

# FELINE URETHRAL OBSTRUCTION: DIAGNOSIS & MANAGEMENT



Christopher M. George, DVM, and Gregory F. Grauer, DVM, MS, Diplomate ACVIM (Small Animal Internal Medicine), Kansas State University

FELINE FRIENDLY ARTICLE



Feline urethral obstruction (UO) is a common disorder encountered in small animal emergency practice, with incidence estimates ranging from 1.5% to 9%.<sup>1,2</sup>

The etiology of UO was long thought to be a physical obstruction, such as a urethral plug, calculi, stricture, or neoplasia. In a recent study,<sup>3</sup> however, causes of UO in 45 cats were found to be idiopathic (53%), uroliths (29%), and urethral plugs (18%), indicating that functional obstructions may be more common than previously thought.

Feline UO is a treatable emergency, with a survival rate to discharge higher than 90%,<sup>1</sup> despite the fact that it is potentially life threatening due to severe electrolyte and acid–base imbalances secondary to acute postrenal azotemia/uremia.<sup>1,4</sup> Treatment commonly involves days of hospitalization, with substantial owner investment, and rates of recurrence following treatment are relatively high (range, 11%–43%).<sup>3,5</sup>

## PREDISPOSING FACTORS

Given their relatively long and narrow urethra, male cats are much more likely than female cats to develop obstruction. Segev and colleagues determined that the mean age of cats with UO ( $51.7 \pm 37.7$  months) was significantly lower than gender-matched and time-matched (sequential hospital admissions) controls without UO ( $75.5 \pm 61.3$  months).<sup>4</sup> In addition, obstructed cats were more likely to live indoors only, weigh more, and be fed a dry diet exclusively.<sup>4</sup>

## PRESENTATION

### Clinical Signs

The most common early clinical signs of UO are similar to those of idiopathic cystitis, including stranguria, dysuria, and hematuria. Delayed systemic

signs—associated with the onset of uremia—include anorexia, vomiting, and lethargy/collapse.

Clinical signs depend on the completeness and duration of the obstruction. The median duration of signs before veterinary presentation was 3 days in one study of 223 cats.<sup>1</sup>

### Physical Examination

The classic physical examination finding in cats with UO is an overdistended, turgid urinary bladder that cannot be expressed. It is important to note, however, that the inability to express urine can be a normal finding in male cats and *not* diagnostic for UO.

The penis may be reddened from self-trauma, and a urethral plug may be observed protruding from the tip of the penis. Dehydration may be present as indicated by prolonged skin turgor and tacky mucous membranes.

Moderate bradycardia (100–140 beats/min) and severe bradycardia (< 100 beats/min) were observed in 6% and 5% of cases, respectively.<sup>1</sup> Bradycardia and arrhythmias occur secondary to the effects of hyperkalemia on cardiac conduction.<sup>1</sup> Of cats with UO, 50% can be expected to have a normal body temperature, 40% hypothermic, and 10% hyperthermic.<sup>1</sup> In one study, the combination of hypothermia (< 95–96.6°F) and bradycardia (< 120 beats/min) was 98% specific for severe hyperkalemia (> 8 mEq/L).<sup>6</sup>

Systolic blood pressure on presentation is typically normal<sup>7</sup>; in one study, 71% of cats were normotensive and 29% were hypertensive.<sup>7</sup>

## INITIAL DIAGNOSTICS

Diagnosis and management of UO are performed simultaneously. Diagnostics should ideally include:

- Minimum database, including packed cell volume/total solids, blood urea nitrogen (BUN),

creatinine, blood glucose, pH, sodium, potassium, chloride, phosphorus, and ionized calcium

- Electrocardiogram
- Urinalysis with sediment examination
- Abdominal/perineal radiographs.

### Blood Analysis

In one study of cats with UO<sup>1</sup>:

- Serum creatinine concentration was above the reference range in 29% of cats
- BUN was above the reference range in 33% of cats
- Serum phosphorus was above the reference range in 25% of cats.

