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Unplanned 30-Day Encounters After Ureterorenoscopy for Urolithiasis

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Abstract

Objective: To identify avoidable predictors of postureteroscopy (URS) unplanned encounters and to minimize 30-day encounters.

Materials and Methods: We performed retrospective chart review and telephone surveys on patients who underwent URS for urolithiasis between January and June 2016. Univariate and multivariable analyses evaluated for potential predictors of unplanned encounters.

Results: Of 157 patients, there were 44 (28.0%) unplanned patient-initiated clinical phone calls, 23 (14.6%) emergency department (ED) visits, and 8 (5.1%) readmissions, with pain being the most common complaint during the encounters. Factors associated with a higher rate of phone calls include first-time stone procedure (36.6% *vs* 20.9%, $p=0.029$), outpatient status (30.3% *vs* 0%, $p=0.021$), intraoperative stent placement (31.2% *vs* 0%, $p=0.006$), and stent removal at home (58.8% *vs* 28.8%, $p=0.014$). Factors associated with increased rate of ED visits were first-time stone procedure (22.5% *vs* 8.1%, $p=0.011$) and ureteral access sheath (UAS) usage (29.6% *vs* 11.8%, $p=0.018$). Factors associated with a higher rate of readmissions were lower body mass index (23.9 *vs* 29.7, $p=0.013$), bilateral procedure (20.0% *vs* 2.9%, $p=0.010$), and UAS usage (14.8% *vs* 3.1%, $p=0.032$). Stone burden, operative time, Charlson comorbidity index, and preoperative urinary tract infection were not significantly associated with postoperative encounters.

Conclusions: Pain, first-time stone treatment, presence of a ureteral stent, outpatient status, bilateral procedures, and UAS usage were common reasons for postoperative encounters after URS. Appropriate perioperative patient education and counseling and adequate pain management may minimize these encounters and improve treatment quality and patient satisfaction.

Keywords: renal stone, stents, ureteral stones, ureteroscopy, ureteroscopy instrumentation

Introduction

Nephrolithiasis is increasing in incidence, affecting approximately 1 in 11 people in the United States during their lifetime.[1] With improvements in the optics and endoscope design, ureteroscopy (URS) is an increasingly popular treatment modality for urolithiasis.[2,3] Despite being a common ambulatory procedure, URS generates a relatively high rate of postprocedural events such as telephone calls, emergency department (ED) visits, and readmissions.[4–7] These events can negatively affect patients' quality of life and satisfaction and add to the cost of healthcare. The Centers for Medicare and Medicaid Services and Hospital Quality Alliance now recommend public reporting of 30-day readmission or revisit rates as one of the quality-of-healthcare outcome measures.[8] There is sparse information on hospital revisits after ureteroscopic stone treatment in the published literature.[4] In this study, we evaluate risk factors for unplanned encounters within 30 days after URS for urolithiasis.

Materials and Methods

After approval by the internal review board, we retrospectively reviewed the medical records of patients who underwent URS for upper tract urolithiasis between January and June 2016 at a tertiary care university hospital and two satellite hospitals. These patients were identified using Current Procedural Terminology codes 52352, 52353, and 52356 from hospital billing data. Both elective and urgent cases were included.

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Preoperative urine culture was routinely performed, and patients with positive cultures were treated with a course of culture-appropriate antibiotics. Otherwise, patients received preoperative prophylactic antibiotics at the time of procedure, according to the American Urological Association Best Practice Statement for urologic surgery antimicrobial prophylaxis. Use of ureteral access sheath (UAS) and placement of stent with or without extraction string were surgeon and case dependent. Patients were discharged home if they met discharge criteria, including stable vital signs and adequate pain control, or were admitted to the hospital for observation, if deemed necessary. All URS procedures were performed on an outpatient basis, defined as discharge within 23 hours of surgery. Patients were managed in the inpatient setting if they were already admitted for other reasons or were admitted postoperatively due to concerns during recovery.

Patient demographics, urolithiasis history, stone characteristics, operative details, and 30-day postoperative unplanned events were collected. These events included patient-initiated phone calls, ED visits, and readmissions. Clinically related phone calls were included, while administrative phone calls were excluded. To capture the most accurate ED and readmission rates, surveys inquiring about any unplanned hospital visits outside of our healthcare system were delivered to all patients via telephone or email in October 2016 and supplemented chart review data.

