all the antibiotics prescribed for people are not needed or are not optimally effective as prescribed. Gupta et al. (2011) argued that despite published guidelines for the optimal selection of an antimicrobial agent and duration of therapy, studies demonstrate a wide variation in prescribing practices. According to Arnold and Straus (2009) prescribers may order a broad spectrum antibiotic when a narrow spectrum antibiotic should be prescribed. The emergency department (ED) provider has a great opportunity to decrease the inappropriate prescribing of antibiotics since the ED is a frequent site of treatment for patients presenting with a urinary tract infection (National Institute of Health, 2013). Practicing emergency department clinicians have a great potential to positively impact outcomes for patients and their communities through careful antimicrobial prescribing and clinical decision-making (National Institute of Health, 2013). Banter et al. (2003) argued that implementation of an antimicrobial stewardship program initially with passive strategies, such as education followed by active strategy with prospective audit and intervention demonstrated progressive decreases in antimicrobial prescribing resulting in a total savings of $913,236 over 18 months. A systematic program executed by a multidisciplinary team is a cost-effective strategy for optimizing antibiotic use in a hospital and had an evident impact on prescribing practice, antibiotic use, cost savings, and bacterial resistance (Banter et al., 2003).

Question Guiding Inquiry

Clinical inquiry must be cultivated in the work environment as a means of identifying and addressing clinical problems. Formulating clinical questions in a structured, specific way, such as with a population-intervention-comparison-outcome-timeframe (PICO-T) question formatting assists the clinician in finding the right evidence to answer the question. Without a well-formulated question, the clinician may search for wrong, too much, or irrelevant information (Melnyk & Fineout-Overholt, 2005). The current clinical question is: "Will the adoption with implementation of clinical practice guidelines for uncomplicated, community acquired urinary tract infection increase the use of first-line antibiotics in adult women aged 18 and older diagnosis with a urinary tract infection, in an emergency department setting within three months"?

P (patient population) The population was the providers at a local emergency department who made the decision of the antibiotic prescribed for acute uncomplicated urinary tract infection.

I (intervention) The intervention was the education and implementation of clinical practice guidelines for uncomplicated, community acquired urinary tract infection. The 2010 clinical practice guidelines for Acute Uncomplicated Cystitis in women by the Infectious Diseases Society of America (Gupta et al., 2011) will be distributed to prescribers at a local emergency department. Prescriptions written for urinary tract infections will be reviewed through the use of IBEX Pulse Check before and after the distribution of the clinical guideline. IBEX Pulse Check is a comprehensive clinical documentation system using an electronic medical record that is used in the emergency

department. IBEX Pulse Check interfaces to the laboratory, pharmacy, and radiology so the patient's results are immediately available on the chart for review by the provider.

C (comparison) The comparison was not applicable.

O (Outcome) The outcome was to increase the use of first-line antibiotics prescribed for adult women with uncomplicated urinary tract infection in an emergency department following the international clinical practice guidelines for the treatment of acute uncomplicated cystitis in women (Gupta et al., 2011).

T (Timeframe) The timeframe was within three months to complete the project. The project will be presented in the next month at Misericordia University for requirements of the DNP program.

The PICO-T question is the best way to answer the question with an evidence-based approached to the treatment of urinary tract infections with current clinical guidelines.

System and Population Impact

Discrepancies exist between provider practice behaviors and use of current clinical practice guidelines. The guidelines and health benefits are supported by scientific evidence. The impact on the system and population would be decrease in health care cost, illness, adverse side effects and antibiotic resistance and increase the consistent use of current clinical practice guidelines. Antimicrobial resistance is a major public health problem. At least two million people become infected with bacteria that are resistant to antibiotics, and at least 23,000 people die each year as a direct result of such infections (Center for Disease Control and Prevention, 2013). Antibiotic resistance in

other community-acquired pathogens has also become more frequent and threatens our ability to treat common community-acquired infections in both the developing and developed world (Arnold & Straus, 2009).

Purpose, Aims/Objectives

The purpose of this project was to present clinical practice guidelines to emergency department providers aimed at improving first-line antibiotic treatment and decreasing further illness, antibiotic resistance, and health care costs. The aim was to improve adherence current clinical practice guidelines through education and practice support thereby decreasing antibiotic resistance, health care costs and disease.

Chapter Two: Review of Literature

The literature reviewed included current evidence-based practices supporting the education of providers in the treatment of uncomplicated, community acquired urinary tract infection. Critical appraisal was required to determine the strengths and weakness of the research studies involved. The most current and applicable research was appraised and presented in this chapter.

Acute community acquired urinary tract infection is a common diagnosis in the emergency department. According to the Center for Disease Control and Prevention (2013) prescribing antibiotics when they are not needed or prescribing the wrong antibiotic are common occurrences. Less than 25% of patients received empirical treatment as suggested by published guidelines (Grover et al., 2007). The literature reveals that establishing a cost-effective strategy for the diagnosis and treatment of UTI is important because of its high incidence (Agency for Healthcare Research and Quality, 2014). Discrepancies exist between provider practice behaviors and published guidelines (Grover et al., 2007). This literature review stresses the importance of provider education and the use of current evidence-based clinical guidelines.

Methodology

A comprehensive search of the literature reviewed was obtained on multiple databases including EBM reviews, EBSCOhost and PubMed which includes MEDLINE, Cochrane Library, CINAHL, OVID, and DynaMed databases. Key words used to assist the literature search were: urinary tract infection, urinary tract infection treatment, clinical practice guidelines, first-line antibiotics, antibiotic resistance, guideline

adherence, and antimicrobial stewardship. Studies appraised included systematic

reviews, randomized controlled trials, cohort, qualitative and evidence-based studies.

Studies were limited to the year of publication of 1998 to present. Literature was limited

to full text, free full text, humans, and five stars. A search of the Cochrane Library

revealed 39 articles under the search of urinary tract infection. A search of EBSCO with

the search terms urinary tract infection revealed 166 articles and PubMed revealed 37. A

change in the search terms to urinary tract infection treatment revealed one article with

EBSCO and two articles for PubMed. A change in the search terms to clinical practice

guidelines revealed 170 articles using EBSCO and 340 with PubMed. A change in the

search terms to antibiotic resistance revealed 47 articles using EBSCO and 1,513 with

PubMed. A change in the search terms to guideline adherence revealed 143 articles using

EBSCO and 139 with PubMed. A change in the search terms to antimicrobial

stewardship revealed 15 articles using EBSCO and 803 with PubMed. A change in the

search terms to antimicrobial stewardship and urinary tract infection revealed 37 articles

using EBSCO. Literature was selected as evidence for inclusion in the evidence-based

practice change project based on its relevance to the defined clinical question and

intervention. The literature was critically appraised for validity, reliability and

applicability. There were two systematic reviews, a randomized controlled trial and the

current evidence-based clinical guideline found relevant that will be discussed.

The first systematic review by Trestioreanu, Green, Paul, Yaphe, & Leibovici

(2010), compares the efficacy, resistance development and safety of different

antimicrobial treatments for acute uncomplicated lower urinary tract infections. Included

in this review were 21 studies with 6016 participants who used different classes of antimicrobials for treating acute urinary tract infections in women for three and up to ten days. Two authors independently extracted the data and assessed study quality. Data was extracted using standard data extraction forms. The types of studies reviewed were random controlled trials comparing different antibacterial used for three days or more with an identical duration of treatment in the two arms for the treatment of uncomplicated urinary tract infections in women. Disagreements were resolved in consultation with a third author.

The review authors searched the Cochrane Renal Group's Specialised Register, the Cochrane Central Register of Controlled Trials, MEDLINE and EMBASE. Study authors were contacted for missing information. Inclusion criteria were outpatient healthy women and aged 16 to 65 years with uncomplicated UTI defined by the presence of urinary complaints and leucocyturia or bacteriuria. Exclusion criteria were people having multiple vomiting, sepsis, hospital acquired infection, pregnancy, indwelling urinary catheter, recent urinary tract instrumentation, known pathological functional or anatomic abnormality of the urinary tract, diabetes mellitus and immunocompromised patients. The authors assessed the methodological quality of studies fulfilling the inclusion criteria based on the Cochrane Handbook assessing allocation concealment, blinding, intention-to-treat, and completeness of follow-up. The review includes table of characteristic of included studies and tables demonstrating data and analyses with comparisons of each antibiotic. The methodology appears to be sound and results should be considered valid.

Statistical analyses were performed using the random effects model and the results expressed as risk ratios with 95% confidence intervals (CI). Two authors analyzed dichotomous data by calculating the risk ratio (RR) for each study being expressed as 95% confidence interval. Comparisons made between the mean duration of symptoms in the two groups, when normally distributed were analyzed by using the mean and standard deviation of each study and calculating the mean difference and the 95% confidence interval. Intention-to-treat analysis was performed considering all drop-outs in a study as failure to achieve symptomatic or bacteriological cure. The main results were Trimethoprim-sulfamethoxazole (TMP-SMX) was as effective as fluoroquinolones in achieving short-term (RR 1.00, 95% CI 0.97 to 1.03) and long-term (RR 0.99, 95% CI 0.94 to 1.05) symptomatic cure. Beta-lactam drugs were as effective as TMP-SMX for short-term (RR 0.95, 95% CI 0.81 to 1.12) and long-term (RR 1.06. 95% CI 0.93 to 1.21) symptomatic sure. Short-term cure for nitrofurantoin was similar to that of TMP-SMX (RR 0.99, 95% CI 0.95 to 1.04) as was long-term symptomatic cure (RR 1.01, 95% CI 0.94 to 1.09). Fluoroquinolones were more effective than beta-lactams (RR 1.22, 95% CI 1.13 to 1.30) for short-term bacteriological cure. Based on these findings, the results are considered reliable.