Hyperkalemia is one of the most common laboratory abnormalities observed in cats with UO and can contribute to severe bradycardia and arrhythmias. In one study of cats with UO, serum potassium concentration was<sup>1</sup>:

- Less than 6 mmol/L in 76% of cats
- 6 to 7.9 mmol/L in 12% of cats
- 8 to 10 mmol/L in 12% of cats
- Above 10 mmol/L in only 0.5% of cats.

Hyperkalemia was also most often encountered with acidosis and low serum ionized calcium concentrations.<sup>1</sup> In cats with UO and bradycardia and/or arrhythmias, the magnitude of hyperkalemia should be assessed and corrected prior to sedation or anesthesia for urethral catheterization.

### Urinalysis

If urine is available, the urine specific gravity (USG) may be greater than 1.040 early in UO, but more dilute urine can be observed with prolonged UO as a result of increasing renal tubular dysfunction. Microscopic hematuria is almost always present, and gross hematuria is common due to bladder overdistension and/or the presence of underlying cystitis. Hematuria is also frequently associated with pyuria and proteinuria.

Nearly all cats presenting for UO have sterile urine; however, urine contamination or misinterpretation of particulate matter in the urine sediment may be mistaken for a urinary tract infection (UTI). Quantitative bacterial culture of urine obtained by cystocentesis is recommended to confirm UTI in patients with suspected infection. Struvite crystals may be observed as well, especially in alkaline urine. Struvite crystals are more likely to form secondary to urine stasis and alkaluria as opposed to being the primary cause of UO.

### Imaging

All cats with UO should be evaluated with abdominal

radiography to rule out urolithiasis as a cause. It is important to make sure the radiographs include the entire urinary system, which allows the kidneys, ureters, bladder, and entire length of the urethra to be assessed for urolithiasis.

Free abdominal fluid, as indicated by loss of serosal detail in the caudal abdomen, may be observed but is not always caused by rupture of the urinary bladder.<sup>8</sup> Increased bladder permeability secondary to severe distension and diffuse cystic mural disease may result in transmural leakage of urine without overt bladder rupture. Positive-contrast urethrography/cystography is the most sensitive diagnostic test for bladder or urethral rupture.

Ideally, survey radiographs are obtained prior to passage of a urethral catheter because the presence of the catheter can make urethral evaluation more difficult, and urolithiasis may be undetected. *If the patient is in critical condition, steps to address metabolic derangements should have priority over radiographs.*

### PATIENT STABILIZATION

The magnitude of azotemia, electrocardiographic stability, and degree of bladder distension helps dictate the order of treatment and how quickly it must be performed. *Cats in uremic crisis with very large, turgid bladders require prompt intervention.*

Stabilization of the patient and treatment of adverse effects of UO are essential before anesthesia is administered. Hypovolemia and hyperkalemia must be the first treatment priorities.

### Fluid Administration

Intravenous access should be obtained soon after presentation because IV fluid administration is critical for severely ill cats with UO.

Crystalloid fluid therapy is indicated; 0.9% sodium chloride is often recommended because it does not contain potassium. However, in a randomized study comparing treatment with 0.9% sodium chloride and a balanced polyelectrolyte solution (Normosol-R, hospira.com), no difference was observed in the rate of decline of serum potassium; in addition, a more rapid correction of acidosis was observed in the cats treated with polyelectrolyte solution than in those treated with 0.9% sodium chloride.<sup>9</sup> This suggests that balanced electrolyte solutions may actually be preferred for correcting acid–base imbalances in cats with UO.

IV fluid therapy is started at a rate of 10 to 20 mL/kg/H, and the rate adjusted as the patient stabilizes and urethral patency is established. Mild increases

## Degrees of Hyperkalemia

Various degrees of hyperkalemia occur in cats with UO (**Table**). Hyperkalemia adversely affects cardiac conduction. As a result, tall and spiked T waves, widened QRS complexes, lengthened PR intervals, flattened P waves, atrial standstill, ventricular fibrillation, and/or asystole may be observed on a lead II ECG rhythm strip (**Figure**).