Fisher's exact and Wilcoxon rank-sum tests were used for qualitative and quantitative variables, respectively. Statistical significance was defined as $p < 0.05$. We performed univariate analysis to identify predictors for unplanned phone calls, ED visits, and readmissions. A multivariable logistic regression model was constructed for ED visits and patient phone calls.

Results

We reviewed 157 URS procedures that had complete 30-day data during the study period. The response rate of the surveys was 40.7% (64 of 157). Baseline demographics and stone data, operative data, and perioperative management for the cohort are summarized in Table 1. The three busiest URS surgeons performed 66, 22, and 17 cases, respectively, while the remaining 52 cases were performed by 11 different surgeons. No differences in rate of encounters were found among the surgeons (data not shown). Of the 27 cases in which UAS was used, 11 cases (40.7%) used 12/14 French size, 7 cases were unspecified, and the remaining 9 cases were spread out among various inner diameters of 9 French to 11 French. All cases with UAS use underwent ureteral stenting. For the 16 patients who were not stented, all but 4 had stents placed before the procedure; none had UAS used during the procedure; and 12 of the operative reports stated reason for omission of stents as minimal trauma/manipulation, or the ureter appeared patent. Median stent dwell time was 13 days (range 2–347 days). Median hospital stay for patient managed as inpatient was 2 days. There were 44 (28.0%) unplanned patient-initiated clinical phone calls, 23 (14.6%) ED visits, and 8 (5.1%) readmissions during the 30-day postoperative period. Median times to event were 5 days (range 0–21 days) for phone calls, 8 days (range 1–29 days) for ED visits, and 3 days (range 1–29 days) for readmissions. Most patients visited the ED only once, while two (8.7%) patients had two ED visits after surgery.

The most common reasons for telephone calls were stent-related pain (16 patients, 36.4%), medication-related issues/questions (6 patients, 13.6%), and pain not specific to stent (4 patients, 9.1%). The most common chief complaints for ED visits and readmissions were flank pain (9 patients, 39.1%/3 patients, 37.5%), hematuria (3 patients, 13.0%/1 patient, 12.5%), and fever (2 patients, 8.7%/1 patient, 12.5%). The most common ED diagnoses were urinary tract infection (UTI) (6 patients, 26.1%), flank pain (5 patients, 21.7%), and sepsis (3 patients, 13.0%) (Table 2). Of the six patients with UTI diagnosis, only one had positive urine culture with *Staphylococcus epidermidis*. All three patients with sepsis diagnosis had positive blood cultures with methicillin-resistant *S. epidermidis*, coagulase-negative Staphylococcus, or yeast, and their preoperative cultures correlated with the blood cultures. Two of the septic patients had antibiotic treatment preoperatively, while therapy for the third patient was unknown. All patients with positive postoperative urine cultures had calcium oxalate stones, and no struvite stones were reported. All patients with ED diagnoses of UTI or sepsis had been stented during the URS procedure. During their ED visits, the majority of patients (14 patients, 60.9%) received imaging evaluation, of which the most frequent modalities were CT (9 patients, 64.3%), chest X-ray (3 patients, 21.4%), and ultrasonography (2 patients, 14.3%). Ten patients (43%) received antibiotics, but none underwent percutaneous nephrostomy tube or stent placement. One patient (4.3%) required intensive care unit admission for sepsis.

