

Overuse of Antimicrobial Prophylaxis in Community Practice Urology

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Purpose: We examined index urological surgeries to assess utilization patterns of antimicrobial prophylaxis in a large, community based population.

Materials and Methods: From the Premier Perspectives Database we identified patients who underwent inpatient urological surgeries that are considered index procedures by the ABU (American Board of Urology), including radical prostatectomy, partial or radical nephrectomy, radical cystectomy, ureteroscopy, shock wave lithotripsy, transurethral resection of the prostate, percutaneous nephrostolithotomy, transvaginal surgery, inflatable penile prosthesis, brachytherapy, transurethral resection of bladder tumor and cystoscopy. Procedures were identified based on ICD-9 procedure codes for 2007 to 2012. Antimicrobial administration, class and duration were abstracted from patient billing data. The class and duration of antimicrobials concordant with the 2008 AUA Best Practice Policy Statement was used to determine compliance.

Results: The overall compliance rate was 53%, ranging from 0.6% for radical cystectomy to 97% for shock wave lithotripsy. Antimicrobial use consistent with AUA Best Practices included the appropriate class in 67% of cases (range 34% to 80%) and the recommended duration in 78% (range 1.2% to 98%). Average prophylaxis duration for procedures for which it is recommended ranged from 1.1 days after brachytherapy to 10.3 days after radical cystectomy. The compliance rate increased from 46% overall in 2007 to 59% overall in 2012.

Conclusions: We documented considerable variation in antimicrobial prophylaxis for urological surgery. Compliance with AUA Best Practices increased with time but overall rates remain less than 60%. Efforts are needed to better understand the reasons for variation from recommended antimicrobial prophylaxis for common inpatient urological procedures to help decrease resultant complications and improve outcomes.

Key Words: urologic surgical procedures; antibiotic prophylaxis; physician's practice patterns; drug resistance, bacterial; quality of health care

THE use of properly timed perioperative prophylactic antimicrobials is associated with a decreased risk of surgical infection.^{1,2} However, there is substantial variation in the duration of antimicrobial administration

and up to 60% of antimicrobials may be continued beyond 24 hours.³ Extended prophylactic antimicrobial use is common in urological cancer surgery and it has been linked to an increased risk of postoperative

Abbreviations and Acronyms

AMP = antimicrobial prophylaxis
 AUA = American Urological Association
 Bt = brachytherapy
 HAI = hospital acquired infection
 IPP = inflatable penile prosthesis
 Nephx = radical or partial nephrectomy
 PCNL = percutaneous nephrostolithotomy
 RC = radical cystectomy
 RP = radical prostatectomy
 SWL = shock wave lithotripsy
 TURBT = transurethral bladder tumor resection
 TURP = transurethral prostate resection
 TVS = transvaginal surgery
 URS = ureteroscopy

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Clostridium difficile infection.⁴ Antimicrobial resistance, driven in part by improper administration of prophylactic antimicrobials for urological procedures, is associated with various negative consequences, including additional health care costs,⁵ a prolonged hospital stay,⁶ increasing resistance patterns^{7,8} and increased mortality.⁹ Moreover, the incidence of *C. difficile* infection is increasing¹⁰ with increasing *C. difficile* relapse rates.¹¹

In an effort to standardize antimicrobial regimens and decrease variability in 2008 the AUA developed a Best Practice Policy Statement.¹² We evaluated practice patterns in a cohort of urological patients spanning a study period before the release of the policy statement and through 4 years thereafter. Our data source, the Premier Perspectives Database (Premier, Charlotte, North Carolina), includes billing claims for care received at a large number of community hospitals and allows for ascertainment of community practices of care. We measured adherence to the policy statement recommendations for commonly performed hospital based urological procedures and identified factors associated with noncompliant antimicrobial administration. We believe that a better understanding of antimicrobial utilization patterns and sources of noncompliance may guide future efforts to decrease antimicrobial overuse and its resultant negative sequelae.