Disagreements between the two authors were resolved in consultation with a third author which is considered a limitation to this study. Another limitation was that four studies did not mention blinding.

Treatment for acute uncomplicated urinary tract infections needs to be based on current evidence-based practice. Providers need updates with education on current

evidence-based practices for the best treatment of acute uncomplicated urinary tract infections. This evidence would be considered applicable because the settings, types of patients and interventions in this review are related to the PICO-T question.

The second systematic review, Arnold & Straus (2009), assessed the effectiveness of multiple education interventions to improve the use of first-line antibiotics and evaluate the impact of these interventions on reducing the incidence of antimicrobial resistant pathogens. Two review authors independently extracted data and assessed study quality without blinding to study author or location. Disagreements were resolved by discussion and consensus which is considered a limitation to this study. The author concluded that the effectiveness of the intervention on antibiotic prescribing depends to a large degree on the particular prescribing behavior and the barriers to changes in the particular community which is also considered a limitation to this study.

The review authors searches Cochrane Effective Practice and Organisation of Care Group, MEDLINE, OVID, EMBASE, bibliographies of retrieved articles, the Scientific Citation Index and personal files. The authors assessed the studies according a template by the Effective Practice and Organisation of Care Group (EPOC). The template included information on: study design, type of intervention, presence of controls, type of targeted behavior, participants, setting, methods, outcomes and results. The Effective Practice and Organisation of Care was developed by an editorial team and considered a supplement to the Cochrane Handbook for Systematic Reviews of Interventions. The EPOC was intended to provide guidance for authors for reviews of studies (Cochrane Effective Practice and Organisation of Care Group, 2015).

The studies included randomised and quasi-randomised controlled trials, controlled before and after studies and interrupted time series studies. There were a total of 151 articles found and after exclusions a total of thirty-nine studies examined. There were 25 randomized controlled trials, one quasi-randomized control trial, 11 controlled before and after studies and two interrupted time studies.

The included thirty-nine studies examined the effect of printed educational materials for physicians, audit and feedback, educational meetings, educational outreach visits, financial and healthcare system changes, physician reminders, patient-based interventions and multi-faceted interventions. The methodological quality of eligible studies was assessed by both authors according to the criteria described by the EPOC group. The main outcome measures were the rate of appropriate antibiotic prescribing, the incidence of antibiotic resistant organisms and the incidence of adverse events. The authors concluded that multi-faceted interventions combining physician, patient and public education in a variety of venues and formats were the most successful in reducing antibiotic prescribing for inappropriate indications. They also concluded that the effectiveness of an intervention depended largely on the particular prescribing behavior and the barriers to change in the particular community. The methodology appears to be sound and results should be considered valid.

The data was reported in natural units. The studies that provided baseline results, pre-intervention and post-intervention means or proportions were reported for both study and control groups and the difference in absolute change from baseline was calculated along with 95% confidence intervals or P values if available. The studies that did not

provide baseline data, results were expressed as the relative percentage change. The studies that compared more than one intervention, the control group was compared to each intervention and was competed separately. The studies were considered very heterogeneous compared to the reported outcomes. There were some limitations to this study. There were variations in the interventions and differences in the clinical settings. There were unit of analysis errors reported by the authors. The author admits to methodological limitations as assessed by the quality criteria of the EPOC study group. The studies were biased by author judgment which is considered a limitation to this study. Although there were some limitations the results should be considered reliable.

According to Arnold and Straus (2009) prescribers may prescribe antibiotics that kill a wide variety of bacteria when an antibiotic that kills specific bacteria should be prescribed. Gupta et al. (2011) argued that despite published guidelines for the optimal selection of an antimicrobial agent and duration of therapy, studies demonstrate a wide variation in prescribing practices. Improvement can be made toward prescribing antibiotics correctly. Arnold and Straus (2009) observed that the simple, single intervention studies such as, printed educational materials, and generally resulted in small to statistically significant changes in prescribing behavior. Based on these findings, the evidence would be considered applicable to the PICO-T intervention.

Roque et al. (2014) conducted a critical systematic search and review of the relevant literature on educational programs aimed at improving antibiotic prescribing and dispensing practice in primary-care and hospital settings. The search used MEDLINE-PubMed database from January 2001 through December 2011. Manual searches were

also used targeting journals. The search strategy was designed to identify relevant studies addressing antibiotic resistance and the prescribing/dispensing habits of health care providers, pre- and post-educational interventions. No inclusion or exclusion criteria were stipulated because their aim was to use quality methodology to conduct a critical review of all published studies.

A total of 78 studies were identified, 47 in primary care and 31 in hospital settings. Outcomes measured were adherence to guidelines, total of antibiotics prescribed, or both, attitudes and behavior related to antibiotic prescribing and quality of pharmacy practice related to antibiotics. The results revealed that antibiotic use could be improved be educational interventions, being mostly used multifaceted interventions.

Twenty-nine studies (62%) in primary care and twenty-four (78%) in hospital settings reported positive results for all measured outcomes; fourteen studies (30%) in primary care and six (20%) in hospital setting reported positive results for some outcomes and results that were not statistically influenced by the intervention for others; only four studies in primary care and one study in a hospital setting failed to report significant post-intervention improvements for all outcomes, improvement in adherence to guidelines and decrease of total antibiotics prescribed, after educational interventions, were observed, respectively, in 46% and 41% of all the reviewed studies. The study listed detailed tables analyzing educational interventions in health care professionals to improve antibiotic use and detailed tables listing interventions to improve antibiotic use in primary care and the hospital setting. This systematic review admits to the limitation of publication bias. Inclusion criteria covered a wide range of studies with different

designs which was considered a limitation due to the difficulty of making comparison and preforming a meta-analysis. The methodology has limitations but appears to be sound and results should be considered valid ad reliable.

The authors concluded that educational interventions to improve antibiotic use are essential and in many studies such interventions are active and multifaceted, some of them include both physician and pharmacists, and were designed taking these health professionals' attitudes and knowledge into account, in order to focus on the barriers so identified. Based on these findings, the evidence would be considered applicable to the PICO-T intervention.

Grigoryan, Trautner & Gupta (2014) conducted a review of 27 randomized clinical trials (6,463 patients), six systematic reviews and 11 observational studies (252,934 patients) to define the optimal approach for treating acute cystitis. Using the general critical appraisal questions, the study was critically appraised to determine whether it was valid, reliable, and applicable.

The objective was to define the optimal approach for treating acute cystitis in young healthy women. Evidence for optimal treatment regimens was obtained by searching PubMed and the Cochrane database for English language studies published up to July 21, 2014. Excluded were antibiotics that are currently not available in the United States, studies that only included pregnant women, children younger than 12 years or adults older than 65 years, studies suggestive of complicated urinary tract infections, pyelonephritis and urological procedure in the prior two weeks and known anatomical or functional abnormalities. Two reviewers independently assessed the quality of included

studies using established quality checklist. Discordance was resolved through consensus of the authors. The American Heart Association grading scale and level of evidence for recommendations was utilized. A weighted average of efficacy rates was calculated by multiplying the clinical efficacy rate by the sample size in each study across trials for cure rates. Although there were some limitations the results should be considered valid because the authors conducted a comprehensive review and is consistent with the current International Clinical Practice Guideline for treatment of acute uncomplicated cystitis.

A table was provided for treatment regimens and early efficacy rates for acute uncomplicated cystitis. Clinical trial evidence supports nitrofurantoin monohydrate/macrocrystals 100 mg twice daily for 5 days, trimethoprim-sulfamethoxazole 160/800 mg twice daily for 3 days and fosfomycin trometamol 3 gram single dose are all appropriate first-line therapies for uncomplicated cystitis. The three treatment regimens are all considered Level of Evidence A-1 on the American Heart Association Grading Scale and Level of Evidence. Despite the limitations this study can be considered reliable.

This comprehensive systematic review correlates with the recommendations of the IDSA guidelines update on management of acute cystitis (Gupta et al., 2011) and is considered applicable to the PICO-T question.

Christiaens et al. (2001) preformed a random controlled trial to examine the efficacy of nitrofurantoin versus placebo. Using the general critical appraisal questions, the study was critically appraised to determine whether it was valid, reliable, and applicable.

The aim of the study was to measure the symptomatic and bacteriological short-term effect of nitrofurantoin treatment versus placebo. The participants in the study were non-pregnant women, aged between 15 and 54 years old, consulting a general practitioner for symptoms suggestive of uncomplicated lower urinary tract infection and with pyuria. Exclusion criteria were patients with a fever, known nephrological or urological problems, diabetes, immunocompromised, patients with recurrent urinary tract infections, abnormal vaginal discharge, labial irritation, intermittent vaginal bleeding, symptoms for greater than seven days, antibiotic ingestion within the past four weeks and known allergy to nitrofurantoin. A dipslide was inoculated in first-void midstream urine and sent for examination. The patients were randomized to receive nitrofurantoin 100 mg or placebo four times daily for three days. After three, seven and 14 days a new dipslide was inoculated and symptoms of urinary tract infection were checked for the disappearance or improvement of symptoms and bacteriuria. In women with diagnosed urinary tract infection, nitrofurantoin was significantly more effective than placebo in achieving bacteriological cure and symptomatic relief in just three days and still present after seven days.