Factors associated with a higher rate of phone calls included first-time stone procedure (36.6% *vs* 20.9%, $p = 0.029$), outpatient status (30.3% *vs* 0%, $p = 0.021$), intraoperative stent placement (31.2% *vs* 0%, $p = 0.006$), extraction string on stent (51.7% *vs* 24.3%, $p = 0.006$), and stent removal at home (58.8% *vs* 28.8%, $p = 0.014$). Factors associated with increased rate of ED visits were first-time stone procedure (22.5% *vs* 8.1%, $p = 0.011$) and UAS usage (29.6% *vs* 11.8%, $p = 0.018$). Factors associated with a higher rate of readmission were lower body mass index (BMI) (23.9 *vs* 29.7, $p = 0.013$), bilateral procedure (20.0% *vs* 2.9%, $p = 0.010$), and UAS use (14.8% *vs* 3.1%, $p = 0.032$). Of the 16 patients who had no intraoperative stenting, none had an unplanned phone call, ED visit, or readmission. Other factors, such as stone burden, operative time, Charlson comorbidity index, and history of preoperative UTI, were not significantly associated with postoperative encounters (Tables 3–5). On multivariable logistic regression analysis, first-time stone procedure (odds ratio [OR] = 2.37, 95% confidence interval [CI] 1.12–5.00, $p = 0.024$) and stent removal at home (OR = 4.41, 95% CI 1.43–13.58, $p = 0.010$) remained significant predictors of postoperative phone calls, while first-time stone procedure (OR = 3.65, 95% CI 1.34–9.91, $p = 0.011$) and UAS use (OR = 3.87, 95% CI 1.32–11.33, $p = 0.014$) remained significantly associated with ED visits (Table 6). Readmission was omitted from multivariate logistic regression because low event rate precluded meaningful analysis.

Discussion

In this retrospective study of unplanned postoperative encounters after URS for urolithiasis in a tertiary academic medical center, patient-initiated phone calls, ED visits, and readmissions occurred at rates of 1 in 4, 7, and 20,

Table 1. Overview Characteristics for the Cohort

Variable	n *(%)*
Age (years), mean (SD)	51.8 (15.9)
Sex	
Female	82 (52.2)
Male	75 (47.8)
Race	
Black	32 (20.4)
White	115 (73.2)
Other/unknown	10 (6.4)
BMI (kg/m^2), mean (SD)	29.4 (7.8)
Charlson comorbidity index	
0	85 (54.1)
1	17 (10.8)
2	24 (15.3)
>2	31 (19.7)
ASA	
1 or 2	99 (63.1)
3 or 4	55 (35.0)
Unknown	3 (1.9)
First-time stone procedure	
No	86 (54.8)
Yes	71 (45.2)
History of ureteral stent	
No	111 (70.7)
Yes	46 (29.3)
Case type	
Elective	147 (93.6)
Urgent	10 (6.4)
Postoperative status	
Outpatient/observation	145 (92.4)
Inpatient	12 (7.6)
Preoperative urine culture	
No growth/insignificant growth	97 (61.8)
Positive	21 (13.4)
Contaminated	20 (22.9)
Unknown	19 (12.1)
Treatment course of antibiotics before procedure	
No	95 (59.2)
Yes	40 (26.8)
Unknown	22 (14.0)
Endoscopic procedure within 30 days prior	
No	107 (68.2)
Yes	50 (31.8)
Stent in place at time of procedure	
No	69 (45.9)
Yes	88 (54.1)
Operative time (minutes), mean (SD)	61.9 (38.0)
No. of stones	
1	80 (51.0)
2	33 (21.0)
≥2	32 (20.4)
Unknown	12 (7.6)
Laterality	
Unilateral	137 (87.3)
Bilateral	20 (12.7)
Type of ureteroscope	
Both	30 (19.1)
Flexible	89 (56.7)
Semirigid	25 (15.9)
Unknown	13 (8.3)
Ureteral access sheath	
No	130 (82.8)
Yes	27 (17.2)
Ureteral access sheath size[a]	
12/14	11 (40.7)
11/13	2 (7.4)
10.7	1 (3.7)
10/12	1 (3.7)
9.5/11.5	2 (7.4)
9/11	3 (11.1)
Unspecified	7 (25.9)
Stent placement	
No	16 (10.2)
Yes	141 (89.8)
Stent size	
≤6F	124 (79.0)
≥7F	14 (8.9)
No stent/unknown	19 (12.1)
Extraction string on stent	
No	115 (73.2)
Yes	28 (17.8)
Unknown	14 (8.9)
Stent dwell time (days),[b] median (range)	13 (2–347)
Stent removal location	
Home	17 (10.8)
Office/operating room	111 (70.7)
No stent/unknown	29 (18.5)

[a]In 27 cases with ureteral access sheath use.
[b]In 129 cases with known stent duration.
ASA = American Society of Anesthesia; BMI = body mass index; SD = standard deviation.

respectively. Thus, a significant portion of patients required additional evaluation and/or intervention, resulting in an increased burden to medical resources that should be recognized given the frequency of URS as treatment for stones. These encounter rates are similar to previous reports, with ED visits occurring at roughly 15% and readmission rates around 4% to 5%.[4–7] Consistent with literature, pain was the most common presenting symptom in our cohort in all types of encounters, highlighting the associated discomfort, despite the minimally invasive nature of the operation.[4–7,9] Therefore, adequate pain management with appropriate quantity of analgesic prescriptions should be part of routine postoperative care. Unfortunately, our data did not include prescription records to allow detailed analysis of pain medication requirement.

