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An Evidence-Based Approach to
Asymptomatic Bacteriuria in the Elderly

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Abstract

Asymptomatic Bacteriuria in the Elderly

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Description of asymptomatic bacteriuria prevalence and clinical significance, both at the individual and population level followed by a literature review of the evidence of asymptomatic bacteriuria's impact on clinical outcomes in the elderly. The literature review results reveal that asymptomatic is a common and benign condition in the elderly and the results support current published guidelines, developed by IDSA and URA, stating that asymptomatic bacteriuria should not be screened for or treated with antibiotics in the elderly. A brief discussion of the factors contributing to provider non-adherence to guidelines and strategies to improve antimicrobial stewardship is included.

Mrs. R is an 89-year-old, independent, cognitively intact, individual living in an assisted living facility. Her primary health care needs are being met by a team of providers who visit her monthly and who also are available 24 hours a day for consultation. One day her youngest daughter arrives for a visit and finds her mother more tired than usual, though her mother explains that she was busy the previous day taking part in a cribbage tournament and pot-luck dinner. This daughter notifies the ALF RN of her concerns and requests that action be taken. The ALF RN promptly notifies the primary provider and requests a urinalysis. The provider declines to order the urinalysis in the absence of specific symptoms. Later that evening the daughter visits and demands to know why the test hasn't been done yet as her mother has had urinary tract infections in the past. She takes her mother to the nearest urgent care, where the urinalysis and culture is performed, shows bacteriuria, and an antibiotic is received. The following day, Mrs. R develops gastrointestinal upset from the antibiotic and while attempting to reach the bathroom in the middle of the night suffers a fall and fractures her hip. This is an unfortunate, common, and potentially preventable event. The question must be asked, in elderly individuals does antimicrobial treatment of asymptomatic bacteriuria improve patient outcomes

or does it pose unnecessary risks and contribute to adverse events, such as the scenario described above?

It is important to distinguish between asymptomatic bacteriuria (AB) and evidence of active urinary tract infection, which requires evidence of host injury, for many compelling reasons. Urinary tract infections are one of the most common indications for antibiotic use and though clinical guidelines exist stating that AB should not be treated with antibiotics, except in pregnant women and in those undergoing urologic procedures, research has shown that AB is in fact frequently inappropriately managed with antibiotics (Lin, 2012). Clinicians may erroneously believe that this practice is without consequence. In fact, antibiotic use is not without risk and may cause injury to the patient who may experience an adverse drug event. Inappropriate antibiotic use increases the potential for the development of drug resistant strains of bacteria and has substantial cost for an ineffective treatment thus constituting a serious threat to public health and a drain on limited health care resources. Rotjanapan and Dosa found that individuals receiving antibiotic therapy for UTI who did not meet McGeer criteria were 8.5 times more likely to suffer from clostridium difficile infection (2011). Anyone working in health care can certainly agree that this is a significant finding as the impact of c.difficile on an elderly individual can be staggering. The purpose of this paper will be to describe the features of AB in the elderly, review the relevant literature, and suggest strategies to improve provider prescribing patterns. A discussion of education suggestions for the wider public will also be included.

Asymptomatic bacteriuria (AB) is defined as the isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms or signs referable to a urinary tract infection. Specific signs include: urinary frequency, urgency, dysuria, and suprapubic pain. In women the presence of 2 consecutive

voided specimens with isolation of the same bacterial strain in $> 100,000$ CFU/ml, in men the collection of a single clean catch voided specimen with $>100,000$ CFU/ml, in either sex a single catheterized specimen of >100 of a single bacterial strain constitutes AB (Nicolle, 2004). AB is extremely widespread with the incidence rate depending on age, sex, and genitourinary abnormalities. Elderly individuals show high incidence rates of AB, estimates are 20% in healthy women living in the community >80 years, 6-15% of community dwelling men >75 years, and a startlingly high estimate of 25-50% for both sexes in long-term care facilities (Matthews, 2011). The most functionally impaired have the greatest rates of AB while those with long-term catheterization have rates of AB of nearly 100% (Abrutyn, 1994). Interestingly, the type of bacteria causing AB is thought to differ from the more virulent strains causing acute UTI (Rodhe et al, 2008). These rates confirm that all providers for a geriatric population will be exposed to individuals with AB and should be confident in their understanding of this condition as opposed to acute urinary tract infection.

