Prophylactic Antibiotics versus Non-Pharmacological Interventions for UTI Reduction and Prevention

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Urinary tract infections (UTI) are the second most frequently diagnosed infection in the elderly population. It is the most common infection diagnosed in patients residing in long-term care facilities (LTCFs) and cost over one billion dollars annually. (Matthews & Lancaster, 2011) The elderly have increased risk factors for UTI’s compared with younger adults. Comorbidities from chronic health conditions, such as diabetes and associated medications, can increase the risk of infection. Anatomical changes, as in benign prostatic hypertrophy (BPH), increase the risk even further.

UTI’s in older adults are often asymptomatic. Asymptomatic bacteriuria (ASB) occurs in, “55% of women and between 15% and 40% of men residing within LTCFs,” (Matthews & Lancaster, 2011, p. 287). Current research indicates that elderly patients with ASB do not necessarily require treatment. Symptomatic bacteriuria may include fever, dysuria, frequency, urgency, or suprapubic pain. Elderly patients can develop atypical signs such as, “change in mental status, lethargy, increased weakness, and complaints of abdominal pain,” (Matthews & Lancaster, 2011, p. 291). With the increase in antibiotic resistant bacteria strains, is prophylactic antibiotic therapy the best option for reducing and preventing UTI’s in the elderly?

The topic our group decided upon for the Evidence-Based Research Project in Nursing 350 is UTI prevention and reduction in the elderly. The PICO statement we chose is:

“*In elderly patients prone to UTI’s, what is the effect of prophylactic antibiotics on reducing or preventing UTI’s compared with non-pharmacological interventions.”*

**Methods**

To address that question, our group completed a literature review. Our group found 10 articles that focused on UTI reduction, prevention and/or prophylaxis. Each member of the group reviewed the articles and as a group we chose five that we felt were the most relevant. Inclusion criteria for the articles in the review include, current within the last five years, unless part of a landmark study, and a focus on interventions for reduction and/or prevention of UTI’s outside of antibiotic prophylaxis. All articles for this review were found using MEDLINE and CINAHL. Those studies include the research of interventions such as cranberry therapy, ultrasound bladder scanning, immunotherapy, herbal therapy and antibiotic prophylaxis.

The articles that were not included in the review were excluded for a variety of reasons. Shortliffe and McCue’s article “Urinary Tract Infection at the Age Extremes: Pediatrics and Geriatrics,” a level I on the hierarchy of evidence scale, was excluded based on the date of 2002 as well as the focus strictly being on antibiotic therapy. Damiano’s et al. article “Prevention of Recurrent Urinary Tract Infections by Intravesical Administration of Hyaluronic Acid and Chondroitin Sulphate: A Placebo-Controlled Randomised Trial,” a level II study, was excluded based on the procedure being very invasive compared to other treatments. It also focuses more on a different age group. Schweizer, Hughes, Macauley and O’Neill’s article “Managing Urinary Tract Infections in Nursing Homes: A Qualitative Assessment” ranked at a Level V on the Hierarchy of Evidence scale. We were able to find articles that were relevant to our review and that ranked higher, therefore we excluded it. Chazan, Dan, and Raz’s article “Cranberry Juice and Urinary Tract Infection” and Nowack and Schmitt’s article “Cranberry Juice for Prophylaxis of Urinary Tract Infections-Conclusions from Clinical Experience and Research” ranked level V and level I respectively. An article was used for the review that focused on cranberries. That article ranked at a level I and we felt it covered more information.

**The Articles**

Cranberries, in the form of juice or capsule, have been used for decades as prophylaxis for UTI prevention. It was originally thought that by ingesting cranberries the pH of the urine was altered to make it difficult for bacteria to grow. More recently, studies have indicated that cranberries actually contain a variety of organic substances that, when excreted in the urine, make it difficult for bacteria to adhere to the walls of the bladder. When bacteria, most commonly Escherichia coli (E. coli), are unable to adhere to the bladder walls, they are unable to infect the urinary tract. (Jepson & Craig, 2008)

Several of the articles reviewed focused or mentioned the use of cranberries in the prevention of UTI’s. Overall, the results have been positive but will require more age related testing. Jepson and Craig (2008), found, through a meta-analysis of ten studies with inclusion criteria of random control trials (RCTs) or quasi-RCT’s, that the ingestion of cranberries reduced the number of UTI’s experienced over a 12 month period. The results from this Level l review state “Cranberry products significantly reduced the incidence of UTI’s at 12 months (RR 0.65, 95% CI 0.46 to 0.90) compared with placebo/control” (Jepson & Craig, 2008, p. 1). The evidence found cranberry products more effective in women with recurrent UTI’s, than in the geriatric population (male or female) and in patients who need frequent catheterization.

