Application and comparison of the AUA and EAU current recommendations for antibiotic prophylaxis in the urologic patient undergoing office procedures

The significant and frequent morbidity of post-procedural urinary tract infections has resulted in both the American Urological Association and European Association of Urology developing guidelines and recommendations. The difficulty with any guideline is the practical application to the office setting. The goal is to effectively and safely evaluate and treat patients by efficient and cost-sensitive means. By creating an algorithm to aid in the application of the guidelines, the clinician can identify the high-risk patient and potentially reduce post-procedural urinary tract infections in an efficient and cost-effective manner.

KEYWORDS: antibiotic prophylaxis ■ cystoscopy ■ dipstick urinalysis ■ nosocomial urinary tract infections ■ post void residual ■ urinary tract infection ■ urodynamics

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Urinary tract infections (UTIs) are a common cause of patient morbidity following office urologic procedures. According to the National Nosocomial Infections Surveillance Report, UTIs are the leading type of infection and are most often post-procedural [1]. The frequency of complications post-urodynamics in men has been reported to be as high as 20% [2]. Recently, the American Urological Association (AUA) published a best practice policy statement regarding antimicrobial prophylaxis for urologic surgery, and the European Association of Urology (EAU) updated its UTI management guidelines, which include sections on prophylaxis as well as treatment of immunocompromised patients [3,4] (**Box 1**). The guidelines discuss the high-risk patient and the frequent use of urine cultures. It should be recognized that two populations exist. One is a patient presenting for a procedure that is bacteriuric at the time of presentation. The second is the patient in which bacteria is introduced at the time of the procedure due to contamination. The goal of this paper is to help identify the office patient at risk for a post-procedure UTI, to compare the AUA and EUA guidelines, and to develop an algorithm that can be easily applied to the office patient.

The high-risk patient

When considering antibiotic prophylaxis, identification of the patient at risk is the first step. The Pan-European study identified the three most important risk factors as: an indwelling urinary catheter, history of genitourinary tract infection (although a time frame is not given) and a long pre-operative hospital stay [5]. The EAU identified high-risk patients as those with advanced age, deficient nutritional status, impaired immune response, diabetes mellitus, smoking history, extreme weight, coexisting infection at a remote site, long-term pre-operative stay or recent hospitalization, history of recurrent genitourinary infections, surgery involving bowel segments, colonization with microorganisms, long-term drainage, urinary obstruction and urinary stone [4]. The AUA identified high-risk patients as those with advanced age, anatomic anomalies of the urinary tract, poor nutritional status, smoking history, chronic corticosteroid use, immunodeficiency, externalized catheters, colonized endogenous/exogenous material, distant coexistent infection and prolonged hospitalization [3,6] (**Box 1**).

A recent study showed that a post-void residual volume (PVR) of 180 ml increased the risk of bacterial growth in men. In this study, 196 consecutive healthy men (mean age of 62 years) presented for a prostate evaluation without symptoms of an acute UTI. Immediately after, voiding PVRs were collected via catheterization. Overall, 27% of the patients presented with a positive urine culture. The mean PVR in the positive-culture group was 257 ml (range: 150–560), compared with 133 ml (range: 10–340) for the group with a negative culture ($p < 0.001$). The PVR of 180 ml was determined to have the best specificity and sensitivity. The positive-predictive value for bacterial growth at a PVR volume of 180 ml or greater was 87%, and the negative-predictive value was 94.7% [7].

Regarding the female population, a recent study identified that a significant relationship exists between PVR and UTIs. This study evaluated 204 women, excluding women with diabetes and/or a cystocele. The mean patient age was 79 years. All patients were asked to void

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Box 1. High-risk patient guidelines.

EAU guidelines

- High age
- Deficient nutritional status
- Impaired immune response
- Diabetes mellitus
- Smoking
- Extreme weight
- Coexisting infection at a remote site
- Long preoperative hospital stay
- Recent hospitalization
- History or recurrent genitourinary infections
- Surgery involving bowel segment
- Colonization with microorganisms
- Long-term drainage
- Urinary obstruction
- Urinary stone
- Antibiotic recommendation: cephalosporin second generation or TMP ± SMX; timing: 1 h prior for oral administration

AUA guidelines

- Advanced age
- Anatomic anomalies of the urinary tract
- Poor nutritional status
- Smoking
- Chronic corticosteroid use
- Immunodeficiency
- Externalized catheters
- Colonized endogenous/exogenous material
- Distant coexistent infection
- Prolonged hospitalization
- Antibiotic recommendation: fluroquinolone or TMP–SMX; alternatives: aminoglycoside (axetreonam) ± ampicillin, cephalosporin first/second generation, amoxicillin/clavulanate; timing: 1 h prior for oral administration

SMX: Sulfamethoxazole; TMP: Trimethoprim.

and a catheterized PVR was obtained. The mean PVR for the entire study group was 53.13 ml (range: 0.5–300). The study concluded that a mean PVR of 70 ml doubled the risk of UTI [8].