Confounding factors confronting providers include the often atypical presentation of urinary tract infection in elders as well as the inherent difficulty assessing symptoms in cognitively impaired elders. Multiple criteria systems exist in order to assist with diagnosis. The McGeer criteria were developed to assist in the surveillance of common infections in the long-term care setting. Regarding acute UTI, McGeer criteria call for antibiotics only if an older patient has three of these five symptoms: a fever; increased frequency or urgency of urination, or burning associated with it; pain behind or near the bladder; a change in the smell or appearance of urine; or deteriorating function or mental state (Ratjanapan & Dosa, 2011). Symptoms must be new or acutely worse, not chronic. Clinicians are advised to consider non-infectious causes for symptoms as well. Research has found that urinary culture for diffuse, non-specific

symptoms in the institutionalized elderly yields no useful information in regards to etiology (Sundvall et al, 2011).

The literature surrounding AB is limited by the fact that small numbers of randomized controlled studies have been completed and that each of them focuses on a subset of the geriatric population. Relevant outcome measures for treatment of AB include: mortality rates, morbidity, frequency of incontinence, and frequency of acute UTI following treatment. Additionally, as previously mentioned, a small amount of research has documented outcomes of adverse impacts of antibiotic use and the emergence of drug resistant strains of bacteria. Therefore, the population of interest will include elders of both sexes that live in institutional and noninstitutional settings, with discussion of the differences in approach between these populations.

Ouslander et al (1995) conducted a clinical trial to determine whether eradicating bacteriuria impacted the severity of incontinence among nursing home residents. This is an important outcome measure as incontinence affects nearly 60% of long-term care residents in the United States and the belief that antimicrobial treatment of bacteriuria reduces incontinence is widespread. The study utilized strong scientific methods with randomized controlled trial design and controlled for confounding variables. Researchers found no significant difference between treatment and non-treatment groups. Furthermore, individuals with pyuria fared no differently in regards to incontinence severity. Pyuria may be considered a laboratory marker and refers to the presence of increased numbers of polymorphonuclear leukocytes in the urine, a marker of the inflammatory response in the urinary tract. Pyuria accompanies other conditions as well, infectious and non-infectious in nature, and does not in itself contribute to the diagnosis of asymptomatic versus symptomatic urinary infection. Applicability is limited to nursing home

residents with stable incontinence, not to be confused with community dwelling elders with new onset incontinence. The small number of men in the study limited the power of the trial to reveal potential differences between sexes. An additional weakness in methods may be that the researchers utilized clinician definition of bacteriuria rather than epidemiologic standard, 50000 CFU in one culture, rather than 100,000 CFU in two cultures. Additionally, the researchers only assessed short-term impact of treatment on incontinence severity and there was no discussion of the power necessary to decrease probability of a type II error. A comprehensive explanation of inclusion/exclusion selection criteria was present. These results are consistent with the majority of previous research and support current guidelines that treatment of AB does not impact incontinence.