As suggested by Morgan et al.,[6] although few objective complications following URS occur, there appears to be a high level of patient anxiety, uncertainty, and discomfort following stone surgery. Therefore, effective preoperative counseling to establish realistic periprocedural expectations may play an important role in reducing the incidence of these encounters.[5,6] The association of a higher rate of patient-initiated phone calls and ED visits with first-time stone procedure may reflect these patients' unfamiliarity with the procedure, leading them to seek medical advice even though reassurance or conservative management may suffice.

Table 2. Postprocedural Encounter Chief Complaints and Emergency Department Visit Diagnoses

	Count (%)
Chief complaint	
Telephone call	44 (100)
Pain attributed to stent	16 (36.4)
Medication issues/questions	6 (13.6)
Pain not specific to stent	4 (9.1)
Stent questions (string, stent removal, etc.)	4 (9.1)
Fever	3 (6.8)
Urinary retention	2 (4.5)
Hematuria	1 (2.3)
Other (rash, urinary incontinence, etc.)	8 (18.2)
ED visit/readmission	23 (100)/8 (100)
Flank pain	9 (39.1)/3 (37.5)
Hematuria	3 (13.0)/1 (12.5)
Fever	2 (8.7)/1 (12.5)
Other (chest pain, seizures, altered mental status, etc.)	9 (39.1)/3 (37.5)
ED diagnosis	23 (100)
Flank pain	5 (21.7)
UTI	6 (26.1)
Sepsis	3 (13.0)
Nephrolithiasis	2 (8.7)
Other/unknown (chest pain, stent removal, etc.)	7 (30.4)

ED = emergency department; UTI = urinary tract infection.

Similarly, outpatient status may limit patients' interaction with medical professionals at the time of URS, possibly reducing the amount of counseling received. Given that the median time to phone calls and ED visits are 5 and 8 days, respectively, perhaps a routine follow-up phone call by trained urology staff on postoperative days 2 to 3 may eliminate a portion of these patient-initiated encounters and improve patient satisfaction, at least for first-time stone formers.

In the study by Tan et al.,[7] unplanned admissions were associated with any previous admission related to stones, history of psychiatric illness, and bilateral procedures. Another study reported a complication rate of 9.7% after bilateral URS, with the most common complication being pain requiring rehospitalization or ED visits.[10] Similarly, we found that readmissions were associated with bilateral procedures.[7] This association may be due to increased ureteral manipulation, risk of bilateral ureteral injury, and longer operative time.[7] The small number (20 cases) of bilateral URS in our study precludes meaningful subgroup analysis. Until further studies are performed, the increased risk of readmissions should be balanced against the benefit of avoiding a second anesthesia afforded by bilateral URS. Although not seen in our study, other reported factors influencing postoperative encounters include younger age, hypertension, asthma or chronic obstructive pulmonary disease, two or more comorbidities, no ureteral stent or endoscopic urologic procedure within the last 30 days before URS, any previous admission related to stones, history of psychiatric illness, lower surgeon experience, lower volume center, and renal calculi.[4–7,11]