TABLE.  
Cats with Urethral Obstruction: Degrees of Hyperkalemia

DEGREE OF HYPERKALEMIA	SERUM POTASSIUM CONCENTRATION	TREATMENT OPTIONS
Mild hyperkalemia	< 6 mEq/L	Dilutional fluid therapy (10–20 mL/kg/H), with rate adjusted as patient stabilizes
Moderate hyperkalemia	6–8 mEq/L	IV administration of: <ul style="list-style-type: none"> <li>• Dextrose (50% solution [1 mL/kg] diluted to final concentration of 10%–20%)</li> <li>• Regular insulin (1 U)</li> </ul>
Severe hyperkalemia	> 8 mEq/L	Calcium gluconate (0.5–1 mL/kg IV), followed by regular insulin and dextrose IV

in serum potassium concentrations will return to reference intervals with dilutional fluid therapy and relief of UO; however, targeted correction of moderate to severe hyperkalemia is necessary prior to sedation or anesthesia for relief of the UO (see **Degrees of Hyperkalemia**).

### Calcium Gluconate

Calcium gluconate is the treatment of choice for cats with severe hyperkalemia, bradycardia, and electrocardiographic instability.

Calcium gluconate (10%) is administered at 0.5 to 1 mL/kg IV slowly over 2 to 3 minutes while continuously monitoring the electrocardiogram. If bradycardia worsens or QT interval shortening occurs, the infusion should be stopped.

While this treatment rapidly stabilizes cardiac conduction, it does little to reduce hyperkalemia. In addition, its beneficial effects are short lived (20–30 min) and other strategies to lower serum potassium are often needed (**Table**).

An IV infusion of calcium gluconate may also be administered to treat muscle twitching or seizures associated with hypocalcemia. Hypocalcemia usually resolves rapidly after relief of obstruction as serum phosphorus concentration decreases.

### Dextrose

IV dextrose is helpful for longer term control of hyperkalemia. A 50% dextrose solution (1 mL/kg), diluted to a final concentration of 10% to

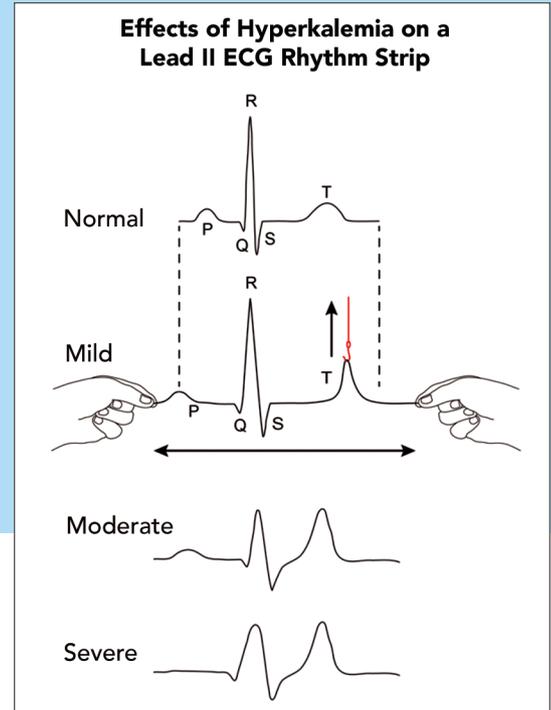


FIGURE. Examples of how different degrees of hyperkalemia can adversely affect cardiac conduction. Picture the lead II rhythm strip as a string being pulled apart. Note the flattened P waves, prolonged PR interval, and widened QRS complexes. The exception to this string analogy is the tall, spiked T waves.

20%, is administered as an IV bolus. This treatment stimulates endogenous insulin release, causing intracellular translocation of plasma potassium.