In the meta-analysis review “Natural Approaches to Prevention and Treatment of the Lower Urinary Tract”, Head (2008), addresses several herbal remedies. In a study of 150 women who had completed antibiotic treatment to cure an E. coli UTI, the women were divided into three groups: cranberry/ligonberry combination, lactobacillus rhamnous GG, and a control group. The results found after six months of the trial, “there was a 20-percent reduction in UTI incidence in the cranberry group (eight cases, 16%) compared to the Lactobacillus (19 cases, 39%) and control (18 cases, 36%) groups” (Head, 2008, p.232). Matthews and Lancaster (2011) included results of a randomized study in their systematic review comparing cranberry extract to trimethoprim for UTI prophylaxis. The study compared 500 mg cranberry extract with 100 mg of trimethoprim daily over a 6-month time period. Results indicate a reduction in UTI development of 36.2% cranberry versus 20.5% trimethoprim (95% CI: 0.93-2.79; P=0.084). The study went on to support the use of non-antibiotic alternatives for prophylaxis against UTI’s. The study focused primarily on adult women of all ages including the elderly. More studies need to be completed to find the ideal dose but studies so far have used doses ranging between 100-500 mg of cranberry concentrate per day.

The use of ultrasound bladder scanning in reducing UTI’s was reviewed as promising in a meta-analysis by Barbone, Buchini, Deroma, and Palese (2010). Bladder scanning is a non-invasive alternative to unnecessary catheterizations. According to Barbone et al. “The use of the ultrasound bladder scanner for evaluating residual volume in immediate postoperative patients, aged 18 or above, reduces unnecessary catheterisations and therefore the risk of UTI” (p. 2976). The inclusion criteria for the study were immediate post-operative adults age 18 and over. This article was included in our review for several reasons. The article is a meta-analysis which ranks it at a level l on the hierarchy of evidence scale. Bladder scanners are a very common piece of equipment that is available in LTCFs. The elderly patients in LTCFs are frequently straight catheterized if they have not voided after a certain length of time. More studies with the use of bladder scanners in geriatric patients should be completed before recommendations are made, however, based on the results in other areas, it stands to reason there will be some measure of effectiveness in the geriatric population.

Immunotherapy using an E.coli extract (OM-89) was evaluated for UTI reduction and prevention in the level l systematic review by Meridith, Chiavaroli, and Bauer (2009). The review included “placebo-controlled and open label trials in both adults and children (and) have confirmed the clinical relevance of the immunological findings” concerning the role of OM-89 in the reduction and prevention of UTI’s (p. 3). One of the studies included in the meta-analysis a “double blind, randomized, placebo-controlled trial” consisted of 64 patients (Meridith, Chiavaroli, and Bauer , 2009, p. 5). Those patients not only had a history of frequent UTI’s but presented with an acute UTI. They showed a significant reduction in UTI’s during the treatment period (1 capsule/day OM-89 for 3 months) as well as in the follow up period of 3 months. In another study that included 160 patients (83% female):

The total number of recurrent UTI’s was significantly lower (p<0.001) in the OM-89 group: 31 versus 59 in the treatment phase and 27 versus 55 in the follow up phase, with the overall mean number of UTI’s in the OM-89 group being half (0.7) of that in the placebo group (1.5) (Meridith, Chiavaroli & Bauer, 2009, p. 3).

Furthermore, OM-89 showed some positive effects in the reduction of UTIs caused by pathogens other than E. coli. Proteus mirabilis and Klebsiella pneumonaie are the third and fourth most common pathogens in UTIs, E. coli being first causing 80% of UTIs and Staphylococcus aureus as second.

Prophylactic antibiotic therapy has demonstrated positive results in the reduction of UTI’s in men and women of all ages. Commonly used antibiotics for prophylaxis include: co-trimoxazole, β-lactam antibiotics, fluoroquinolones and nitrofuratoin. Although effective, different treatment options need to be explored due to adverse side effects from antibiotic use and the increasing prevalence of antibiotic resistant pathogens (Matthews & Lancaster, 2011).

**Conclusion**

At this time, more research needs to be conducted in regards to different prophylactic treatments for UTI’s. The studies analyzed showed cranberries had some effectiveness in reducing and preventing UTIs. With this, more studies need to be completed to determine the best form and dosage of cranberries and the effectiveness of such on the geriatric population. The use of bladder scanning showed promise in reducing catheter related infections in post-operative patients. Studies in the geriatric population should be completed to assess the effectiveness in that population. Immunotherapy appears to have positive effects on reducing and preventing UTI’s caused by E. coli. Immunotherapy has also demonstrated some promise in reducing and preventing UTI’s caused by Staphylococcus aureus, Proteus mirabilis and Klebsiella pneumonaie. Prophylactic antibiotics are effective in reducing and preventing UTI’s, however, the risks of use may outweigh the benefits in the long term perspective. Adequate hydration and hygiene will help reduce the rates of infections. Frequent toileting and hand washing should also be encouraged. By reducing the rate of UTIs in the elderly population, it helps reduce comorbidities and comortalitites for the elderly patient. Along with these changes, health care costs will also decrease. In addition, many urinary tract infections can be decreased with education, good nursing care and standard precautions, thus improving overall patient care and promoting positive outcomes.

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