The recommendations address the use of a negative urine culture prior to any urologic instrumentation. Often it is difficult to correlate a recent urine culture with the patient appointment. This requires an extra trip for the patient to the office or laboratory prior to the procedure and additional cost. This raises the question: how reliable is the office dipstick? The dipstick provides tests to identify bacteria and pyuria. The Griess test detects nitrites in the urine when bacteria reduce the nitrate normally present in the urine. Pyuria is detected by determining leukocyte esterase activity. The sensitivity and specificity of these tests vary in correlation with a positive urine culture [6]. A study reviewing 5000 clinical urine specimens demonstrated the leukocyte esterase/nitrate combination had a sensitivity of 79.2%, a specificity of 81% and a negative-predictive value of 94.5% for specimens with greater than or equal to 10^5 colony-forming units (CFU)/ml [9]. A recent meta-analysis of the accuracy of the urine dipstick test noted that the positive-predictive value in the elderly patient if both tests are positive is greater that 80%. Negative-predictive values were high in all populations. A negative dipstick test result excluded the presence of infection in most studies, with accuracy being highest in urology patients, surgery patients and children [10].

Patient history is important when determining the efficacy of the urine dipstick. A study evaluating the efficacy of the dipstick with hospital inpatients reviewed 420 individuals. Urine cultures were positive with greater than 10^5 CFU/ml in 17% of the cases. With either marker, sensitivity was only 78% and specificity 75%, with 22% demonstrating false-negative results. The conclusion was that because of the high false-negative rate, dipstick tests are not suitable for screening hospital inpatients for UTIs [11].

Another high-risk patient is the patient in the long-term care setting. A recent study evaluated 96 patients from a long-term care facility aged 65 years and older with symptomatic UTIs compared with a similar number of age-, sex- and comorbidity status-matched patients with asymptomatic bacteriuria. In both groups, urine culture results were compared with the results of the multireagent strips. Positive cultures were found in 71% of the patients with symptoms and in 60% of patients with an asymptomatic UTI. The correlation between positive cultures and leukocyte esterase/nitrite dipsticks was analyzed. Because of the high false-negative rate of the combination of leukocyte esterase and nitrite-positive dipsticks compared with the positive urine culture, the conclusion was that dipsticks are not suitable for screening long-term-care inpatients [12].

Both the AUA and EUA suggest that advancing age is a risk factor. What age determines the development of significant risk? Postmenopausal women aged between 50 and 70 years have a 2.8–8.6% prevalence of asymptomatic bacteriuria [13,14]. It has been reported that up to 10% of women are bacteriuric after 70 years of age. In the postmenopausal female, significant risk factors for UTI include incontinence, cystocele and increased PVR [15]. Women living in the community aged 70 years or greater have a 10.8–16% prevalence of asymptomatic bacteriuria [14]. At 60 years of age, the prevalence in men increases substantially, secondary to benign prostatic hypertrophy and obstructive uropathy [13,16].

Men living in the community aged 70 years or greater have a 15–40% prevalence of asymptomatic bacteriuria. Men and women aged 70 years or greater in a long-term care facility have a 15–40% and 25–50% prevalence of asymptomatic bacteriuira, respectively [17].

Cystoscopy & urodynamics

In attempting to critically examine the need for antibiotic prophylaxis for patients undergoing cystoscopy and urodynamics, a number of specific studies are identified. Regarding cystoscopy, one study evaluated 126 patients undergoing cystoscopy who did not have pyuria or bacteriuria. The patients were divided into two groups. One group received 400 mg of norfloxcine (group 1), the other group nothing (group 2). In group 1, the incidence of infection was 3% (2/67) versus 5.1% (5/59) in group 2 ($p > 0.05$) [18]. A second study with a similar design gave sparfloxacin 200 mg 1 h prior to the procedure. A total of 21 patients received antibiotics and 16 evaluable patients did not. No patient in either group developed pyuria, bacteriuria or a febrile infection [19]. Both studies concluded that antibiotic prophylaxis for cystoscopy is not necessary in patients with sterile urine.

Regarding urodynamics, a recent meta-analysis revealed eight randomized, controlled trials comparing the effectiveness of prophylactic antibiotics with placebo or nothing. The studies included 995 patients, the majority of whom were female. On meta-analysis, there was a 40% reduction in the risk of significant bacteriuria with administration of prophylactic antibiotics. The authors concluded that one would need to give prophylactic antibiotics to 13 individuals undergoing urodynamics to prevent one significant bacteriuria of unknown clinical significance. They conclude that the use of prophylactic antibiotics in urodynamics reduces the risk of significant bacteriuria [20].