The study design was a double-blind randomized placebo-controlled clinical trial in general practice in Belgium. All patients entered the study with intention to treat. After giving verbal informed consent, patients were randomized to receive either a box containing capsules of nitrofurantoin 100 mg or placebo capsules with the same appearance. The randomized list was only available in the case of an emergency and was kept at a local University hospital pharmacy. Although there were some limitations the

results should be considered valid because the authors conducted a study and the results are consistent with the current International Clinical Practice Guideline for treatment of acute uncomplicated cystitis.

Limiting the number of participants in the study was intended. Out of 166 women, 78 women were included in the study. Thirty-eight were allocated to receive the placebo and 40 were allocated to receive nitrofurantoin. The mean age was 29 years in the placebo group and 31 in the nitrofurantoin group. For the power calculation, the aim was to detect, with a 90% probability, a statistically significant difference at $\alpha = 0.05$ for a one-sided test, between treatment and placebo. A χ^2 test with Yates' correction 2 x 2 tables were used to test differences between the groups and the number needed to treat (NNT) with a 95% CI was calculated using Confidence Interval Analysis software. A flowchart describing patient participation on each examine visit was illustrated. Tables were illustrated comparing symptomatic and bacteriological effects as well as reasons for drop-outs. Despite the limitations this study can be considered reliable.

This study is considered applicable to the PICO-T question and practice because it provided evidence that the use of nitrofurantoin was significantly more effective than placebo in achieving bacteriological cure and symptomatic relief. The population, intervention and outcome were similar to the PICO-T question.

The International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women were updated in 2010 by a panel of international experts (Gupta et al., 2011). The guideline recommends the optimal antibiotic for the treatment of acute uncomplicated urinary tract infections. They

recommend nitrofurantoin monohydrate/macrocrystals 100 mg twice daily for 5 days as the first and optimal treatment of acute uncomplicated cystitis. The second treatment listed was trimethoprim-sulfamethoxazole 160/800 mg twice daily for 3 days. Fosfomycin trometamol 3 gram single dose, pivmecillinam 400 mg twice daily for 3-7 days, fluoroquinolones and β-Lactam agents are listed subsequently. Local antimicrobial susceptibility patterns should be considered in empirical antimicrobial selection. Clinical practice guidelines recommend first-line antibiotics by selecting the correct drug, dose, and shortest clinically effective duration of therapy.

The panel consisted of the Infectious Disease Society of America, the European Society for Microbiology and Infectious Diseases. Co-sponsoring organizations included the American Congress of Obstetricians and Gynecologists, American Urological Association, Association of Medical Microbiology and Infectious Diseases-Canada and the Society for Academic Emergency Medicine. The idea was to assemble an expert panel from diverse geographic areas with a goal of finding the optimal and most accepted recommendations for the treatment of urinary tract infections. The expert panel completed a review and analysis of data published since 1998 before making their recommendations. A search was conducted using PubMed database in the English language from 1998 to 2008 using the terms cystitis or pyelonephritis with MESH terms of "acute uncomplicated UTI", "women" and specific antimicrobials and or class of antimicrobials. Inclusion criteria were open-labeled or randomized, clinical trial of treatment of women with symptoms of acute uncomplicated cystitis or pyelonephritis, at least one follow-up visit. Exclusion criteria were studies with >10% men, complicated

UTI and non-English language studies. Outcomes of interest included early clinical, microbiological cure, late clinical cure and adverse effects. The evaluation of evidence for each antimicrobial class used in treatment of cystitis was performed by two members of the panel. Each member was assigned at least one antimicrobial class to review. The process for evaluating the evidence was based on the IDSA Handbook on Clinical Practice Guideline Development and involved a systematic weighing of the quality of the evidence and the grade of recommendation. Based on the above methodology this guideline can be considered valid.

The recommendations are specific and unambiguous and are related to the current evidence-base practice. The different options for management of the condition are clearly presented. The key recommendations of this guideline were easily identifiable. All members of the Expert Panel were provided IDSA's conflict of interest disclosure statement and were asked to disclose any conflict of interest. The panel reviewed and made decisions on a case-by-case basis regarding limiting the individual's role as a result of the conflict. Conflicts were listed by name and conflict such as serving as a consultant and receiving grants from pharmaceutical companies. Despite the limitations of this guideline it was considered reliable.

This study is considered applicable to the PICO-T question and practice because it provided evidence of first-line treatment of acute uncomplicated urinary tract infections. The only barrier to this guideline was allergies to recommended antibiotics. The population, intervention and outcome were related to the PICO-T question and outcome.

Grover et al., 2007 reviewed the medical records to assess adherence to evidence-based guidelines. Using the general critical appraisal questions, the study was critically appraised to determine whether it was valid, reliable, and applicable.

The authors retrospectively reviewed the medical records of female patients to assess adherence to evidence-based guidelines for the diagnosis and management of uncomplicated urinary tract infection in a family medicine residency clinic setting. Three hundred and thirty-three female patients' medical records were reviewed. Sixty-eight patients were diagnosed with uncomplicated urinary tract infection and received antibiotic treatment. Trimethoprim-sulfamethoxazole was used as initial therapy in 26 patients and 36 patients received ciprofloxacin. Trimethoprim-sulfamethoxazole was found to be effective but underused. Less than 25% of the patients received empirical treatment as suggested by evidence-based guidelines.

The authors recorded information from electronic medical records. Information was collected regarding results of urine dipstick analyses, microscopic urinalyses, urine and culture and sensitivity analyses. Data was collected on treatment prescription and duration of therapy. Data was collected on data collection sheets which they developed to record information from the chart review. Data from the collection sheet was entered on Excel database and analyzed using SAS software package. Descriptive statistics were used to present frequencies, percentages, means, SDs and ranges. A 2-sided χ^2 test and the Fisher exact test to compare documentation rates, test utilization, and treatments provided between groups. A 2-sided 1-sample binomial test was used to compare the observed urine culture sensitivities for patients with uncomplicated urinary tract

infections in the outpatient setting. All calculated $p<.05$ was considered statistically significant.   Despite the limitations this study can be considered valid.

A figure was provided indicating inclusion and exclusion criteria. Tables were provided demonstrating reasons for exclusion as a function of patient age and documentation of urinary tract infection history and physical examinations.   The study found that the physicians ordered urine cultures too frequently and did not prescribe trimethoprim-sulfamethoxazole appropriately. The study was approved by the Mayo Foundation Institutional Review Board. Despite the limitations this study can be considered reliable.

This study is considered applicable to the PICO-T question and practice because it provided evidence that providers were not utilizing current practice guidelines. The population, intervention and outcome were similar to the PICO-T question.

Hecker et al. (2014) evaluated a stewardship intervention which included implementation of an electronic urinary tract infection order set followed by a two month period of audit and feedback. Using the general critical appraisal questions, the study was critically appraised to determine whether it was valid, reliable, and applicable.

The studies objective was to evaluate adherence to uncomplicated urinary tract infections guidelines and diagnostic accuracy in an emergency department setting before and after implementation of an antimicrobial stewardship intervention. Adherence to urinary tract infection guidelines increased from 44% at baseline to 82% at the end of the study.

Women between the ages of 18 and 65 years were randomly selected for review using computer-generated randomization. The study was conducted before and after the intervention between 2010 and 2012 at MetroHealth Medical Center. MetroHealth Medical Center is an academic urban level 1 trauma center averaging 90,000-100,000 emergency department visits annually of which approximately 200-300 visits per month include any urinary tract infection associated diagnosis. Excluded from the study were pregnancy, known significant structural or functional urological abnormalities, urinary tract instrumentation within the preceding seven days, residency in a skilled nursing facility, inability to give a history, or current suppressive antibiotic therapy to prevent urinary tract infections and diabetes. The study was conducted during twelve specified months over a three year time period. Two hundred patient visits (50 during each of 4 specified months February, March, November, December 2010) before any intervention, 200 patient visits (50 during each 4 specified months February, March, September, October 2011) after the electronic order set intervention (period 1), and 200 patient visits (50 during each of 4 specified month February, March, September, October 2012) after the audit and feedback intervention (period 2) meeting inclusion criteria were included in this study. There were no significant differences in patient characteristics between baseline, period 1 and period 2. Demographic and clinical data were abstracted from the electronic medical record by three of the authors using a standardized data collection form with detailed instructions on how each variable was defined. Each chart was reviewed at least twice for accuracy of data collection. Patients' medical records were reviewed for eight weeks following the emergency department visit to evaluate for

treatment failure and for adverse events related to treatment. The 2010 updated IDSA guidelines (Gupta et al., 2011) were reviewed by three key emergency department personnel after publication. The methodology appears to be sound and results should be considered valid.