Administration of 1 unit of regular insulin IV hastens the intracellular translocation process. However, insulin should never be given without a concurrent dextrose bolus, followed by a constant rate dextrose infusion to prevent hypoglycemia.

### Sodium Bicarbonate

Sodium bicarbonate may be administered in cats with severe hyperkalemia to help translocate potassium from the plasma into the intracellular fluid in exchange for hydrogen ions. Sodium bicarbonate (1 mEq/kg) is administered IV, with a maximum dose of 4 mEq/kg.

If excessive amounts of bicarbonate are administered, the major disadvantage of this treatment is the development of ionized hypocalcemia due to increased binding of calcium to albumin

and intracellular translocation of ionized calcium, creating an alkalemia. Sodium bicarbonate may also be less effective than dextrose or insulin in reducing potassium concentrations.

### Cystocentesis

Therapeutic cystocentesis should be performed as soon as possible in cats with very large bladders and prior to anesthesia for urethral catheter placement to aid in stabilizing the patient. The benefits of therapeutic cystocentesis almost always outweigh the potential adverse effects; benefits include:

- Rapid reduction of bladder pressure
- Improvement in glomerular filtration rate
- Collection of an uncontaminated urine sample
- Reduction of cystic pressure, which may facilitate urethral catheterization and back flushing.

Cystocentesis in cases of UO is considered controversial by many clinicians, with the major concern being bladder rupture or tear. However, clinical experience and recent evidence have shown that the overall risk for bladder rupture is low.<sup>8,10</sup> In a recent study of 47 cats with UO, decompressive cystocentesis, followed by urethral catheterization, had no significant adverse effects on the bladder.<sup>8</sup> In most cases, a needle hole in the bladder resulting in a clinically significant uroabdomen is unlikely, especially if the bladder is kept decompressed by placement of a urinary catheter.<sup>10</sup>

To reduce potential complications of bladder laceration and aortic puncture:

- Perform the procedure with the cat in lateral recumbency
- Use a 22-gauge needle attached to an extension set with a 3-way stopcock and 35-mL syringe; the extension tubing and 3-way stopcock allow the bladder to be emptied at least partially without manipulation and movement of the needle
- Advance the needle through the bladder wall at a 45-degree angle directed toward the trigone; the 45-degree angle helps the needle tract seal after withdrawal
- Stabilize the bladder with one hand while the other hand guides the needle and an assistant operates the syringe.

## URETHRAL OBSTRUCTION RELIEF

### Anesthesia

After the cat has been stabilized, sufficient anesthesia is administered to provide immobilization and urethral relaxation. Many effective anesthesia protocols are available and can be chosen based on clinician comfort and drug availability.

- Ketamine (2–5 mg/kg IV), with either diazepam (0.2–0.5 mg/kg IV) or acepromazine (0.005–0.05 mg/kg IV), is generally a safe and effective protocol; a second dose of ketamine and diazepam can be administered if additional time is needed to complete the procedure.
- Diazepam may be a better choice for more critical patients because it is less likely to cause hypotension compared with acepromazine.
- Inhalational anesthesia (isoflurane or sevoflurane) via endotracheal tube may be necessary in some cats that are not sufficiently relaxed with the above protocols.
- Propofol is also effective, but apnea and hypotension are possible adverse effects. If propofol is used, the cat should be intubated to provide adequate ventilation.

Epidurals provide analgesia to the penis and bladder and may reduce the depth of anesthesia necessary, but these techniques require additional training and expertise. A simplified method of coccygeal epidural with local anesthetic has been described and provides safe and effective analgesia to the penis and urethra.<sup>11</sup>

### Urethral Catheter Placement

Aseptic technique and a gentle hand are fundamental to urethral catheter placement.