Abrutyn et al (1994) asked the important question of whether bacteriuria contributes to mortality in elderly ambulatory women. They utilized a cohort and controlled clinical trial design. They found that bacteriuria was unrelated to mortality. The longitudinal study compared mortality rates of those with and without bacteriuria over a 9-year period and the double blind, controlled trial looked at mortality rates after antimicrobial treatment for AB to determine whether treatment decreased mortality. Rigorous scientific methods with complete disclosure and description of methods were used. Full discussion of the necessary power to detect a difference in the treatment vs non-treatment group was included. Though the necessary number was disclosed, the actual number of individuals participating in each group was slightly lower, thus weakening the degree of confidence in the results. These finding contradicted a small number of earlier studies, which did show a connection between bacteriuria and mortality rates. The researchers reviewed and discussed previous research findings and consciously designed their study with the weaknesses of previous work in mind. They employed a rigorous definition

of bacteriuria, allowed for identification of individuals who became bacteriuric during the course of the study, and medical and functional status were carefully assessed and controlled. The findings suggest that treatment with antimicrobial agents for AB is not necessary if the purpose is to reduce mortality. The impact on morbidity was not assessed in this study and this is an important distinction.

Nicolle et al (1983) examined bacteriuria in elderly institutionalized men, defined characteristics of bacteriuria, and performed a randomized controlled trial of treatment versus no treatment. They found a bacteriuria prevalence rate of 37%, which is consistent with previous research. Results revealed no difference between the treatment and non-treatment groups with the incidence of bacteriuria and mortality rates similar between groups. They found three instances of superinfections, no adverse effects from treatment, and no evidence that bacteriuria contributed to death in any individual. An important conclusion the researchers made is that once bacteriuria occurred in this population it persisted or recurred. Poor functional status was mentioned as a likely contributing factor to this finding, which is not consistent throughout the literature. No tie was found between bacteriuria and renal failure, though the researchers did not employ rigorous monitoring of renal function. The major conclusion made is that bacteriuria in this population is a relatively benign condition and any impact on mortality is indirect. These findings are certainly clinically significant, and would impact practice a great deal. If one feels confident that eradicating bacteriuria in elderly men is futile, one would certainly not start antimicrobial treatment lightly. It is again important to note that these findings are applicable to a small subset of elderly individuals and apply in the absence of symptoms.

Boscia et al (1987) conducted a randomized controlled trial to determine the efficacy of antimicrobial treatment for bacteriuria in elderly ambulatory women. They specifically wanted to

determine if antimicrobial therapy was effective in eliminating bacteriuria . The fact that one must be able to effectively eradicate bacteriuria before determining its impact on morbidity and mortality is vital. A strength of this study is the large sample size of over 500 women from both institutionalized and independent senior housing thereby increasing the generalizability of findings. Strict definition of bacteriuria was adhered to in study design and randomization was blinded. Functional assessment was made, but was simply defined as intact or impaired. Of note is that of the 124 women found to be bacteriuric none had symptoms. No evidence of adverse drug reactions was found with short or 2 week treatment. Results were consistent with previous research in that no increase in mortality was found in the untreated bacteriuric group, but departed from earlier research by showing that treatment was effective in eradicating bacteriuria at 6-month follow-up, though this effect did not extend to the subset of nursing home residents. The authors' note that the findings do not indicate that antimicrobial treatment should be undertaken without further evidence that eradication leads to improved outcomes.

Das et al (2011) examined the relationship between increased episodes of bacteriuria and adverse clinical outcomes in a group of nursing home residents. The researchers employed an observational cohort study design with a large sample size of 544 individuals. They did not find that AB resulted in increased episodes of acute UTI or hospitalization. Furthermore, the researchers were able to show a correlation between antimicrobial treatment for bacteriuria and the development of multi-drug resistant gram-negative rods (MDRGNR). An additional finding of great clinical significance, suggested by this study, is that a change in mental status in a nursing home resident is likely multifactorial and should not, on its own, prompt empirical antibiotic treatment for suspected urinary tract infection. These findings move the literature forward by quantifying the emergence of drug resistant strains due to inappropriate antimicrobial

treatment. These findings are generalizable to nursing home residents and possibly to assisted living facility residents.