Data were analyzed with the use of STATA 11. The baseline was compared with period 1 and period 1 was compared to period 2 using unpaired Student t- and Kruskal-Wallis tests for normally and non-normally distributed data, respectively. The Pearson Chi-square test and Fisher's exact tests were used for categorical data as indicated. In comparison to baseline, after implementation of the electronic order set (period 1) overall adherence to recommended urinary tract infection treatment regimens increased from 44% to 68% (P<.001), adherence to the recommended antibiotic choice increased from 70% to 89% (P<.001), and adherence to the recommended duration of treatment improved from 62% to 75% (P<.005). In comparison to period 1, after audit and feedback overall adherence to treatment guidelines increased further from 68% to 82% (P<.015), that was attributable to increased adherence to the recommended duration of treatment from 75% to 88% (P=.017). Adherence to recommended antibiotic choice was similar in periods 1 and 2 (89% an 90%, respectively; P=.74). In comparison to baseline, after implementation of the electronic order set (period 1), unnecessary urinary tract infection days of therapy for the 200 patients evaluated in each period decreased fro 250 unnecessary days to 119 unnecessary days (P<.001). In comparison to period 1, after audit and feedback, unnecessary days of therapy for the 200 patients evaluated decreased significantly further to 52 unnecessary days (P<.001). This study was supported by the

Centers for Disease Control and Prevention and by the Department of Veterans Affairs. There were several limitations to this study listed. The study was conducted at a single institution and intervention was specific to the department workflows, patient population of that institution. Financial incentive checks began for the use of urinary tract infection order sets as one of the emergency department's quality indicators. Financial incentive checks began three months after the implementation of the order set and after collection of the first two period 1 data points. However, there was no difference in adherence during period 1 before versus after the financial incentive was added for use of the order set (67% versus 69%; *P*=.88). Despite the limitations this study can be considered reliable.

This study can be considered applicable to the PICO-T question and practice because it offered evidence that providers can be educated to use evidence-based practice guidelines. The improvement in adherence to guidelines was achieved through a simple intervention that required minimal resources. The population, intervention and outcome were similar to the PICO-T question.

Dellit et al. (2007) developed guidelines for developing an institutional program to enhance antimicrobial stewardship. The guidelines were collaboratively reviewed and the recommendations supported by the following organizations: American Academy of Pediatrics, American Society of Health-Systems Pharmacists, Infectious Disease Society for Obstetrics and Gynecology, Pediatric Infectious Disease Society, Society for Hospital Medicine, and Society of Infectious Disease Pharmacists. The guidelines are focused on hospital-based stewardship programs. The primary goal of antimicrobial stewardship is

to optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms and the emergence of resistance.

The recommendations in this guideline are based on a review of published studies identified through a search of the PubMed database. Committee member included results from prospective cohort studies, case control studies, longitudinal time series, and other descriptive studies because of the limited number of randomized control trials. Recommendations reflect a compilation of the studies in each section, as well as the opinions of the committee members. Under active antimicrobial stewardship strategies was a recommendations of prospective audit of antimicrobial use with direct interaction and feedback to the prescriber can result in reduced inappropriate use of antimicrobials. The strength of the recommendation and quality of evidence was rated using IDSA criteria and this recommendation was listed as A-I. The strength of recommendation was listed as A defined as good evidence to support a recommendation for use. The quality of evidence was listed as I and defined as evidence from $\geq$ properly randomized control trial. The authors found that effective audit with intervention and feedback can be facilitated through computer surveillance of antimicrobial use, allowing the targeting of specific services or units where problems exist, as well as identification of patients receiving particular agents or combinations of agents that might benefit from intervention. A supplemental antimicrobial stewardship strategies was education. The recommendation states that education is considered to be an essential element of any program designed to influence prescribing behavior and can provide a foundation of

knowledge that will enhance and increase the acceptance of stewardship strategies. The

strength of the recommendation and quality of evidence was rated using IDSA criteria

and this recommendation was listed as A-I. The committee members supplemented

reviews of references of relevant articles to identify additional reports. Individual studies

were evaluated both for their impact on the targeted antimicrobial or resistance problem

and for any secondary impact on local antimicrobial use and resistance patterns. This

guideline was based on a limited number of randomized control trials and included author

opinions but was considered valid and reliable.

This study is considered applicable to the PICO-T question and practice because it

provided evidence that education, audit and feedback can result in reduced inappropriate

use of antibiotics. The population, intervention and outcome were related to the PICO

question and outcome.

Conclusions

This chapter critically appraised four systematic reviews, one randomized control

trial, two current evidence-based guideline, a retrospective review, and a before and after

intervention study. Based on the evidence provided, the literature concluded the

international clinical practice guidelines for the treatment of acute uncomplicated cystitis

and pyelonephritis in women (Gupta et al., 2011) are the optimal treatment guidelines of

acute uncomplicated urinary tract infections. Providers do not always follow current

guidelines. Inappropriate treatment of a urinary tract infection can have severe

implications for the patient, development of antibiotic resistance and for health care costs.

Providers need to be educated and keep up with current clinical practice guidelines for

prescribing antibiotics. Improvement to adherence of clinical guidelines can be enhanced by simple interventions.   Roque et al. (2014) concluded that antibiotic use could be improved be educational interventions, being mostly used multifaceted interventions.

Chapter Three: Organizational Framework of Theory or Conceptual Model for

Evidence Based Practice Change

A theoretical or conceptual framework is made up of a number of interrelated statements that attempt to describe, explain, and predict a phenomenon (Melnyk & Fineout-Overholt, 2005). The use of a theoretical or conceptual model is important to advance practice nurses in order to translate research findings into evidence-based practice to provide the highest quality of care and improve patient outcomes. Conceptual models evolve from the empirical observations and intuitive insights of scholars or from deductions that creatively combine ideas from several fields of inquiry (Fawcett, 2005). This chapter will discuss the conceptual model for evidence-based practice change.

The Rosswurm and Larrabee Model (1999) was chosen for this evidence-based practice change. This model guides practitioners through the entire process of evidence-based practice and was adopted as a standard of care delivery in acute care settings (Melnyk & Fineout-Overholt, 2005). This model incorporates elements of evidence-based practice, research utilization, standardized language, and change theory (Rosswurm & Larrabee, 1999). This model adapts the existing evidence-based practice which incorporates teaching providers and nurses the evidence-based practice model while also evaluating the possibility of changing clinical practice (Pipe, Wellik, Buchda, Hansen, & Martyn, 2005). After a clinical problem has been identified, it is stated as a clinical question that is focused and answerable by searching the literature (Pipe, Wellik, Buchda, Hansen, & Martyn, 2005). The Rosswurm and Larrabee Model involves a six-step model for incorporating evidence-based practice into clinical practice including assessing the

need for change in practice; linking the problem with interventions and outcomes; synthesizing the best evidence; designing a change in practice; implementing and evaluating the practice; and integrating and maintain the practice change (Rosswurm & Larrabee, 1999).

Rosswurm and Larrabee (1999) define each of the six phases. The first step is to assess the need for change in practice by including stakeholders and identifying the problem. The participation in the antimicrobial stewardship committee supports the necessity of antibiotic stewardship to combat antibiotic resistance and to collect internal data about current practice and compare internal data with external data. This comparison will specify the need for a practice change or if the current clinical practice is validated. The need for change was assessed by reviewing urinary culture results compared to the prescribed antibiotics. It was noted that the prescribed antibiotics were not always consistent with current clinical guidelines and some were not consistent with local microbial resistance pathogens. Upon identifying the focused problem, a PICO-T question was developed and a practice change opportunity presented itself.

The second step focuses on locating the best evidence. A comprehensive review of the literature was conducted by searching multiple databases. These sources assisted in linking the problem, intervention and outcomes using standardized systems and language. They also identified potential interventions and activities and select outcomes indicators. The problem of non-compliance with current clinical guidelines was linked to the need for intervention with education on current clinical guidelines and the outcome measurement of an increase in the use of first-line antibiotics in an emergency

department following the international clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women (Gupta et al., 2011).

The third step involves synthesis of the best evidence by searching research literature related to major variables, critiquing and weighing evidence, synthesizing best evidence and assessing feasibility, benefits and risks. Studies critically appraised included systematic reviews, randomized controlled trials, cohort, qualitative and evidence-based studies. The evidence supports the need for practice change because a urinary tract infection is a common illness and needs to be treated correctly.

The fourth step designs practice change by defining proposed change, identifying needed resources, defining implementation process and defining outcomes. The Rosswurm and Larrabee Model (1999) was utilized to design the evidence-based practice change to educate all practitioners in the emergency department. After all of the literature is reviewed, a synthesis of the best evidence is documented outlining the change in practice in the form of a procedure, protocol, or standard (Rosswurm and Larrabee, 1999). The project leader took into consideration the culture, environment and stakeholders involved in the practice change. Baseline data was collected for comparison. The ED providers received a questionnaire regarding the treatment of uncomplicated, community acquired urinary tract infections. They then received the current clinical guideline for the treatment of uncomplicated, community acquired urinary tract infections. Prescriptions written for urinary tract infections were studied one month before and one month after the education. The expected outcome was an increase the use of first-line antibiotics as current clinical guidelines recommends.

The fifth step implements and evaluates the change in practice with pilot study demonstration, evaluates process and outcome, and decides to adapt, adopt, or reject practice change (Melnyk & Fineout-Overholt, 2005). The education was given and the use of the International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women (Gupta et al., 2011) would be implemented in the emergency department. Post intervention was collected and compared to the baseline data.