1. Clip the hair in the perineal region carefully and prepare the skin aseptically.
2. Extrude the penis and retract it caudally to straighten the urethra. Failure to fully retract the penis caudally impedes the catheter from navigating the sigmoid flexure of the urethra.
3. Advance a urinary catheter (see **What Types of Catheters?**, page 40) into the urethra to the site of obstruction. Advance the catheter slowly to avoid urethral trauma; it should never be forced past an obstruction.
4. Urethral irrigation (hydropulsion) with sterile physiologic saline via an extension tube is recommended both to dilate the urethra and to flush any obstructing material retrograde into the bladder.
5. A 50:50 mixture of water-soluble lubricant and sterile physiologic saline may also be injected through the catheter to provide lubrication along the entire length of the urethra and aid in catheter advancement.
6. Once the urethra is patent, flush it thoroughly to ensure all debris is removed and then advance the catheter into the bladder.
7. After catheterization, flush and drain the bladder multiple times with sterile saline to remove

## What Types of Catheters?

For **urethral catheter placement**, use a well-lubricated, rigid, open-ended urinary catheter (eg, 3.5- or 5-Fr, 10-cm polypropylene). A 20- to 22-gauge over-the-needle catheter (without the needle) or olive-tip catheter may also be used; however, these are not usually long enough to reach the trigone and drain the bladder.

For **indwelling catheter placement**, use a longer, softer catheter; material options include polyvinyl (red rubber catheter or infant feeding tube), polytetrafluoroethylene (Slippery Sam Tomcat Urethral Catheters, surgivet.com), or polyurethane. A 3.5-Fr catheter is preferred over a 5-Fr catheter because the smaller diameter catheter is associated with a decreased incidence of recurrent UO within 24 hours (in one study, 6.7% of cats with a 3.5-Fr catheter versus 19% of cats with a 5-Fr catheter).<sup>5</sup> Polypropylene catheters should not be used as indwelling catheters because they tend to be more irritating to the urethra than other types of urinary catheters.<sup>12</sup>

debris and help prevent rapid recurrent UO. We use refrigerated sterile saline to help promote vasoconstriction and reduce hemorrhage.

### Role of Atracurium Besylate

One study evaluated the effect of intraurethral atracurium besylate—a neuromuscular blocking agent that causes paralysis of striated muscle—in male cats with urethral plugs in aiding the resolution of UO.<sup>13</sup>

- A solution of 0.5 mg/mL atracurium besylate was infused into the urethral lumen of treated cats for 5 minutes prior to retrograde flushing; the control group was infused with saline.
- The percentage of cats with urethral plug removal at the first attempt was significantly higher in the atracurium group (64%) compared with the saline group (15%).
- The mean time required for removal of the UO was also significantly reduced in the atracurium group.

Use of this protocol may result in shorter anesthetic events and easier urethral catheterization in cats with UO.

### Indwelling Catheters

Indwelling urethral catheters are not necessary in all cases of UO because the presence of the catheter causes urethral irritation. However, indwelling urethral catheters are necessary in patients with:

- Severe azotemia, which often results in

postobstructive diuresis (requiring measurement of urine production to guide fluid therapy; see **After Relief of Urethral Obstruction**)

- Severe bladder distension, which often results in detrusor atony and inability to void
- Grossly abnormal urine or cystic calculi, both of which increase the risk for immediate recurrent UO.

To avoid trauma to the bladder mucosa and the catheter tangling inside the bladder, indwelling urethral catheters (see **What Types of Catheters?**) should not be inserted fully into the bladder. Catheters should be “premeasured” and inserted only to the level of the trigone. The indwelling catheter is then secured to the prepuce using a nonabsorbable suture and finger trap technique, tape butterfly and suture, or other technique depending on clinician preference.

A sterile collection system should always be attached and secured to the cat’s tail. It is never acceptable to leave an indwelling catheter exposed to the environment due to the risk for bacterial infection. An Elizabethan collar or hind leg hobbles should be used to prevent the cat from chewing out the catheter.