Table 3. Patient Characteristics

Variable	*No phone calls (113), %*	*Phone calls (44), %*	p	*No ED visits (134), %*	*ED visits (23), %*	p	*No readmission (149), %*	*Readmission (8), %*	p
Age (years), mean (SD)	51.1 (16.9)	53.5 (13.0)	0.443	51.8 (15.4)	51.8 (18.7)	0.802	51.3 (15.2)	61.1 (24.4)	0.156
Sex			0.727			0.363			1.000
Female	73.2	26.8		87.8	12.2		95.1	4.9	
Male	70.7	29.3		82.7	17.3		94.7	5.3	
Race			0.577			0.345			0.075
Black	78.3	21.9		84.4	15.6		93.8	6.3	
White	69.6	30.4		87.0	13.0		96.5	3.5	
Other/unknown	80.0	2.0		70.0	30.0		80.0	20.0	
BMI (kg/m^2), mean (SD)	29.6 (8.1)	29 (7.1)	0.847	29.6 (8.1)	28.3 (6.2)	0.526	29.7 (7.9)	23.9 (4.2)	0.013
Charlson comorbidity index			0.794			0.676			0.323
0	71.8	28.2		85.9	14.1		96.5	3.5	
1	64.7	35.3		82.4	17.6		100.0	0.0	
2	79.2	20.8		91.7	8.3		91.7	8.3	
>2	71.0	29.0		80.6	19.4		90.3	9.7	
ASA class			0.538			0.303			0.226
1 or 2	73.4	26.3		87.9	12.1		97.0	3.0	
3 or 4	69.1	30.9		81.8	18.2		92.7	7.3	
First-time stone procedure			0.029			0.011			0.142
No	79.1	20.9		91.9	8.1		97.7	2.3	
Yes	63.4	36.6		77.5	22.5		91.5	8.5	
History of ureteral stent			0.129			0.220			0.438
No	68.5	31.5		82.9	17.1		93.7	6.3	
Yes	80.4	19.6		91.3	8.7		97.8	2.2	

Table 4. Perioperative Variables

Variable	*No phone calls (113), %*	*Phone calls (44), %*	p	*No ED visits (134), %*	*ED visits (23), %*	p	*No readmission (149), %*	*Readmission (8), %*	p
Case type			0.285			1.000			0.417
Elective	70.7	29.3		85.0	15.0		95.2	4.8	
Urgent	90.0	10.0		90.0	10.0		90.0	10.0	
Postoperative status			0.021			1.000			0.479
Outpatient/observation	69.7	30.3		84.8	15.2		95.2	4.8	
Inpatient	100.0	0.0		91.7	8.3		91.7	8.3	
Preoperative urine culture			0.793			1.000			0.216
No growth/insignificant growth	72.2	27.8		87.6	12.4		96.9	3.1	
Positive	76.2	23.8		90.5	9.5		90.5	9.5	
Contaminated	—	—		—	—		—	—	
Unknown	—	—		—	—		—	—	
Treatment course of antibiotics before procedure			0.058			0.458			0.422
No	66.3	33.7		87.4	12.6		95.8	4.2	
Yes	82.5	17.5		82.5	17.5		92.5	7.5	
Unknown	—	—		—	—		—	—	
Endoscopic procedure within 30 days prior			0.260			0.417			1.000
No	74.8	25.2		86.9	13.1		94.4	5.6	
Yes	66.0	34.0		82.0	18.0		96.0	4.0	
Stent in place at time of procedure			0.552			1.000			0.731
No	69.6	30.4		85.5	14.5		94.2	5.8	
Yes	73.9	26.1		85.2	14.8		95.5	4.5	
Operative time (minutes)			0.515			0.768			0.728
Mean (SD)	62.5 (41.6)	60.4 (26.9)		62.0 (39.0)	61.4 (32.4)		62.1 (38.3)	57.8 (33.1)	
No. of stones			0.803			1.000			1.000
1	70.0	30.0		85.0	15.0		95.0	5.0	
2	75.8	24.2		84.8	15.2		93.9	6.1	
≥2	68.8	31.3		87.5	12.5		96.9	3.1	
Unknown	—	—		—	—		—	—	
Laterality			1.000			0.178			0.010
Unilateral	71.5	28.5		86.9	13.1		97.1	2.9	
Bilateral	75.0	25.0		75.0	25.0		80.0	20.0	
Type of ureteroscope			0.050			0.147			0.574
Both	85.2	14.8		92.6	7.4		92.6	7.4	
Flexible	63.6	36.4		81.8	18.2		93.2	6.8	
Semirigid	80.8	19.2		96.2	3.8		100.0	0.0	
Unknown	—	—		—	—		—	—	
Ureteral access sheath			0.490			0.018			0.032
No	73.2	26.8		88.2	11.8		96.9	3.1	
Yes	66.7	33.3		70.4	29.6		85.2	14.8	
Unknown	—	—		—	—		—	—	