The sixth step integrates and maintains change in practice by communicating recommended change to stakeholders, presenting staff in-services education on change in practice, integrating into standards of practice and monitoring process and outcomes. The providers understand the use of the recommended evidence-based guidelines. Compliance with use of this guideline was monitored with re-education of the providers if necessary. Change is a continuous process and requires persistence. The practice change and evidence found were discussed with the antimicrobial stewardship committee and recommendations were discussed to expand this project change and make it into a policy.

The Rosswurm and Larrabee Model (1999) relates to the proposed PICO-T question. The model provides a pragmatic, theory-driven framework for empowering clinicians in the process of evidence-based practice (Pipe, Wellik, Buchda, Hansen, & Martyn, 2005). This model guides practitioners through the entire process of changing to evidence-based practice, beginning with the assessment of the need for the change and ending with the integration of an evidence-based protocol (Rosswurm & Larrabee, 1999).

There was a need for a change in practice which the PICO-T question focuses and guides the framework. A problem was linked to an intervention and outcome, the evidence was synthesized for best evidence. A practice change was designed, implemented and evaluated. The change in practice was integrated and maintained.

Chapter Four: Project Design

The purpose of this project was to review current clinical practice guidelines aimed at improving antibiotic prescribing by providers in an emergency department setting. Continuing education in healthcare is to gain current knowledge and skills to provide the best patient care. Staff continuing education will lead to practice efficiency, job competency and patient satisfaction. The current clinical question is: "Will the adoption with implementation of clinical practice guidelines for uncomplicated, community acquired urinary tract infection increase the use of first-line antibiotics in adult women aged 18 and older diagnosed with a urinary tract infection, in an emergency department setting within three months"?

Institutional Review Board approval was obtained through Misericordia University on May 12, 2015 (Appendix B). The submission was an exempt review since the project involved an educational program with minimal risk. Approval from the institutional review board at Wilkes-Barre General was not needed for this project. Once approval was obtained by the Institutional Review Board, the project was implemented.

The project was focused on standard practice, in infectious disease management. The design of this evidence-based practice change project included an introductory cover letter (Appendix C), informed consent (Appendix D) to participate in the project and a pre-education questionnaire of clinical knowledge (Appendix E) followed by an educational presentation to providers that reviewed current clinical guidelines for the treatment of urinary tract infection. The 2010 clinical practice guidelines for Acute Uncomplicated Cystitis in women by the Infectious Diseases Society of America (Gupta

et al., 2011) were emailed and distributed to prescribers at Wilkes-Barre General

emergency department. A post-education questionnaire was given in one month after the

educational program (Appendix F). The questionnaires were left in each prescriber's

mail box each time and the providers were instructed to voluntarily leave the completed

questionnaire in a locked collection box in the medical director's office and were

destroyed at the conclusion of the project. The practitioners were asked to complete the

questionnaires without identifying marks on the paper. The questionnaires were

compared for improvement in prescribing habits and provider knowledge base regarding

first-line treatment of urinary tract infections. Adherence to the clinical guideline was

studied through the use of IBEX Pulse Check, the emergency department's computer

system, one month before and one month after the education and distribution of the

clinical guideline. Anonymity was assured by not having any names on the questionnaire

and names on prescriptions were kept confidential by the researcher and data was de-

identified by removing name, date of birth and medical record number and the data was

analyzed in aggregate. The only data collection tool needed for this project was a locked

box. Resources needed for this project, paper and ink, was purchased at Staples. Staples

multipurpose paper was purchased at $8.49. HP black ink cartridge was purchased for

$41.33. These monies were minimal and justified under the budget for this project. This

project did not involve direct patient care. There was no coercing of any prescribers to

participate in this study. There was no loss of benefit for refusal to participate in this

project. The outcome was to increase the use of first-line antibiotics in an emergency

department following the international clinical practice guidelines for the treatment of

uncomplicated, community acquired urinary tract infections in women. Improvement to following the current clinical guidelines can be improved with a simple intervention that requires minimal resources such as, education. Education has been found to be most effective when paired with corresponding interventions and measurement of outcomes (Dellit et at., 2007). Educating clinicians about resistance and optimal prescribing is one of the core elements of hospital antibiotic stewardship programs (Center for Disease Control and Prevention, 2014). The results of this study will be presented for a Doctor of Nursing Practice Capstone Project at Misericordia University.

Chapter Five: Implementation Procedures and Processes

Implementation of this evidence-based capstone project began after extensive planning for the education and clinical practice initiative. This capstone project was an evidence-based project completed by a doctoral nursing student at Misericordia University to meet the requirements for graduation from the Doctor of Nursing Practice program. Chapter Five presents the details of the implementation phase of this capstone project.

The project coordinator implemented the project at the Wilkes-Barre General Emergency Department located in Wilkes-Barre, Pennsylvania. Patricia Ihnat, DO, Department of Emergency Medicine, Chairman/Medical Director and preceptor, fully supported the integration of this capstone project. Participants in this project were the current providers employed at the emergency department including physicians, nurse practitioners, and physician assistants. A letter of support was received from the Medical staff president, Gary Decker, MD who is also section chief of Infectious Disease (Appendix G).

After determining a need for change and formulating a PICO-T question the literature was reviewed and the planning for implementation began. To begin the implementation, a meeting was held with the project coordinator and her preceptor, Dr. Ihnat, to discuss timing and scheduling for the project. A timeline was developed to ensure that the project would be completed as anticipated (Appendix H).

Implementation began after IRB approval (Appendix B). To begin the implementation, a cover letter was sent to the emergency department providers

(Appendix C). The cover letter explained the upcoming project and what will be asked of them. The providers were asked to participate in a project to evaluate the prescribing habits of providers for uncomplicated urinary tract infections. A letter of informed consent was distributed to the staff (Appendix D). The informed consent was signed by participating staff. The providers were informed that they were being asked to participate in a project to evaluate the prescribing habits of providers for uncomplicated urinary tract infections. The providers were also informed that there would be no coercing of any prescribers to participate in this study. There would be no compensation for participating in this project. There would be no loss of benefit for refusal to participate in this project. The project was supported enthusiastically by the providers.

The providers received a pre-questionnaire (Appendix E) regarding the treatment of uncomplicated, community acquired urinary tract infections five days after the informed consent. The pre-questionnaires were left in each prescriber's mail box and as instructed, they voluntarily left the completed questionnaire, anonymously, in the locked collection box in the medical director's office and the questionnaires were destroyed at the conclusion of the project. Prescriptions written for urinary tract infections were studied through the use of IBEX Pulse Check, the emergency department's computer system for one month. The day after the one month study, the providers were then given the IDSA guidelines for the treatment of urinary tract infection for review (Gupta et al., 2011).

Three days after the distribution of the guideline, prescriptions written for urinary tract infections were studied through the use of IBEX Pulse Check, the emergency

department's computer system, for one month. The providers received a post-questionnaire (Appendix F) regarding the treatment of uncomplicated, community acquired urinary tract infections five days before the end of the one month end period. The questionnaires were left in each prescriber's mail box and as instructed. The prescribers voluntarily left the completed questionnaire, anonymously, in the locked collection box in the medical director's office and were destroyed at the conclusion of the project.

The data from the questionnaires and the data from the two separate months studied through the use of IBEX Pulse Check were collected and analyzed by the project coordinator and conversed with their preceptor, Dr. Ihnat. The results of this study will be presented for a Doctor of Nursing Practice Capstone Project at Misericordia University.

Effective implementation of an evidence-based project is directly related to comprehensive planning of the project design. The project demonstrated the importance of keeping current with clinical guidelines.

Chapter Six: Evaluation and Outcomes

The project coordinator implemented an evidence-based practice change project and the intended outcome was to improve adherence to the current clinical practice guidelines by the providers (physicians, nurse practitioners and physicians assistants). A Doctor of Nursing Practice capstone project requires an effective evaluation process for determining outcomes to the practice change initiative. The project was implemented and the data was collected and analyzed with the results communicated in statistical manor that demonstrated the outcomes. The results demonstrate how advanced practice nurses contribute toward improving clinical practice. This chapter provides the evaluation and outcomes on educating the providers to improve adherence to the current clinical practice guidelines.

Prescriptions written for urinary tract infections were studied through the use of IBEX Pulse Check, the emergency department's computer system, for a 30 day period before and 30 day period after the education and distribution of the international clinical practice guidelines for the treatment of acute uncomplicated cystitis in women (Gupta et al., 2011). A retrospective chart review was conducted for those consenting to participate in the project. An informed consent (Appendix D) was signed by seventeen providers currently working at the emergency department. The providers voluntarily completed a five question pre-education questionnaire regarding the prescribing habits for treatment of acute uncomplicated urinary tract infections in women. The providers voluntarily completed a five question post-education questionnaire which had identical questions to the pre-education questionnaire, to evaluate for any modification in prescribing habits for

treatment of acute uncomplicated urinary tract infections in women. The data was calculated from the chart reviews and the questionnaires to evaluate whether there was improved adherence to current clinical practice guidelines by the providers.