## AFTER RELIEF OF URETHRAL OBSTRUCTION

After obtaining urethral patency, intensive supportive care is indicated until resolution of metabolic derangements. This care includes:

- Maintenance of urethral catheter
- Monitoring for postobstructive diuresis and secondary UTI
- Administration of IV fluid therapy, analgesia, and urethral relaxants/antispasmodics
- Potential supplementation with potassium.

### Postobstructive Diuresis

Postobstructive diuresis (POD) is a well-described phenomenon in human medicine that may result secondary to UO in cats as well. In one study, 46% (13/28) of cats developed POD, defined as urine production exceeding 2 mL/kg/H within 6 hours after relief of UO.<sup>15</sup> Several cats had diuresis up to 84 hours following relief of UO.<sup>15</sup>

The high incidence of POD calls for close measurement of urine output and continued IV fluid administration using an “ins and outs” fluid therapy protocol after resolution of hypovolemia. This protocol involves administering balanced electrolyte fluids at a rate to replace the urine volume produced hourly, plus 20 mL/kg/day for insensible losses to prevent negative fluid balance.

## Avoiding Euthanasia: Nonconventional Management

Conventional management of UO can involve substantial owner expense. Financial constraints may result in euthanasia of cats with UO, especially those with recurrent UO. While conventional management with urethral catheter and intensive care should always be offered as the first treatment choice, a noncatheterization protocol may be a viable alternative to euthanasia.

In a 2010 study, Cooper and colleagues described a protocol for managing UO in male cats without urethral catheterization<sup>14</sup>:

1. Acepromazine (0.25 mg IM) and buprenorphine (0.075 mg IM) are administered to provide sedation and analgesia.
2. The penis is inspected and gently massaged in an attempt to dislodge any obstruction in the distal penis, followed by a single attempt to express the bladder.
3. If no urine is expressed, therapeutic cystocentesis is performed and the cat is housed in a dark, quiet room to minimize stress.

4. Acepromazine (2.5 mg PO Q 8 H) and buprenorphine (0.075 mg PO Q 8 H) are administered, with cystocentesis repeated every 8 hours. Medetomidine (0.1 mg IM Q 24 H) can be administered if no urination is noted within 24 hours, and SC fluids can be given as needed.

Treatment success, defined as spontaneous urination within 72 hours, occurred in 11 of 15 (73%) cats; treatment failure occurred in 4 of 15 (27%) cats. Cats that experienced treatment failure had significantly higher serum creatinine concentrations, although the magnitude of pretreatment azotemia was not an exclusionary criterion. Necropsy of 3 of the cats with treatment failure showed no evidence of bladder rupture.<sup>14</sup>

Cats with unresponsive mentation, severe metabolic derangements (severe acidosis or hyperkalemia), or radiographic evidence of uroliths were excluded from the study and are not good candidates for this protocol.<sup>14</sup>

### Monitoring & IV Fluid Rate

Serum electrolytes should be monitored at minimum every 24 hours, and potassium supplementation may be required to prevent hypokalemia, especially in the face of substantial POD. Reduced urine production typically occurs after resolution of azotemia.

If urine production does not decrease, the high rates of IV fluids may be driving the diuresis. The IV fluid rate in these patients should be tapered initially by 25%. If urine production decreases, continued reduction of IV fluids by 25% every 6 to 12 hours is recommended. If urine production is not reduced, the fluid rate should be increased to its previous level and tapering attempted again 24 hours later.

### Analgesics

Continued treatment with analgesics for 5 to 7 days after relief of UO is indicated in all patients. Opioid derivatives (eg, buprenorphine) are used most commonly.

Use of the nonsteroidal anti-inflammatory drug (NSAID) meloxicam was evaluated recently in the treatment of obstructive feline idiopathic cystitis.<sup>16</sup> Cats were separated into 2 treatment groups: one receiving buprenorphine and meloxicam and the other receiving buprenorphine and a placebo. Meloxicam did not influence the recurrence rate of UO or rate of recovery from clinical signs. Due to these findings and the risk associated with NSAIDs in the face of hypovolemia and decreased renal function, NSAIDs should be used with caution in cats with post-UO.