Postoperative infection was diagnosed in nearly 40% of ED visits in our cohort. Due to the brief nature of ED visits, these were presumed UTIs, and five of the six UTI diagnoses were not confirmed by culture. As such, culture-confirmed infection only occurred in 4 of 157 patients (2.5%). Nevertheless, these patients account for 17.4% of patients presenting to the ED, with three of four developing sepsis, indicating the severity of the complication. Some risk factors for postoperative infections after URS reported in the literature include preoperative stenting, longer operative time, and positive stone culture.[12,13] Blackmur et al.[14] found that a positive preoperative urine culture increased the odds of postoperative urosepsis despite appropriate preoperative antibiotic therapy. Our experience corroborates this finding, where two of three patients who experienced sepsis postoperatively had positive preoperative urine culture and were treated with a course of antibiotics preoperatively. While the use of oral antibiotic prophylaxis is sufficient to prevent symptomatic UTIs at the time of stent removal in patients after uncomplicated ureteroscopic stone treatment, more intensive antibiotic prophylaxis and careful monitoring may benefit higher risk patients.[14,15] Interestingly, compliance with the

Table 5. Stent Variables

Variable	*No phone calls (113), %*	*Phone calls (44), %*	p	*No ED visits (134), %*	*ED visits (23), %*	p	*No readmission (149), %*	*Readmission (8), %*	p
Stent placement			0.006			0.131			1.000
No	100.0	0.0		100.0	0.0		100.0	0.0	
Yes	68.8	31.2		83.7	16.3		94.3	5.7	
Stent size			0.763			0.698			0.585
≤6F	69.4	30.6		84.7	15.3		94.4	5.6	
≥7F	64.3	35.7		78.6	21.4		92.9	7.1	
No stent/unknown	—	—		—	—		—	—	
Extraction string on stent			0.006			0.410			0.662
No	75.7	24.3		85.2	14.8		94.8	5.2	
Yes	48.3	51.7		79.3	20.7		93.1	6.9	
Unknown	—	—		—	—		—	—	
Stent removal location			0.014			0.305			1.000
Home	41.2	58.8		76.5	23.5		94.1	5.9	
Office/operating room	71.2	28.8		85.6	14.4		94.6	5.4	
No stent/unknown	—	—		—	—		—	—	

American Urological Association Best Practice Statement on antibiotic prophylaxis has been associated with unplanned hospital return for infection.[12] In a study by Moses et al.,[12] postoperative cultures often showed organisms not covered by the best practice statement regimens or organisms not present on initial preoperative culture, such as gram-positive organisms or common skin pathogens. The authors suggested the potential benefit of providing both gram-negative and gram-positive perioperative antibiotic coverage to reduce the risk of infection.

Intriguingly, lower BMI was a risk factor for readmission within 30 days. A phenomenon called ''obesity paradox'' has been documented in general surgery, where overweight (BMI 25.1–30) and moderately obese (BMI 30.1–35) patients undergoing nonbariatric general surgery have a significantly lower risk of death than normal weight patients.[16] A proposed mechanism for this paradox includes sufficient nutritional reserve and a more adaptive inflammatory response due to a chronic low-grade inflammation in the obese state. Whether the protective effect of mild to moderate obesity is present in URS remains to be investigated.

UAS facilitates URS by improving visualization and simplifying ureteral reentry, and despite mixed data on the influence of UAS on stone-free rate, its ability to reduce renal pelvic pressure during URS is an established benefit.[17] While one study reported a reduction of postoperative infectious complications with UAS, this was not seen by others.[14,18] Although a UAS was routinely used in their study, Morgan et al.[6] found that a larger UAS size was an independent predictor for unplanned symptom-related encounters after URS. Similarly, we observed that close to 30% of patients who had UAS during their procedure visited the ED, with half of them being readmitted. A potential explanation for the higher hospital visit rate is that the cases in which UAS was used were likely to be more complicated or had larger stone burden. Another possible mechanism for increased pain includes induction of mechanical dilation by the UAS within the ureter and upregulation of proinflammatory mediators such as cyclooxygenase-2 and tumor necrosis factor-α, causing ureteral edema and decreased ureteral blood flow, leading to ureteral spasm or colic.[17,19,20]

