Evaluation of Postoperative Antibiotic Prophylaxis in Patients Undergoing Urologic Procedure

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Background

- According to the 2016 American College of Surgeons and Surgical Infection Society guidelines, administration of pre-operative prophylactic antibiotics has been shown to decrease surgical site infection rates.
- In contrast, many national guidelines do not recommend post-operative antibiotic prophylaxis due to lack of literature supporting its use; however, they are frequently prescribed at ChristianaCare for urologic procedures.
- The practice of post-operative antibiotic administration has not correlated with reduction in post-operative infections, and has been shown to increase the risk for resistant infections, *Clostridiodes difficile* (*C. difficile*) and acute kidney injury (AKI).
- Limited literature is available regarding antibiotic prophylaxis for urologic procedures
- The purpose of this study is to describe the use of postoperative antibiotic prophylaxis in patients undergoing urologic procedures.

Methods

- **Study design:** Single-center retrospective chart review
- **Time frame:** January 1, 2018 – September 1st 2019
- **Exposure group:** Patients who underwent a urologic procedure and received postoperative antibiotic prophylaxis
- **Control group:** Patients who underwent a urologic procedure and did not receive postoperative antibiotic prophylaxis
- **Inclusion Criteria:** Adult > 18 years of age, patients who underwent urologic procedure
- **Exclusion Criteria:** Receiving antibiotic therapy for documented infection pre-operatively, previous history of multi-drug resistant organisms (MDRO) prior to urologic procedure, patients who developed culture positive infection 24 hours preop, and patients who died within 24 hours postop

Outcomes

Primary:

- Incidence of surgical site infections, post-operative bacteremia, and urinary tract infections between the exposure and control group

Secondary:

- Incidence of adverse outcomes, including C. difficile infection, AKI, development of antibiotic resistance, and antibiotic-specific adverse effects between the two groups
- Length of hospital stay, readmission and inpatient mortality within 30 days

Statistics

- Descriptive statistics were performed for all variables in the exposure and control group. Variables were expressed as mean values with standard deviation
- Continuous variables were compared using Student's t-test and Fisher's exact test. A p value of < 0.05 served as the threshold for statistical significance

Results

Table 1. Baseline Characteristics

Characteristic	Exposure (N = 195)	Control (N = 55)
Mean Age in years (SD)	63.4 (± 13.2)	63.3 (± 13.31)
Male sex (%)	141 (72.3)	37 (67.3)
Race (%)		
White	146 (74.9)	39 (70.9)
Black	46 (23.6)	12 (21.8)
Ethnicity (%)		
Non-Hispanic Latino	191 (97.9)	55 (98.2)
Hispanic Latino	4 (2.1)	1 (1.8)
Median body-mass index (IQR)	28.3 (6.0)	27.2 (6.0)
Mean Charlson comorbidity score (SD)	8.4 (± 5.1)	8.3 (± 5.1)
Type of urologic procedure (%)		
1. Nephrectomy	68 (34.9)	24 (43.6)
2. Prostatectomy	64 (32.8)	11 (20)
3. Other*	36 (18.5)	2 (3.6)
4. Cystoscopy	17 (8.7)	12 (19.7)
5. Cystectomy	10 (5.1)	6 (9.8)
Duration of procedure in minutes (SD)	157.1 (± 86.4)	132.1 (± 81.2)
Admitting service (%)		
Surgical Services	65 (34.4)	23 (37.7)
Missing	104 (55)	29 (47.5)
Diagnosis of diabetes (%)		
Yes	35 (18.5)	13 (21.3)
Smoking history (%)		
Current smoker	15 (7.9)	9 (14.8)
Former smoker	70 (37)	12 (19.7)
Never smoker	104 (55)	40 (65.6)
Outpatient PPI use (%)		
Yes	38 (20.1)	16 (26.2)
Broad spectrum antibiotic use (≤ 90 days from admission) (%)		
Yes	42 (22.2)	5 (8.2)