### Indwelling Catheter Removal

The duration of indwelling urethral catheterization is controversial. Removing the indwelling catheter too soon may not allow for adequate clearing of bladder debris, clots, or crystals. However, the presence of a urinary catheter causes irritation and inflammation of the lower urinary tract.<sup>13</sup>

The duration of urethral catheterization should be based on the patient's clinical status rather than a specific amount of time. Guidelines for catheter removal include resolution of metabolic derangements (such as azotemia) and POD as well as improvement in the gross character of the urine (clear versus cloudy/hemorrhagic).<sup>10</sup> The average duration of indwelling catheterization is 48 hours.

### Use of Antimicrobials

Antimicrobials are not recommended unless quantitative bacterial culture demonstrates the presence of a UTI. The majority of cats presenting for their first UO do *not* have a UTI, and antimicrobials do *not* prevent the development of catheter-associated UTI.

A prospective study of cats with UO found zero positive cultures on presentation, but 6 of 18 (33%) cats developed UTI while catheterized.<sup>17</sup> Cats treated with an indwelling urethral catheter should have a quantitative bacterial culture performed on urine at the time of catheter removal or 7 to 10 days later. Antimicrobials should be prescribed based on culture and sensitivity results.

### Urethral Relaxants

Because urethral irritation and spasm can contribute to UO, the use of urethral relaxants has become standard. Medications most commonly used include acepromazine, phenoxybenzamine, and prazosin, all of which function as alpha-1 antagonists, which cause smooth muscle relaxation. Since smooth muscle is located in the proximal 1/3 of the penile urethra only, whereas striated muscle comprises the remainder of the urethra, urethral relaxants may not be effective in improving outcome in cats with more distal obstructions.

One retrospective study evaluating factors affecting recurrent UO rates found that patients receiving prazosin had significantly lower recurrent UO rates than those receiving phenoxybenzamine at 24 hours (7% versus 22%, respectively) and 30 days (18% versus 39%, respectively).<sup>5</sup> This may be due to the more rapid onset of action of prazosin compared with phenoxybenzamine as well as the effects of prazosin on both the preprostatic and prostatic urethra.

Therefore, prazosin (0.25–1 mg/cat PO Q 8–12 hours) is recommended in cats for 5 to 10 days post-UO. However, phenoxybenzamine or acepromazine may be substituted based on availability. It is important to consider the sedative effects of acepromazine, as these may be beneficial in reducing stress or contraindicated based on the individual patient.

Further prospective studies are needed to evaluate the effects of other alpha-1 antagonists on recurrent UO.

## AFTER DISCHARGE

### Home Environment

The home environment of cats with UO should be changed as needed to help decrease stress and increase water consumption. Alterations may include:

- Increasing contact time between the cat and owner
- Improving litter box hygiene and increasing number of litter boxes
- Switching to a canned food diet and increasing water availability
- Environmental enrichment, such as vertical perches and hiding places
- Increasing hunter behavior and use of pheromones (Feliway spray, [feliway.com](http://feliway.com)) to help reduce stress.<sup>18</sup>

In a prospective study evaluating risk factors associated with recurrent UO, the combination of environmental modifications significantly lowered the risk for recurrent UO, but increasing water consumption was the only independent factor associated with a decreased risk for recurrent UO.<sup>19</sup>

### Follow-Up

Re-evaluation 7 to 10 days after discharge is recommended. Factors to evaluate include:

- Urinalysis to monitor USG (goal of < 1.030), urine pH, and crystalluria
- Quantitative bacterial culture (obtained by cystocentesis) to rule out UTI that may have occurred during indwelling urethral catheterization.

### IN SUMMARY

UO is a common but complex disorder encountered in cats. A great deal remains to be learned about the treatment of UO and the risk factors for recurrent UO to help standardize care. Despite the severe metabolic consequences associated with UO, aggressive treatment results in high success rates. When aggressive conventional treatment is not an option, nonconventional management may be successful.