Based on a review of the literature several recommendations can be made for clinical practice regarding bacteriuria in elderly individuals. A diagnosis of bacteriuria should be made based on strict guidelines. Providers should not routinely screen elderly individuals for bacteriuria as it is known that bacteriuria is common and unlikely to require treatment. The Infectious Disease Society of America (IDSA) has published guidelines that support this approach and the American Urology Association supports the IDSA guidelines. The U.S. Preventive Service Task Force Guidelines are also congruent with this approach (Lin, 2008). In summary, the research reveals that in elderly individuals the prevalence of asymptomatic bacteriuria is high, that it is not an independent predictor of mortality, that treatment does not eradicate AB in a majority of patients, and that treatment is associated with significant side effects as well as increasing antimicrobial drug resistance, a major public health risk.

The ubiquity of urinary tract infections and the presumed knowledge base of patients and families regarding the best treatment for UTI is a challenge, given the fact that a positive urine culture does not mean that an active infection is occurring or requires antibiotic treatment. The provider needs to examine the entire clinical picture, while the lay person may look only at the positive urine culture. The desire for treatment is understandable given the fact that acute UTI can lead to serious illness, including sepsis and death. Families and patients who have experience with previous UTIs believe, at times erroneously, that all changes in observed behavior can be attributed to bacteriuria. Walker et al (2000) qualitatively explored the perceptions, attitudes, and opinions of physicians and nurses involved in prescribing antibiotics for AB in institutionalized elders and concluded that nurses are playing a central role in initiating

urinalysis and culture based on subtle functional and behavioral changes in residents. Content analysis of focus group discussions were made using an open analytic approach and found that the term “symptomatic” often referred to nonspecific symptoms, nurses often triggered the culture, and that communication breakdown frequently occurs during the reporting of culture results. Both physicians and nurses involved in the research felt that there was a definite need for educational interventions to improve prescribing practices, of note is that non-prescribing staff must be included in the educational intervention. Also mentioned, as a potential strategy to reduce inappropriate antibiotic use is the inclusion of interpretative comments with submission of culture results. Family pressure to do something when any change is observed in a loved one is part of the problem of provider poor adherence to guidelines. It is certainly easier to reflexively order a urinalysis or a short course of antibiotics than to provide the education and emotional support necessary to assuage a panicked family member's concerns. A recommendation may be to wait 48 hours and then reassess the need for further investigation in the absence of symptoms. Providing educational sessions with introduction of the McGeer criteria may also be beneficial. In dealing with ALF and LTC settings ensuring that all nursing staff are aware of the criteria is essential in order to prevent the occurrence of mixed messages being sent to families. Providers must develop comfort in knowing that doing less is often doing less harm. In regards to concerns about litigation, documenting the decision not to treat based on adherence to IDSA guidelines would be beneficial and likely protective.

In contrast to the above argument mention must be made of an opposing viewpoint that feels that current diagnostic tools may be responsible for inappropriate undertreatment of acutely infectious UTI in the geriatric population. Mehta et al (2011) raise an interesting point by evaluating the limitations of current criteria to effectively diagnose acute UTI. They propose

that many geriatric individuals may be erroneously defined as having AB when in fact they are in need of treatment. Rather than calling for a reduction in antibiotic use they ask for further refinement of available criteria and diagnostic methods. They state, "Therefore, prospectively identifying evidence-based clinical criteria that are associated with laboratory evidence of UTI will be an important first step to a more rigorous definition for diagnosis, management, and prevention strategies."

There are clearly no easy answers and the literature is not suggesting a cookie cutter approach to patients or a denial of treatment for symptomatic infection. When choosing a treatment plan the total picture of the particular patient must be taken into account, including place of residence, severity of current illness, functional status, the ability to comply with therapy, comorbidities, presence of catheterization, and local antibiotic resistance. Laboratory results are a piece of the puzzle, not the total picture. There may not be a right answer to this important clinical question and providers may reasonably differ in their level of suspicion of acute infection and thus treat differently. A final thought is that a close and consistent relationship between patient and provider holds great promise for improving prescribing practices, reducing adverse drug events, and ensuring that patient and family feel that their concerns are being addressed.

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