Ureteral stent placement after UAS use has been advocated as it decreases pain and the likelihood of undergoing CT imaging in the ED.[20,21] In our cohort, ureteral stenting was associated with more phone calls, and questions or complaints regarding stent-related symptoms constituted a large

Table 6. Multivariable Logistic Regression Analysis Modeling the Probability of One or More

Variable	*Odds ratio*	*95% Low*	*95% High*	p
Telephone calls				
First stone procedure (yes *vs* no)	2.37	1.12	5.00	0.024
Stent removed at home (yes *vs* no/unknown)	4.41	1.43	13.58	0.010
Admission to hospital before operating room (yes *vs* no)	0.21	0.03	1.73	0.146
Sex: male *vs* female	0.86	0.40	1.86	0.701
Age (numeric): 10-year increase	1.18	0.91	1.51	0.207
ED visits				
First stone procedure (yes *vs* no)	3.65	1.34	9.91	0.011
Use of ureteral sheath (yes *vs* no)	3.87	1.32	11.33	0.014
Sex: male *vs* female	1.46	0.57	3.79	0.432
Age (numeric): 10-year increase	0.92	0.68	1.26	0.610

proportion of these calls. This observation is consistent with multiple studies reporting hematuria and significant stent-related irritative symptoms, including flank pain, dysuria, and frequency.[22,23] Although one study showed that unstented patients were significantly more likely to have an unplanned ED, hospital, or office visit, we did not find such a correlation.[23] In fact, none of the unstented patients in our cohort had any phone calls, ED visits, or readmission, suggesting that stentless URS is feasible in appropriately selected patients. Stent-related symptoms appear to be significantly improved by α-blockers.[24,25] Other medical therapies include anticholinergic medication with solifenacin, preoperative belladonna and opium suppository, and periureteral botulinum toxin type A injection.[26–28] Incorporation of certain medical therapies to reduce stent discomfort should be considered part of routine postoperative care after URS.

While we found a significant association between phone calls with stent extraction string and stent removal at home, others have reported no difference in stent-related quality of life, pain at stent removal, rates of UTI, ED visits, or phone calls.[29] In fact, some patients may prefer stent removal using the extraction string as they may feel less pain compared with flexible cystoscopic stent removal.[30] However, anxiety regarding self-removal of stent or concerns about the string itself potentially led patients to seek medical advice in our study. Thus, proper patient selection and clear instructions may be helpful to reduce the number of phone calls, again highlighting the need for adequate preoperative counseling to manage patient expectations.

Other than its retrospective nature, our study is limited by an absence of postoperative prescription history, which may have informed us of medications that potentially prevent certain encounters. Multiple surgeons performed the URS, and no standardized operative technique or perioperative patient care regimen was available (e.g., UAS use or stenting, postoperative medications, or follow-up time frame), potentially introducing confounders. We do not have data on unplanned clinic visits since there is no clear distinction in documentation between planned and unplanned clinic visits, although these visits were rare in our anecdotal experience. The duration of stenting was variable, with the median almost 2 weeks. The relatively long stent dwell time is likely due to scheduling reasons, given that the vast majority of procedures did not leave extraction strings and required stent removal in the office or operating room. The true rate of ED visits and readmissions may not be accurate due to visits outside of our medical system. Although we attempted to minimize this error by surveying patients at the time of study, the response rate of the survey was only 40%. In addition, the relatively small sample size limited multivariate statistical analysis. Finally, the single-institution nature of the study conducted at a tertiary academic center reduces the generalizability of our findings.

Conclusions

Postoperative encounters after ureteroscopic stone treatment are common. Pain, first-time stone treatment, outpatient status, bilateral procedures, presence of a ureteral stent, and UAS usage were common reasons for these encounters. Appropriate perioperative patient education and counseling and adequate pain management may minimize these encounters and improve treatment quality and patient satisfaction.

Author Disclosure Statement

No competing financial interests exist.

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Abbreviations Used

ASA = American Society of Anesthesia
BMI = body mass index
CI = confidence interval
ED = emergency department
OR = odds ratio
SD = standard deviation
UAS = ureteral access sheath
URS = ureteroscopy
UTI = urinary tract infection