There were two benchmarks established for this project. The first benchmark was the providers would score 80% on the pre-questionnaire and 100% on the post-education questionnaire. The second benchmark was that the providers would adhere to the current clinical guidelines 100%. These benchmarks were based on the premise that the providers previously had education on the treatment of uncomplicated urinary tract infections.

The t-test was significant ($p = 0.1$). There percentage of change for the adherence to clinical guidelines was -1000 which a positive change was demonstrated. The percentage of change for prolonged use was 58.69% and incorrect antibiotic was 16.67%, which were negative changes. Therefore, there was a positive change in the use of the current clinical guideline adherence from pre-education to post-education.

Table 1:
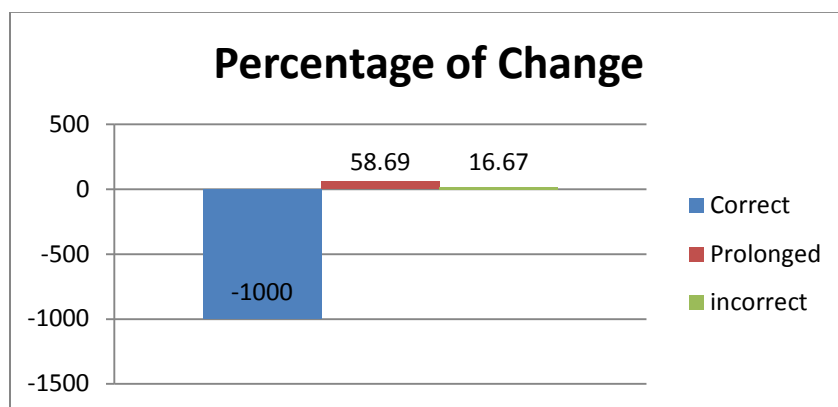
The pre-education questionnaire completed by 60% of the providers revealed a mean score of 80%. The 30 days that were studied pre-education revealed that out of 55 diagnosed uncomplicated urinary tract infections, 5.45% were treated according to current clinical guidelines. Treatment with the correct medication but with prolonged duration, seven or ten days, was 83.64% and 10.91% were treated with an antibiotic that was not listed on current clinical guidelines.

Table 2:
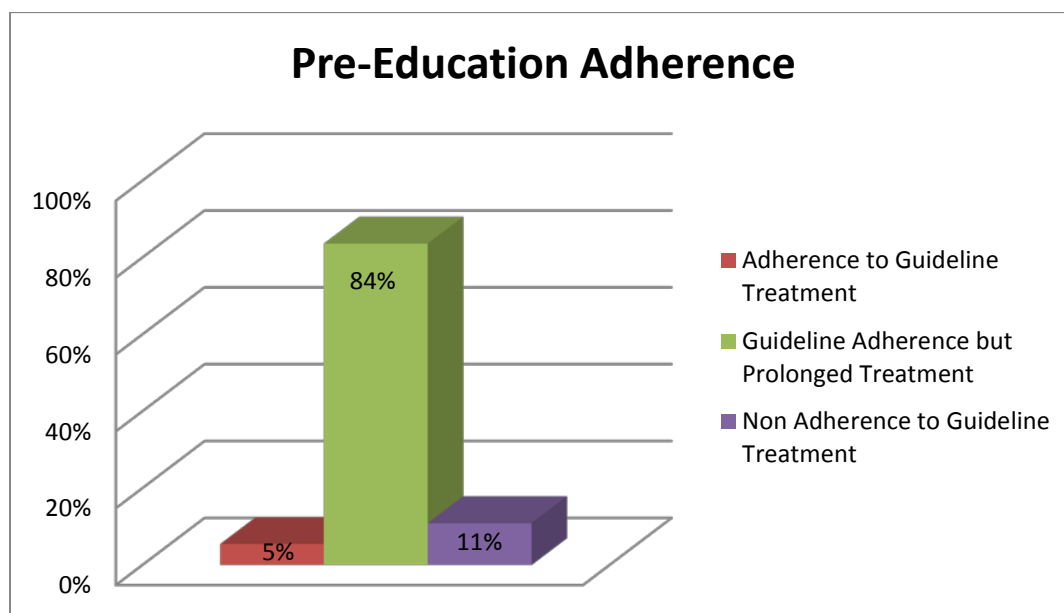
The post-education questionnaire completed by 60% of the providers revealed a mean score of 90%. The 30 days that were studied post-education revealed that out of 57 diagnosed uncomplicated urinary tract infections, 57.8% were treated according to current clinical guidelines. Treatment with the correct medication but with prolonged duration, seven or ten days, was 33% and 9.2% were treated with an antibiotic that was not listed on current clinical guidelines.

Table 3:

Post-Education Adherence

- Adherence to Guideline Treatment: 58%
- Guideline Adherence but Prolonged Treatment: 33%
- Non Adherence to Guideline Treatment: 9%
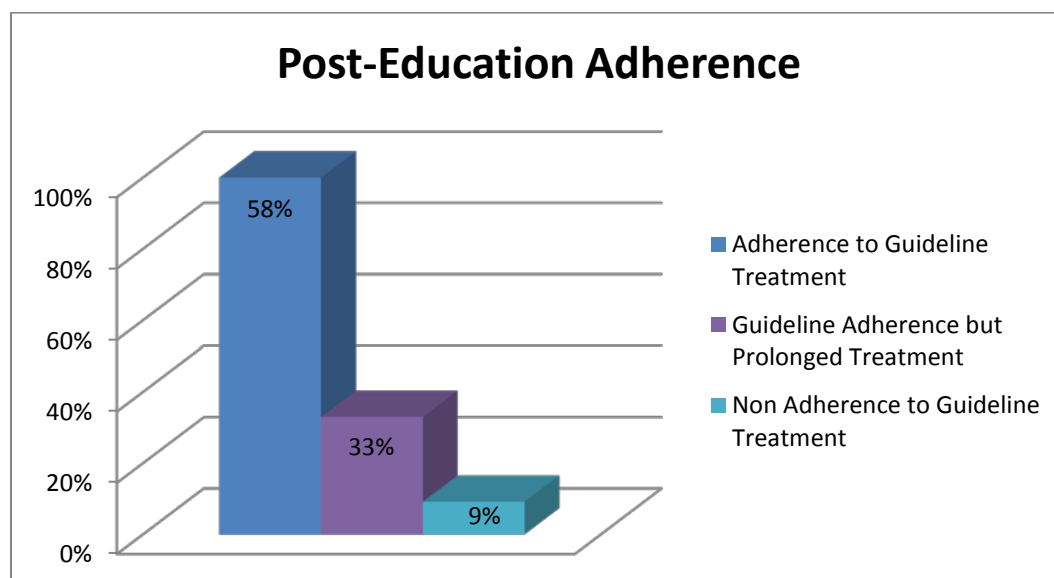
This project focused on improving provider education and adherence to current clinical guidelines for uncomplicated urine tract infections. Increased knowledge was demonstrated by an increase in the pre to post education questionnaire scores. Individual scores could not be evaluated due to anonymity of the questionnaires. Provider adherence to current clinical practice guidelines rose from 5% to 58%. Non adherence to the guidelines decreased from 11% to 9%. This indicates success in this education project.

Chapter Seven: Project Implications for Nursing Practice and Limitations

This chapter discusses the implications for nursing practice as it applies to the American Association of Colleges of Nursing (2006) *Essentials for Doctor of Nursing Practice* and this capstone project. The DNP Essentials address the foundational competencies that are core to all advanced nursing practice roles (American Association of Colleges of Nursing, 2006). The eight DNP Essentials are used as a guide for discussion of the project implications.

Essential I: Scientific Underpinnings for Practice

DNP Essential I addresses the integration of nursing science with knowledge from ethics, the biophysical, psychosocial, analytical, and organizational sciences as the basis for doctor of nursing practice. The DNP is prepared to utilize concepts and science-based theories as well as develop and evaluate new practice approaches bases on nursing theories and theories from other disciplines (American Association of Colleges of Nursing, (2006).

The implication for practice is that high-level evidence must be available for the capstone project to be successful. The DNP is prepared to research, assess, and design future initiatives to facilitate progressive changes in patient health using conceptual and theoretical approaches.

Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking

An organized effort to educate providers and provide an opportunity for clinical change was the focus for this evidence-based practice project. Proficiency in quality

management strategies ensured safe and cost-effective care. Clinical improvements were organized and evaluated to promote consistency in clinical practice for the treatment of urinary tract infections.

The implication for practice is the DNP graduate and this evidence-based practice project includes organizational and systems leadership component that emphasizes practice, ongoing improvement of health outcomes, and ensuring patient safety (American Association of Colleges of Nursing, (2006). The DNP graduate is capable of identifying areas of need and to strategically develop innovative plans to change practice and improve patient outcomes.

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

A comprehensive review of the literature was conducted from multiple databases. Existing scholarship was evaluated to determine the strongest evidence available to improve urinary tract infection treatment in clinical practice. The DNP graduate focuses on the translation of new science, its application and evaluation. The DNP graduate also generates evidence through their practice to guide improvements in practice and outcomes of care (American Association of Colleges of Nursing, (2006). The implication for practice is for the DNP to strive for clinical scholarship through dissemination and continued use of their skills in analytical methods to make evidence-based practice successful.

Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care

Information technology was utilized to gather, analyze and critique literature or resources for evidence-based practice. Information technology is used in health care to collect and store data, provide efficient communication and to obtain reimbursement. The implication for practice in this evidence-based practice project is to practice based on evidence and not by culture. Improvement and transformation of health care are improved by the use of information technology by utilizing evidence-based practice.

Essential V: Health Care Policy for Advocacy in Health Care

This evidence-based practice project leads the DNP through designing a change in the way urinary tract infections are treated in the emergency department at Wilkes-Barre General Hospital. This project identified urinary tract infection treatment as an area of health care that requires policy changes with regard to health professional education. The implications for practice are that DNP graduates are prepared by way of the capstone project to design, develop, and promote health are policy based on evidence. The DNP graduate has the capacity to engage proactively in the development and implementation of health policy at all levels, including institutional, local, state, regional, federal, and international levels (American Association of Colleges of Nursing, (2006).

Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes

This evidence-based practice project and the project coordinator lead the providers in education of urinary tract infection treatment for the benefit of the patients. Interprofessional collaboration can be effective, interdisciplinary communication method that is essential to ensuring the safest and highest quality of care for health care

recipients. The implications for practice are that DNP graduates are prepared in methods of effective team leadership and are prepared to play a central role in establishing interprofessional teams, participating in the work of the team, and assuming leadership of the team when appropriate (American Association of Colleges of Nursing, (2006).

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health

The patients being studied in this capstone project are the aggregate population and represent population health. This capstone project was designed to improve the treatment of urinary tract infections which will improve the health of the aggregate population. The implementation of clinical prevention and population health activities is central to achieving the national goal of improving the health status of the population of the United States (American Association of Colleges of Nursing, (2006).

Essential VIII: Advanced Nursing Practice

This evidence-based practice project is a comprehensive and systematic process that was developed based upon the identified need to improve the treatment of urinary tract infections. The implication for practice is that the DNP can act as a change agent in a health care system that is in need of education and change. The role of the DNP includes the dissemination of knowledge gathered from project implementation and evaluation. This information should be shared with stakeholders to demonstrate need for system changes.

Strengths and Limitations

The greatest strength of this project was the ease of a simple intervention such as education. A limitation of this capstone project was the small sample size. No all providers saw an equal number of uncomplicated urinary tract infections. Since there was not an equal distribution of the aggregate population, the overall adherence rate may not be reflective of the behavior pattern of all of the providers. The distribution of the patients diagnosed with uncomplicated urinary tract infections is unpredictable. Another limitation of this capstone project was that there was no guarantee that the providers read the clinical guidelines that were given to them.

Chapter Eight: Summary of Project and Conclusion

The purpose of this project was to present clinical practice guidelines to emergency department providers aimed at improving first-line antibiotic treatment and decreasing further illness, antibiotic resistance, and health care costs. The aim was to improve adherence to current clinical practice guidelines through education and practice support thereby decreasing antibiotic resistance, health care costs and disease.

The inquiring clinical question was: "Will the adoption with implementation of clinical practice guidelines for uncomplicated, community acquired urinary tract infection increase the use of first-line antibiotics in adult women aged 18 and older diagnosed with a urinary tract infection, in an emergency department setting within three months"? The project coordinator implemented an evidence-based practice change project after extensive planning and the intended outcome was to improve adherence to the current clinical practice guidelines by the providers at the Wilkes-Barre General Emergency Department located in Wilkes-Barre, Pennsylvania (physicians, nurse practitioners and physicians assistants). The providers were given a pre-education and post-education questionnaire to complete on the treatment of uncomplicated urinary tract infections. Prescriptions written for urinary tract infections were studied through the use of IBEX Pulse Check, the emergency department's computer system 30 days before and 30 days after the education of the current clinical guidelines. The data was calculated from the chart reviews and the questionnaires to evaluate whether there was improved adherence to current clinical practice guidelines by the providers.

Provider adherence to current clinical practice guidelines rose from 5% to 58%. Non adherence to the guidelines decreased from 11% to 9%. This indicates success in this education project. The results demonstrate how advanced practice nurses contribute toward improving clinical practice. The project demonstrated the importance of keeping current with clinical guidelines. Future implications of this project are the health benefits of decreasing further illness, antibiotic resistance, and health care costs for patients.

The results of this capstone project will be discussed at the next monthly ED meeting following the DNP presentation at Misericordia University. Future education and projects will be discussed for implantation at the meeting given the success of this project. The project and the results will also be discussed at the next Antimicrobial Stewardship Committee meeting following the DNP presentation. Future implications regarding the success of this project are the dissemination of this project throughout the hospital and the potential of future project developments. Future projects can include other hospitals in the area with the results being published in a Nurse Practitioner journal.

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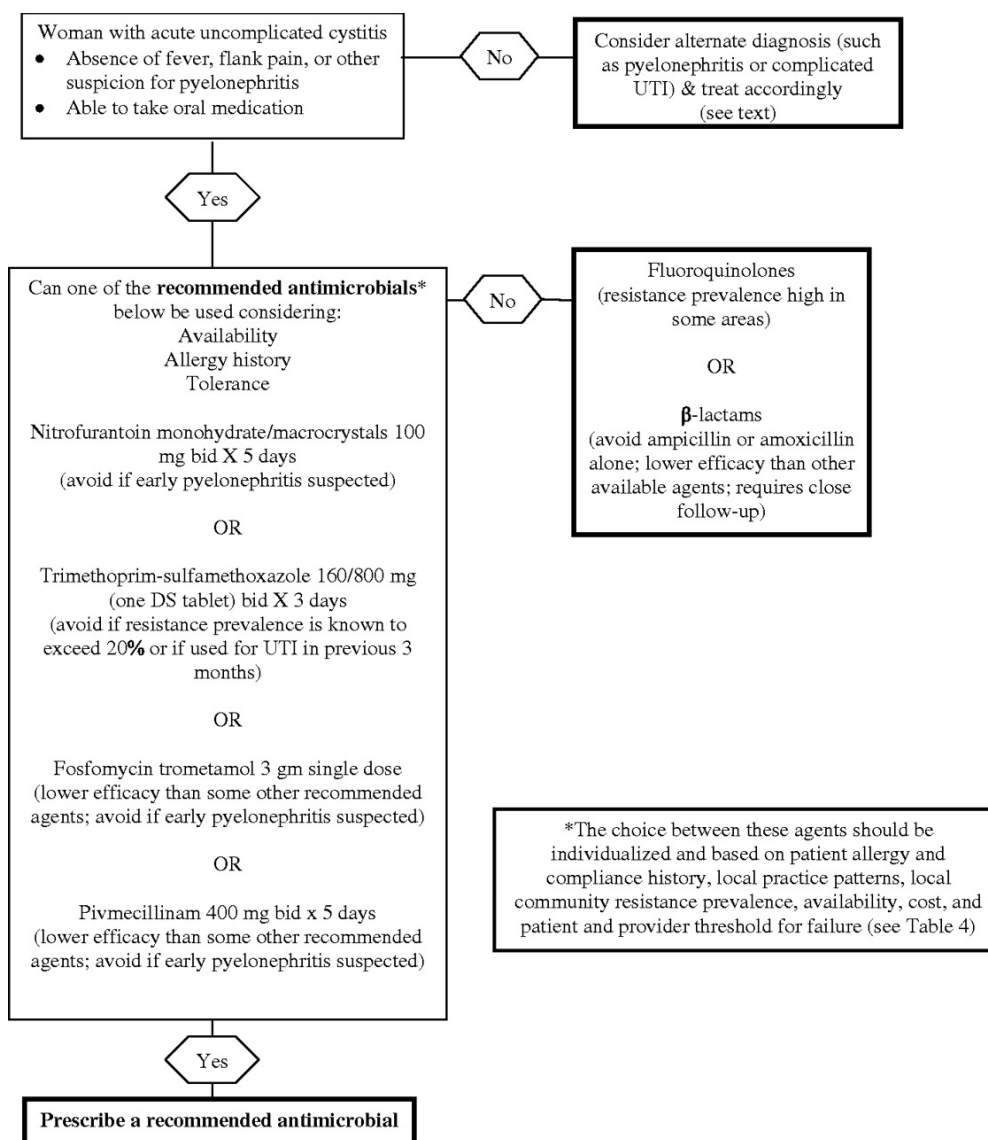office/2014/09/18/executive-order-combating-antibiotic-resistant-bacteria

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Appendix A

Approach to choosing an optimal antimicrobial agent for empirical treatment of acute uncomplicated cystitis.

Woman with acute uncomplicated cystitis
- Absence of fever, flank pain, or other suspicion for pyelonephritis
- Able to take oral medication

→ No → Consider alternate diagnosis (such as pyelonephritis or complicated UTI) & treat accordingly (see text)

↓ Yes

Can one of the **recommended antimicrobials*** below be used considering:
Availability
Allergy history
Tolerance

Nitrofurantoin monohydrate/macrocrystals 100 mg bid X 5 days
(avoid if early pyelonephritis suspected)

OR

Trimethoprim-sulfamethoxazole 160/800 mg (one DS tablet) bid X 3 days
(avoid if resistance prevalence is known to exceed 20% or if used for UTI in previous 3 months)

OR

Fosfomycin trometamol 3 gm single dose
(lower efficacy than some other recommended agents; avoid if early pyelonephritis suspected)

OR

Pivmecillinam 400 mg bid x 5 days
(lower efficacy than some other recommended agents; avoid if early pyelonephritis suspected)

→ No → Fluoroquinolones
(resistance prevalence high in some areas)

OR

β-lactams
(avoid ampicillin or amoxicillin alone; lower efficacy than other available agents; requires close follow-up)

*The choice between these agents should be individualized and based on patient allergy and compliance history, local practice patterns, local community resistance prevalence, availability, cost, and patient and provider threshold for failure (see Table 4)

↓ Yes

Prescribe a recommended antimicrobial

(Gupta et al., 2011)

Appendix B

MISERICORDIA
UNIVERSITY.