*Includes nephroureterectomy, nephroscopy/ostolithotomy, ureteral re-implant, TUR bladder tumor, etc

Table 3. Primary Endpoints

Endpoint	Exposure (N = 195)	Control (N = 55)	P-value
30 day SSI (%)			0.491
Yes	9 (4.6)	4 (7.3)	
Post-operative bacteremia (%)			0.608
Yes	2 (1.0)	1 (1.8)	
30 day UTI (%)			0.307
Yes	16 (8.2)	7 (12.7)	

Table 2. Definitions

Outcome	Definition
Surgical Site infection (SSI)	Diagnosis of superficial incisional SSI, deep incisional SSI, or organ/space SSI as per the American Urological Association, Urologic Procedures and Antimicrobial Prophylaxis Guidelines, ≤ 30 days after receipt of post-operative antibiotic prophylaxis
Urinary Tract Infection (UTI)	Positive urine culture ≤ 30 days from post-operative antibiotic prophylaxis initiation for treatment of suspected UTI
Postoperative Bacteremia	Positive blood culture ≤ 10 days after urologic procedure
Antimicrobial Resistance	The presence of resistance to a post-operative antibiotic received in any type of culture ≤ 30 days from date of surgery, where the threshold for resistance includes isolates with intermediate susceptibility, as well as, resistant susceptibility to the chosen antibiotic
***C. difficile* Infection**	Positive *C. difficile* PCR test result ≤ 90 days from post-operative antibiotic prophylaxis initiation
Acute Kidney Injury	7 day incidence of AKI, defined according to the acute kidney injury network definitions or a determination of AKI as documented by the provider
Antibiotic-Related Adverse Effects	-Gastrointestinal reactions (diarrhea, nausea), skin rash, anaphylaxis for all antimicrobials -QTc prolongation, in-hospital falls for Fluoroquinolones -Hyperkalemia for Sulfamethoxazole-trimethoprim
Days of Antimicrobial Therapy	A minimum of 1 dose of antibiotic therapy required to count as 1 day of antimicrobial therapy

Table 4. Secondary Endpoints

Endpoint	Exposure (N = 195)	Control (N = 55)
90 day incidence of C difficile infection – no. (%)		
PCR positive	1 (0.5)	0 (0)
PCR negative	6 (3.1)	1 (1.8)
Test not performed	188 (96.4)	54 (98.2)
Acute Kidney Injury – no. (%)		
Yes	4 (2.1)	2 (3.6)
No	32 (16.4)	10 (18.2)
N/A	159 (81.5)	43 (78.2)
Resistant organism present (If any positive culture present) within 30 days of surgery (%)		
Yes	3 (21.4)	1 (16.7)
No	11(78.6)	5 (83.3)
Postoperative antibiotic related adverse effects (%)		
Yes	11 (5.6)	
No	184 (94.4)	
Mean Length of Hospital Stay in days (SD)	3.7 (±4.8)	3.7 (±2.9)
Readmission within 30 days (%)		
Readmission	26 (13.3)	8 (14.5)
No readmission	169 (86.7)	47 (85.5)
Inpatient mortality within 30 days (%)		
Yes	0 (0)	0 (0)
No	195 (100)	55 (100)

Conclusions

- In patients undergoing urologic procedures, we determined the following:
  - Post-operative antimicrobial prophylaxis was common in patients undergoing urologic procedures
  - Post-operative antimicrobial prophylaxis led to no statistically significant difference in post-operative infections and a potential to increase adverse effects and development of resistant organisms.
- The results of this retrospective study support withholding post-operative antibiotics in patients undergoing urologic procedures.
- Limitations include differences in population size and pertinent baseline characteristics in both groups, lack of adverse event markers, and study design flaws that could have confounded results.
- Efforts to change current practice at ChristianaCare will be implemented via collaboration with the urology section and review of current order sets.

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Disclosures: All authors have no conflicts of interests or financial interests