METHODS

Study Sample

We retrospectively reviewed the records of patient visits in the Premier Perspectives Database from January 1, 2007 through December 31, 2012. Premier is a large collaborative health care database that incorporates approximately a sixth of all hospitalizations annually in the United States. Premier extracts data from individual hospitals rather than partnered employers or payers and thus includes a wide range of patient ages and insurers.

Using ICD-9 procedural codes we identified patients who underwent certain ABU index inpatient urological procedures, including RP (ICD-9 code 60.5), RC (57.7, 57.71 and 57.79), Nephx (55.51, 55.52, 55.54, 55.4, 55.01, 55.24, 55.31, 55.39, 55.81, 55.89, 55.91, 59.02, 59.09 and 59.21), URS (56.0, 56.31, 56.35 and 56.39), SWL (98.5), TURP (60.2, 60.21 and 60.29), PCNL (55.03 and 55.04), TVS (70.51, 70.54, 59.4, 59.7, 59.71, 59.72 and 59.79), IPP (64.97), Bt (92.27) and TURBT (57.49 and 57.4). We also examined AMP use during outpatient cystoscopy (ICD-9 codes 57.31 and 57.33) for a primary diagnosis of hematuria (ICD-9 codes 599.7, 599.71, 599.72 and 791.2) to evaluate practice patterns for a simple urological procedure during which no AMP is recommended.

Our unit of analysis was a discrete admission since an individual patient may be included in the database more

than once. For example, a patient with bilateral kidney cancer undergoing staged surgeries would count as 2 separate episodes for analysis. We further restricted the sample by including only surgical patients who were at least 18 years old, in whom the procedure was performed by a urologist as coded by Premier and who underwent surgery at a facility where more than 1 urological procedure was done during the study period.

Other variables extracted from Premier data included age, gender, race/ethnicity, marital status, insurance type and procedure year. We abstracted hospital characteristics, including teaching status, location and procedural volume. Comorbidity was determined and tabulated according to the method of Elixhauser et al¹³ using secondary diagnosis ICD-9 codes for the index hospitalization. We calculated the length of stay from surgery date to the discharge date and classified a length of stay as prolonged beyond the 75th percentile in the patient respective surgery cohort.

Outcomes

Our main outcome of interest was the receipt of inappropriate AMP in the perioperative window, as defined by compliance with the 2008 AUA Best Practice Policy Statement on Urologic Surgery Antimicrobial Prophylaxis.¹² Recommendations for index urological procedures included the class and duration of the antimicrobial with no recommended duration exceeding 24 hours postoperatively. We identified patterns of AMP utilization from a review of a comprehensive list of cost information by patient episode. All antimicrobial pharmaceutical billing codes were included and parsed out to the generic name level. However, for the purpose of analysis doses and administration routes were not considered. Day of antimicrobial receipt was extracted from claims and categorized in relation to the day of the urological procedure. To distinguish between perioperative AMP and antimicrobial use for treatment or suspicion of infection (ie for cause antimicrobial use) we flagged and excluded from study 58,069 patients with a switch in antimicrobial class within 24 hours postoperatively. After removing patients whose antimicrobial course was determined to be for cause we classified appropriate AMP in 2 ways, including 1) if the patient received only the recommended AMP type or combination on the day of surgery and 2) if AMP did not extend into postoperative day 2. A compliant antimicrobial course (the main outcome) was defined as meeting the 2 definitions, ie a patient received the appropriate antimicrobial type or combination of antimicrobial types that did not extend into postoperative day 2. For SWL and cystoscopy any antimicrobial use was considered noncompliant.

Statistical Analysis

Descriptive statistics were calculated using the frequency and percent for categorical variables and the mean \pm SD for continuous variables. Univariate associations between compliant AMP and patient characteristics were assessed by the chi-square tests for categorical variables and the independent sample t-test for continuous variables. Multivariate logistic regression models were constructed for each procedure type to identify factors independently

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