Another study focused on women presenting with stress urinary incontinence. This study reports on 225 women who had a negative midstream urine culture prior to urodynamic testing. Another urine specimen was obtained for urinalysis and cultured 3–7 days after urodynamics. This study evaluated patients for potential risk factors including age, body mass index, parity, medical and operation history, degree of pelvic organ prolapse and results of urodynamics. The prevalence of significant bacteriuria post procedure was 6.2%. They concluded that for most women with stress urinary incontinence, it may not be necessary to use preventive prophylactic antibiotics. However, for patients with a previous history of recurrent UTIs or urologic surgery, the risk of significant bacteriuria is increased and use of prophylactic antibiotics should be considered [21].

One final study evaluated 192 patients with culture-negative urine prior to urodynamics. Randomly, 98 of the 192 patients were given ciprofloxacin 500 mg 1 h prior to urodynamics. A total of 18 patients who were excluded from the study had significant bacteriuria in the urine culture before urodynamics. The rate of significant bacteriuria in the urine culture after urodynamics was 1% in the prophylaxis group and 14% in the controls. Three independent risk factors were identified: not administering antibiotic prophylaxis before urodynamics, antibiotic use in the preceding month and the presence of pyuria before urodynamics. The authors concluded that all patients should have prophylaxis for urodynamic studies [22] (**Table 1**).

Antibiotic recommendation

The EAU and AUA recommendations differ in the type of antibiotic suggested for office procedures. Both guidelines recommend the treatment of patients at risk for less than 24 h. The EAU recommends the use of a second-generation cephalosporin or trimethoprim with or without sulfametoxazole [4]. The AUA recommends the use of a fluoroquinolone or trimethoprim with sulfametoxazole [3]. One should consider the amount of trimethoprim/sulfametoxazole resistance in their particular region [23].

Conclusion

The significant and frequent morbidity of post-procedural UTIs has resulted in both the AUA and EAU having developed guidelines and recommendations. The difficulty with any guideline is the practical application to the office setting. Based on the guidelines and reviewed articles, all patients should receive antibiotic prophylaxis prior to urodynamic testing. A specific population with a normal dipstick urinalysis to the procedure and without risk factors will not require a urine culture prior to urodynamic testing. Based on the studies presented regarding cystoscopy, antibiotic prophylaxis is not necessary for routine cystocopy, provided the patient does not have risk factors and has had a normal dipstick urinalysis. The limitation of any guidelines is the studies providing the basis for the recommendation. Although a number of studies discuss the issue, there are few large prospective, randomized, controlled studies that address a specific prophylaxis

Table 1. Office procedure/infection rate.

Study	Design	Procedure	No. of patients	Outcome	Ref.
Karmouni *et al.* (2001)	Randomized prospective	Cystoscopy	126	No difference in infection rate in either group	[18]
Tsugawa *et al.* (1998)	Randomized prospective	Cystoscopy	47	No symptomatic infections in either group	[19]
Choe *et al.* (2007)	Prospective	Urodynamics	225	Prevalence of bacteriuria 10^5 CFU/ml 6.2%, symptoms not considered	[21]
Kartal *et al.* (2006)	Randomized prospective	Urodynamics	192	Prevalence of bacteriuria 10^5 CFU/ml was 14% in controls, 1% in the prophylaxis group	[20]

CFU: Colony forming unit.

regimen. Another limitation is the definition of post-procedural infection. Most studies use the urine culture with a 10^5 CFU/ml as the definition of a positive culture. The patient's symptoms need to be considered in defining an adverse event. Another factor that is difficult to control in the office is the adherence to sterile technique. This must be considered in the overall reduction of post-procedural infection and the value of prophylactic antibiotics. Moving forward, a large prospective study specifically addressing office procedures will provide a better understanding of the need for prophylaxis.

Future perspective

Antibiotic prophylaxis will continue to be debated. The first mission, do no harm, is the primary objective. Office evaluation for urologic disease will continue to grow with the aging population and the increased performance of various office procedures. We will continue to weigh the risk of significant allergic reaction to the prophylactic antibiotic compared with the treatment of an occasional symptomatic UTI.

Guidelines provided by the AUA and EAU raise the level of care provided to our patients. As these guidelines are implemented over the next 5 years it is hoped that the risk factors will be further stratified. The implementation of electronic medical records will allow for quicker access to a patient's past medical history, recent hospitalizations and infections. A correlation between risk factors and urine dipstick would be helpful in determining the high-risk patients. Future studies following the guidelines will determine their overall effectiveness in improving patient care.

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Executive summary

- Increased risk factors for post-cystoscopy or urodynamic testing include: indwelling catheter, recent hospitalization, resident of a long-term care facility, age ≥ 60 years living in the community, recurrent genitourinary tract infections, antibiotic use in the past 30 days and a post-void residual volume greater than or equal to 180 ml for a male and greater than or equal to 79 ml for a woman.
- All patients undergoing urodynamics testing should receive antibiotic prophylaxis prior to the procedure.
- Patients undergoing cystoscopy do not require antibiotic prophylaxis unless they are in a high-risk group.

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