

Immediate Unplanned Hospital Admission After Outpatient Ureteroscopy for Stone Disease

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Purpose: Medicare recently changed reimbursement for ureteroscopy, encouraging migration to ambulatory surgical centers. To our knowledge the risk of immediate unplanned hospital admission, which may discourage ureteroscopy at ambulatory surgical centers, is unknown. We determined the rate of immediate unplanned hospital admission, identified factors associated with admission and developed a risk stratification tool to assist with location selection for outpatient ureteroscopy.

Materials and Methods: We retrospectively reviewed the records of 1,798 consecutive outpatient ureteroscopic procedures for urolithiasis performed from 1998 to 2008 at our institution. Patients requiring immediate hospital admission were matched 1 to 3 by provider, gender and date with controls who did not require admission. Patient demographics, comorbid conditions, stone history and burden, and operative technique were assessed for impact on admission by bivariate and multivariate logistic regression. A scoring system was developed and estimated admission rates were calculated.

Results: There were 70 immediate unplanned admissions (3.9%). Based on multivariate analysis the factors associated with unplanned admission were any previous admission related to stones ($p < 0.001$), history of psychiatric illness ($p = 0.016$) and bilateral procedure ($p = 0.019$). Patients with distal ureteral stones were less likely to require admission ($p = 0.026$). One point was added for each positive factor and 1 was subtracted for a distal ureteral stone. A risk factor score of 2 or greater in 9% of the cohort was associated with an estimated 20.0% admission rate while lower scores in 91% of the cohort were associated with a 2.9% admission rate.

Conclusions: Readily identifiable factors can stratify the risk of unplanned hospital admission and help guide the selection of the most appropriate facility for outpatient ureteroscopy.

Key Words: ureter, ureteroscopy, urolithiasis, ambulatory care facilities, hospitals

UROLITHIASIS is a common urological problem with an increasing prevalence in the United States.¹⁻³ In the last 20 years urolithiasis management has been migrating to the outpatient setting. Between 1994 and 2000 the inpatient admission rate decreased by 5% to 15% while ASC use

increased by 58%.¹ Currently urolithiasis is managed primarily in the ambulatory setting with surgical management done predominantly at hospital outpatient facilities.⁴

URS, considered first line therapy for urolithiasis, is associated with a primary stone-free rate of greater than

Abbreviations and Acronyms

ASC = ambulatory surgery center

RFS = risk factor score

SWL = shock wave lithotripsy

URS = ureteroscopy

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80% for renal and ureteral stones.⁵ Also, the complication rate decreased in the last 2 decades due to technological advances and increased use, and is now approximately equivalent to that of SWL.^{6,7} With the decreased risk of adverse events some providers now perform URS at freestanding ASCs. These facilities potentially offer decreased cost, increased efficiency and improved patient experience.⁸ Physician ownership and recent increases in Medicare reimbursement provide further incentives to perform URS at freestanding ASCs.⁹

Despite these incentives URS is still predominantly performed at hospital outpatient facilities.⁴ Enthusiasm for URS in ASCs appears to be tempered by concern for complications that may result in unplanned hospital admission, which would require transfer from an ASC to an inpatient facility. However, this risk is largely unknown. To better define the risk of unplanned hospital admission we analyzed our URS experience at our hospital outpatient facility to determine the rate of immediate unplanned admission and identify factors associated with admission that may help providers select the most appropriate location for individuals when performing outpatient URS.

METHODS

Institutional review board approval was obtained to retrospectively review the records of patients who underwent URS at the University of Michigan. We identified all patients who underwent URS for renal and ureteral calculi between July 1998 and July 2008. All procedures were done at the same hospital outpatient facility. All patients received preoperative prophylactic antibiotics. Preoperative imaging, such as abdominal plain x-ray, computerized tomography or renal ultrasound, was performed in all cases. Patients were assessed using anesthesia preoperatively. Standard rigid cystoscopy was done in most cases before semirigid and/or flexible URS. Patients postoperatively discharged home from the recovery unit met anesthesia discharge criteria. Patients who did not meet discharge criteria and/or required same day hospitalization were assessed by the operating or inpatient urological team.

To identify patients undergoing URS for urolithiasis hospital billing data were used to identify patients with CPT codes 52353 and 52352. Unplanned hospitalization was defined as a change in visit type to inpatient or outpatient observation for study purposes. Billing data extraction also included date of service, hospital admission and discharge dates, date of birth, gender, provider and length of stay. Planned admissions or current inpatients were excluded from analysis. Patients in whom renal or ureteral calculi were not the primary indication were also excluded.

Each patient with admission (cases) was then matched to 3 patients without admission (controls) based on surgeon and gender, and then by date of surgery with all controls performed within months of the corresponding case. Three surgeons performed 87.5% of the procedures. For matching all remaining surgeons were grouped as a

single provider. A detailed chart review of the inpatient and outpatient records available through our electronic medical records was then performed for each case and control. Admission was verified by discharge summary on a day after admission for each case. Data pertaining to patient characteristics (eg age and body mass index), comorbid conditions (eg renal insufficiency, previous infection and psychiatric history identified through diagnoses or medication) and urolithiasis history (eg medullary sponge kidney, previous stone surgery, medical expulsion therapy and previous admission) were extracted. We also collected data on stone burden (eg size, location and number) and technical factors (eg laterality, laser lithotripsy vs extraction, semirigid vs flexible URS and ureteral stent placement).

Conditional logistic regression analysis was performed of each case-control group to identify significantly different variables ($p < 0.05$). By fitting conditional logistic regression separately we first assessed the association of each clinical characteristic with immediate unplanned admission after the procedure. For parsimony we then used backward model building procedure for multivariate analysis to determine the most significant clinical predictors of immediate unplanned admission. For all statistical inferences we performed 2-sided significance testing and set a type I error rate at 0.05 using SAS®, version 9.2.

Sensitivity, specificity, and positive and negative predictive values were calculated for each risk factor identified by multivariate analysis. Using these values we calculated estimated unplanned admission rates for the entire cohort, excluding each positive risk factor. The estimated unplanned admission rate for patients with distal stones was also calculated. A scoring system was developed by assigning 1 point for each positive risk factor and -1 point for each negative risk factor. An RFS was summed for each patient. Sensitivity and specificity were calculated for each score and then applied to the entire cohort to calculate the estimated rate of immediate unplanned hospital admission for each score. The proportion of the cohort for each RFS was also calculated.

RESULTS

After 1,798 ureteroscopies there was a total of 70 hospital admissions (3.9%). Average length of stay was 1.4 days (range 1 to 17). Of the cases 39 were female and 31 were male. Of 70 admissions 57 were 23-hour observations, 11 were inpatient and 2 were unknown. Reasons for admission varied widely but the most common reasons were pain in 37 patients (53%) and presumed infection in 9 (13%). The other reasons were nausea in 5 patients (7%), cardiac condition in 3 (4%), urinary retention in 3 (4%), hematuria in 2 (3%), ureteral perforation in 2 (3%), unknown in 10 (14%) and miscellaneous in 6 (9%), including stroke, respiratory distress, autonomic dysreflexia, anesthesia, obstetric monitoring and transportation.

In cases and controls mean age was 44.9 and 46.4 years ($p = 0.48$), and mean body mass index was 30.5 and 30.7 kg/m², respectively ($p = 0.52$). Multiple vari-

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