May 12, 2015

Carol Medura, MSN, DRNP, NP-C, DNP Student
Brenda Hage, Ph.D., DNP, CRNP
Nursing Department
Misericordia University
Dallas, PA 18612

Dear Ms. Medura and Dr. Hage:

Thank you for submitting the items requested by the IRB for your application *The Impact of Prescriber Education of Current Clinical Practice Guidelines for Management of Uncomplicated Urinary Tract Infections,* IRB Study Number 11-15-T1. Your study is now approved by the IRB.

As part of the approval, the IRB has received and accepted the consent form as submitted. The attached consent form with a valid period of eligibility is the only consent form to be used. Any modifications must be approved by the IRB. The date stamp indicates the eligible period.

You will be reminded one month prior to end date of your protocol, of your need to complete a Continuation or End-of-Project Report. You also have the responsibility to notify the IRB of any changes in the conduct of this study or injury to study subjects and to retain all approved application documents and signed consent forms for a minimum of three years following completion of the study (this includes student research). Please refer to the IRB Policies and Procedures document for specific details on what is expected.

If you have any questions, please feel free to contact me.

Sincerely,

McKinley H. Manasco, Ph.D.
Chairperson, IRB

Appendix C

Emergency Department Prescribers,

You will receive a questionnaire regarding the treatment of uncomplicated, community acquired urinary tract infections. You will then receive the current clinical guideline for the treatment of uncomplicated, community acquired urinary tract infections. Prescriptions written for urinary tract infections will be studied through the use of IBEX Pulse Check, the emergency department's computer system, one month before and one month after the education and distribution of the clinical guideline. The surveys will be left in each prescriber's mail box each time and will be instructed to voluntarily leave the completed questionnaire in a locked collection box in the medical director's office and destroyed at the conclusion of the project. The outcome will be to increase the use of first-line antibiotics in an emergency department following the international clinical practice guidelines for the treatment of uncomplicated, community acquired urinary tract infections in women. There will be no coercing of any prescribers to participate in this study. The results of this study will be presented for a Doctor of Nursing Practice Capstone Project at Misericordia University.

Thank you,

Carol Medura, MSN, CRNP, NP-C, DNP Student
89 Fawn Ridge Rd.
White Haven, PA 18661
570-443-0614

Appendix D

Informed Consent

The Impact of Prescriber Education of Current Clinical Practice Guidelines for
Management of Uncomplicated Urinary Tract Infections

You are being asked to participate in a project to evaluate the prescribing habits of
providers for uncomplicated urinary tract infections. You will be given a pre-
questionnaire to voluntarily fill out and leave in a locked box. You will then be given the
IDSA guidelines for the treatment of urinary tract infection for review. After a month
period of time, you will be given a post-questionnaire to voluntarily fill out and leave in a
locked box. The questionnaires will be compared for improvement in prescribing habits
and provider knowledge base regarding first-line treatment of urinary tract infections.
Prescriptions written for urinary tract infections will be studied through the use of IBEX
Pulse Check, the emergency department's computer system, one month before and one
month after the education and distribution of the clinical guideline. The surveys will be
left in each prescriber's mail box each time and will be instructed to voluntarily leave the
completed questionnaire in a locked collection box in the medical director's office and
destroyed at the conclusion of the project. The outcome will be to increase the use of
first-line antibiotics in an emergency department following the international clinical
practice guidelines for the treatment of uncomplicated, community acquired urinary tract
infections in women. There will be no coercing of any prescribers to participate in this
study. There will be no compensation for participating in this project. There will be no
loss of benefit for refusal to participate in this project. The results of this study will be
presented for a Doctor of Nursing Practice Capstone Project at Misericordia University.

All of my questions have been answered to my satisfaction and if I have any further
questions I may call Carol Medura, MSN, CRNP, NP-C, DNP Student,
medurac@misericordia.edu or call 570-443-0614 or Dr. Brenda Hage at
bhage@misericordia.edu or call 570-674-6760. If I have any questions about the rights
of project participants, I may call the Chairperson of the Misericordia University
Institutional Review Board at 570-674-8108.

Statement of consent: I have read the above information and I volunteer consent to take
part in this project.

Your signature_____ Date_____
Your name printed_____

Investigator signature_____ Date_____
Investigator printed _____

Appendix E

Prescriber Education of Current Clinical Practice Guidelines for Uncomplicated Urinary Tract Infections
Pre-Education Questionnaire

1. Are you an NP, PA, MD, or DO?_____
   How long have you worked in an emergency department? ____years, ____months
   Do you currently work in any other practice? _____

2. Do you follow current clinical guidelines for treatment of uncomplicated, community acquired urinary
   tract infections?

   ☐ YES
   ☐ NO

3. What is your choice of first-line antibiotics for treatment of uncomplicated, community acquired urinary
   tract infections with no known allergies? What is your second choice if unable to prescribe your first
   choice?

   1._____   2._____

4. What is the current guideline recommendation for the optimal treatment of uncomplicated urinary tract
   infection in adult nonpregnant, premenopausal women?

   a. Macrobid 100mg BID for 5 days   b. Cipro 250mg BID for 3 days
   c. Keflex 500mg BID for 7 days   d. Trimethoprim/sulfamethoxazole 160/800mg BID for 7 days

5. A patient presents with dysuria, fever and costovertebral angle tenderness, what is the first-line
   antibiotic for treatment?

   a. Macrobid 100mg BID for 5 days   b. Cipro 250mg BID for 7 days
   c. Amoxicillin 500mg BID for 7 days   d. Fosfomycin trometamol 3g in a single dose

Please voluntarily leave the completed questionnaire in the locked collection box in the medical director's
office and all questionnaires will be destroyed at the conclusion of the project.

You will soon receive the IDSA guidelines for treatment of urinary tract infection for review.

Thank you.

Carol Medura, MSN, CRNP, NP-C, DNP Student
89 Fawn Ridge Rd.
White Haven, PA 18661
570-443-0614

Appendix F

Prescriber Education of Current Clinical Practice Guidelines for Uncomplicated Urinary Tract Infections
Post-Education Questionnaire

1. Are you an NP, PA, MD, or DO?_____
   How long have you worked in an emergency department? _____years, _____months
   Do you currently work in any other practice?_____

2. Do you follow current clinical guidelines for treatment of uncomplicated, community acquired urinary tract infections?

   ☐ YES
   ☐ NO

3. What is your choice of first-line antibiotics for treatment of uncomplicated, community acquired urinary tract infections with no known allergies? What is your second choice if unable to prescribe your first choice?

   1._____   2._____

4. What is the current guideline recommendation for the treatment of uncomplicated urinary tract infection in adult nonpregnant, premenopausal women?

   a. Macrobid 100mg BID for 5 days   b. Cipro 250mg BID for 3 days
   c. Keflex 500mg BID for 7 days   d. Trimethoprim/sulfamethoxazole 160/800mg BID for 7 days

5. A patient presents with dysuria, fever and costovertebral angle tenderness, what is the first-line antibiotic for treatment?

   a. Macrobid 100mg BID for 5 days   b. Cipro 250mg BID for 7 days
   c. Amoxicillin 500mg BID for 7 days   d. Fosfomycin trometamol 3g in a single dose

6. Has reviewing the IDSA guidelines changed your prescribing practices for uncomplicated urinary tract infections?

Please voluntarily leave the completed questionnaire in the locked collection box in the medical director's office and all questionnaires will be destroyed at the conclusion of the project.

Thank you.

Carol Medura, MSN, CRNP, NP-C, DNP Student
89 Fawn Ridge Rd.
White Haven, PA 18661
570-443-0614

Appendix G

Wilkes-Barre General Hospital
An affiliate of Commonwealth Health
MEDICAL AFFAIRS

January 21, 2015

Misericordia University
Institutional Review Board
McAuley Hall, Room 1
301 Lake Street
Dallas, PA 18612

Dear Members:

I write this letter in support of Carol Medura for her Misericordia University capstone project for her Doctor of Nursing Practice degree.

Carol will be educating the Emergency Department providers on the current clinical practice guidelines for the treatment of uncomplicated, community acquired urinary tract infections in women.

Thank you.

Gary Decker, MD
Wilkes-Barre General Hospital
Medical Staff President

Appendix H

May 18, 2015
Distribute
pre-
questionnaire

July 9, 2015
Distribute post-
questionnaire

May 12, 2015
IRB Approval

June 12, 2015
Distribute
IDSA
Guidelines

Capstone Project Timeline

May 13, 2105
Distribute Informed
Consent
Day 1 of 30 day pre-
education

June 15, 2015
Day 1 of 30 day
post-education

June 11, 2015
Day 30 of pre-
education

July 14, 2015
Day 30 of post-
education collection