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Antibiotic Stewardship in Urology

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Abstract

Introduction: An increase in antibiotic resistance and a decrease in the production of new antimicrobials have created a difficult problem for our health care system.

Methods: We review issues associated with antibiotic stewardship, which refers to organized processes aimed at measuring and optimizing the use of antimicrobials to decrease toxicity and resistance and improve outcomes.

Results: Urologists are in a unique position to implement these programs given that the genitourinary tract is a common source of infection.

Conclusions: In this article we discuss particularly relevant infectious problems in urology and highlight the need for antibiotic stewardship in our field.

Key Words: anti-bacterial agents, infection, prostate, biopsy, cystitis

Abbreviations and Acronyms

AUA = American Urological Association

CDI = Clostridium difficile infections

TMP-SMX = trimethoprim-sulfamethoxazole

TRUGBP = transrectal ultrasound guided prostate biopsy

Effective antibiotic use is essential for the success of modern health care. The emergence of multidrug resistant bacteria and the scarcity of new antibiotics on the market pose a significant problem for our health care system and the well-being of the population. Infectious disease is the third leading cause of death in the United States and the second leading cause of death worldwide.[1,2] The genitourinary tract is a major source of infection and, thus, urologists have a critical role in the treatment of infection and the emerging idea of antibiotic stewardship.

Antibiotic stewardship is defined by the Infectious Diseases Society of America as "coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy and route of administration."[3] The goal of this movement would ideally decrease antimicrobial resistance and improve outcomes related to infections within health care while reducing costs associated with infection.

The knowledge that repeated exposure to antibiotics increases bacterial resistance has existed for many years. The emergence of gram-positive bacteria resistant to almost all antibiotics (methicillin-resistant Staphylococcus aureus, vancomycin-resistant enterococci) has prompted significant efforts in infection control in hospitals.[4] The Food and Drug Administration approval of new antimicrobial agents decreased by 56% from 1992 to 2002 compared to 1983 to 1998.[5] Even more concerning, of the new antimicrobial agents publicly disclosed by the world's 15 largest pharmaceutical companies and 7 largest

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biotechnology companies, none has a novel mechanism of action.[6]

An increase in the number of multidrug resistant bacteria combined with a decrease in the production of antibiotics with novel mechanisms is troubling. Physicians in all specialties must be educated on the current trends to aid in the promotion of antibiotic stewardship. Given that gram-negative bacteria tend to infect the genitourinary tract and have a higher associated morbidity and mortality, urologists have a critical role in the practice of antibiotic stewardship.

Antibiotic resistance is a global problem faced by developed as well as third world countries. The majority of resources and scientific research have focused on the developed world, but unique circumstances face third world countries such as poor sanitary conditions and antibiotic self-prescription.[6,7] Additionally, subtherapeutic doses and failure by the medical profession to adhere to specific antibiotic policies has contributed to the problem in the developing world.[8] Independent of the factors involved in different parts of the world, antibiotic resistance is a global threat, particularly with the evolution of international travel.

A recent headline from the BBC News read "Superbugs to kill more than Cancer," based on a recently published review that predicted that drug resistant infections will kill approximately 10 million people a year worldwide by 2050.[9] These numbers are frightening, and highlight the importance of improving education for patients and physicians. Urologists have an important role in the era of antibiotic stewardship, a global necessity for all providers. In this article we will focus on antibiotic stewardship as it relates to post-prostate biopsy infectious complications, the treatment of outpatient bacterial cystitis and the appropriate use of perioperative antibiotics.

Infection after Prostate Biopsy

Transrectal ultrasound guided prostate biopsy is a commonly performed procedure in the outpatient setting. Bruyère et al performed a multicenter prospective analysis of infectious complications after prostate biopsy demonstrating a post-biopsy sepsis rate of 2.8%.[8] They reported that noncompliance with antibiotic prophylaxis and antibiotic treatment in the last 6 months and history of prostatitis were significant risk factors for post-prostate biopsy sepsis. Clinical guidelines have recommended antibiotic prophylaxis before this procedure for many years but the regimen of choice has been debated and varies by region.

Fluoroquinolones were initially used based on their rapid penetration and concentration in the prostate gland as well as activity against genitourinary pathogens. However, the presence of fluoroquinolone-resistant Escherichia coli is most responsible for the increasing incidence of post-prostate biopsy infection. Taylor et al reported a rate of 19.0% of ciprofloxacin-resistant Gram-negative coliforms in the rectal flora of men undergoing prostate biopsy.[10] This rate of resistance prompted more aggressive prophylaxis regimens.

The AUA released a Best Practice Policy Statement in 2008 regarding antimicrobial prophylaxis for TRUGBP, in which they reported Level 1b evidence for prophylaxis. The antibiotic regimen of choice according to this statement is a fluoroquinolone, or 1st, 2nd or 3rd generation cephalosporin. An alternative regimen recommended is trimethoprim-sulfamethoxazole with an aminoglycoside.[11] Interestingly the duration of prophylactic regimen has not been shown to impact outcomes as demonstrated by Zani et al.[12] Seven randomized controlled trials were reviewed and long-term vs short-term antibiotic course only differed significantly in regard to bacteriuria, but not fever, urinary tract infection or hospitalization. In addition, the route of administration did not prove to be significant.[13] Based on these data, antibiotic prophylaxis dosing for TRUGBP should not exceed 24 hours.

Historically many urologists used some method of bowel preparation to attempt to reduce bacterial counts in the rectum before biopsy. Shandera et al reported that 81% of practicing American urologists used rectal cleansing techniques, typically sodium phosphate enemas, despite conflicting literature on its usefulness.[14] Carey and Korman retrospectively reviewed 448 patients who underwent TRUGBP, and found no significant benefit of preoperative enema, and cited increased cost and patient discomfort.[15] Zani et al found that the antibiotic + enema group differed only in terms of bacteremia compared to the antibiotic alone group.[12] Fever, urinary tract infection and hospitalization did not differ between the groups.

Traditional enemas before TRUGBP are now far less commonly performed, but novel techniques such as perioperative povidone-iodine rectal preparation before biopsy have been shown to reduce colony counts and infectious complications.[13] Taylor et al studied the effect of targeted prophylaxis based on rectal swab cultures before biopsy and found a decrease in infectious complications as well as overall cost of care.[16] One group reported a decrease in infectious complications with a bisacodyl suppository given the night before the procedure.[17] Although specialized preparation or targeted prophylaxis is not standard of care, these techniques are used at some institutions and might be considered by others.

Bacterial Cystitis

Acute bacterial cystitis is one of the most common diagnoses seen by primary care physicians, affecting women