BUN = blood urea nitrogen; NSAID = nonsteroidal anti-inflammatory drug; POD = postobstructive diuresis; UO = urethral obstruction; USG = urine specific gravity; UTI = urinary tract infection

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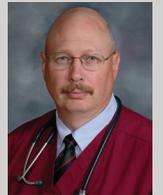
#### CHRISTOPHER M. GEORGE

Christopher M. George, DVM, is a small animal internal medicine resident at Kansas State University College of Veterinary Medicine. Dr. George received his DVM degree from Kansas State University and completed a small animal surgery and medicine internship at VCA Mission Animal Referral and Emergency Center before returning to Kansas State University for his residency training. His clinical interests and Master's research include feline chronic kidney disease and urology.



#### GREGORY F. GRAUER

Gregory F. Grauer, DVM, MS, Diplomate ACVIM (Small Animal Internal Medicine), is a professor and Jarvis Chair of Medicine, Department of Clinical Sciences, at Kansas State University College of Veterinary Medicine. His clinical and research interests involve the small animal urinary system. He is on the board of directors of the IRIS and American Society of Veterinary Nephrology and Urology. Dr. Grauer received his postgraduate training in internal medicine at Colorado State University. He has been a faculty member at University of Wisconsin and Colorado State University Colleges of Veterinary Medicine.



## CE TEST. FELINE URETHRAL OBSTRUCTION: DIAGNOSIS & MANAGEMENT

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### Learning Objectives

Upon completion of this article, readers should be able to formulate a plan for appropriate diagnostics that will facilitate patient stabilization prior to relief of a urethral obstruction (UO). Readers should also have an increased understanding of traditional and nontraditional methods of relieving UO as well as some of the factors that may contribute to recurrent obstruction.



#### Note

Questions online may differ from those here; answers are available once CE test is taken at [vetmedteam.com/tvp.aspx](http://vetmedteam.com/tvp.aspx). Tests are valid for 2 years from date of approval.

- Cats treated for UO have a survival rate to discharge of:**
  - < 70%
  - 70–80%
  - 80–90%
  - > 90%
- Classic historical and physical examination findings in cats with UO include all of the following except:**
  - Stranguria, dysuria, and/or hematuria
  - Anorexia and vomiting
  - Perineal and hindlimb edema
  - A large, turgid urinary bladder
- What is the most significant laboratory abnormality requiring emergent treatment in cats with UO?**
  - Hyperkalemia
  - Hypercalcemia
  - Hyponatremia
  - Hypochloremia
- What type of imaging is recommended for all cats presenting with UO?**
  - Abdominal ultrasonography
  - Abdominal radiography
  - Thoracic radiography
  - Abdominal computed tomography
- What emergent IV therapy is most effective in rapidly reducing serum potassium levels?**
  - Calcium gluconate
  - Sodium bicarbonate
  - Dilutional fluid therapy
  - Regular insulin and dextrose
- True/False: Therapeutic cystocentesis is contraindicated in cats with UO.**
- What type of urinary catheter is not recommended for use as an indwelling catheter?**
  - Polypropylene (Tomcat catheter)
  - Polyvinyl (red rubber catheter or infant feeding tube)
  - Polytetrafluoroethylene (Slippery Sam Tomcat Urethral Catheter)
  - Polyurethane
- True/False: Cats with UO must be treated with urethral catheterization; other treatment protocols are ineffective.**
- When are antimicrobials indicated in the treatment of UO?**
  - When cats present for recurrent UO
  - When quantitative bacterial culture suggests significant bacteriuria
  - To prevent UTI during urethral catheterization
  - In all cats being discharged after urethral catheterization
- The use of \_\_\_\_\_ has become standard in cats with UO to help prevent recurrent UO secondary to urethral irritation and spasms.**
  - Meloxicam
  - Diazepam
  - Alpha-1 antagonists
  - Calcium gluconate