Feline lower urinary tract disease (FLUTD) is a general term used to describe conditions affecting the bladder or urethra of cats;\textsuperscript{1} it is not a syndrome or specific diagnosis. It has been reported that between 4.5\% and 8\% of cats presenting to veterinary practices or teaching hospitals have FLUTD.\textsuperscript{2,3} Causes of FLUTD include physical conditions and behavioral disorders resulting in inappropriate urination (BOX 1). Because FLUTD encompasses a set of diseases manifesting similar clinical signs, an individualized, thorough diagnostic approach is required to determine the cause and optimize therapy (FIGURE 1).

**CLINICAL PRESENTATION**

**Clinical Signs**
Lower urinary tract disease can be nonobstructive or obstructive (FIGURE 2). Common clinical signs of each are listed in TABLE 1. Affected cats may exhibit one or more of these signs. Clinical signs of urethral obstruction vary with the duration of obstruction. Because of urethral diameter, obstruction is more common in male cats.\textsuperscript{4}

**Signalment**
Most cats presenting with FLUTD are between 1 and 10 years of age.\textsuperscript{4} In cats younger than 10 years, feline idiopathic cystitis (FIC) is the most common cause (55\% to 63\%), followed by urolithiasis (15\% to 22\%) and urethral plugs (10\% to 21\%). Neoplasia (less than 1\% to 2\%) and urinary tract infection (UTI; less than 1\% to 8\%) are uncommon.\textsuperscript{5-7} In one study, cats aged 10 years or older were reported to have an increased risk for UTI.\textsuperscript{3} Additionally, cats with certain metabolic disorders,\textsuperscript{8,9} urolithiasis,\textsuperscript{10} and prior urinary tract procedures (e.g., urethral catheterization, perineal urethrostomy)\textsuperscript{11-13} have an increased incidence of UTI. Bladder neoplasia is rare in cats but is more common in cats older than 10 years.\textsuperscript{3} Certain breeds may have an increased risk of specific etiologies of FLUTD; for example, in some studies, Russian Blue, Himalayan, and Persian breeds have had an increased risk of urolithiasis.\textsuperscript{3,14}

**A COMPLETE APPROACH**
Treatment of FLUTD will depend on the underlying cause; successfully managing it requires a long-term commitment and a multimodal strategy.
Patient History
Clinical signs help localize the problem to the lower urinary tract. Information from the client can be used to determine the duration and severity of signs. Additionally, it is important to determine if the cat is showing systemic signs of illness, especially if urethral obstruction is a concern. Information regarding the cat’s environment, including diet, litterbox management, access to the outdoors, other pets in the household, available enrichment, and potential stressors, may be helpful when modifying environmental conditions as part of chronic...
Available online surveys, such as the one included in the 2014 AAFP and ISFM Guidelines for Diagnosing and Solving House-Soiling Behavior in Cats (catvets.com/guidelines/practice-guidelines/house-soiling), can be helpful in obtaining a detailed environmental history. If the cat has been medicated, particularly with empirical antibiotics, response to therapy should be interpreted with caution because FIC typically spontaneously resolves after 1 to 7 days, which may be mistaken for a therapeutic response.

Physical Examination
A thorough physical examination should be performed, including measurement of vital parameters, as urethral obstruction can result in severe metabolic derangements. A distended, painful bladder that cannot be expressed is the classic finding with urethral obstruction. The penis may be reddened from self-trauma. Patients with nonobstructive FLUTD often have a small or minimally distended bladder that may have a palpably thickened wall. It is rare to palpate a mass effect in a cat with bladder neoplasia.

**TABLE 1 Clinical Signs of Feline Lower Urinary Tract Disease**

<table>
<thead>
<tr>
<th>NONOBSTRUCTIVE</th>
<th>OBSTRUCTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollakiuria</td>
<td>Stranguria</td>
</tr>
<tr>
<td>Hematuria</td>
<td>Anuria</td>
</tr>
<tr>
<td>Stranguria</td>
<td>Lethargy</td>
</tr>
<tr>
<td>Periuria (urinating in inappropriate places)</td>
<td>Vomiting</td>
</tr>
<tr>
<td>Licking at urethral opening</td>
<td>Depressed mentation</td>
</tr>
<tr>
<td></td>
<td>Licking at urethral opening</td>
</tr>
<tr>
<td></td>
<td>Inappetence</td>
</tr>
</tbody>
</table>
If a cat has frequently recurring or chronic, persistent signs, differentials should include FIC, urolithiasis, UTI, and behavioral problems, so a complete diagnostic evaluation is indicated, even if the patient is not an older cat.

Complete Urinalysis
A complete urinalysis includes evaluation of a dipstick, urine specific gravity (USG) measurement by refractometer, and a urine sediment examination. Urine should be analyzed within 60 minutes of collection for the most reliable results. One concern is that crystals may form in vitro. The leukocyte esterase test pad on the dipstick has a high false-positive rate in cats and, therefore, is not useful. Inflammatory diseases of the lower urinary tract often result in gross or microscopic hematuria, proteinuria, and possibly pyuria. Bacteriuria should prompt submission of a sample for quantitative urine culture, as debris can be easily mistaken for bacteria. Urease-producing bacteria (e.g., *Staphylococcus* spp, *Proteus* spp) may result in an alkaline pH; however, a single pH measurement should be interpreted with caution as pH may vary throughout the day.

In general, struvite (i.e., magnesium ammonium phosphate) stones are associated with an alkaline to neutral urine pH and calcium oxalate stones are associated with an acidic to neutral pH. Struvite crystals and calcium oxalate crystals may be present with or without urolithiasis. Struvite or calcium oxalate crystalluria does not predict which cats will form stones, can occur in apparently healthy cats, and does not require treatment if the cat has never formed stones previously. Additionally, crystal type does not necessarily predict urolith composition. Although rare, urate crystals should prompt evaluation for a portosystemic shunt.

Abdominal Radiography
Uroliths are the cause of lower urinary tract signs in approximately 15% to 20% of feline patients, so survey abdominal radiographs are indicated in all cats with lower urinary tract signs, regardless of patient signalment. Also, uroliths must be ruled out before FIC can be diagnosed. Struvite and calcium oxalate stones are radiopaque, and radiographs allow assessment of their presence, location, number, and size. Bladder neoplasia is not usually apparent on radiographs, but if a calcified mass is present, it may be detectable.

Quantitative Urine Culture and Susceptibility Testing
Urine for culture must be collected by cystocentesis. Because UTIs are a relatively uncommon cause of FLUTD in young adult cats, the decision of whether to culture may be based on factors such as
owner finances and the need to have the cat return for repeat urine collection if signs persist. A urine culture is indicated before concluding a patient has FIC, since this is a diagnosis of exclusion.

Urine culture and susceptibility testing are indicated if pyuria and bacteriuria are present on urinalysis to confirm the diagnosis and guide therapy. Studies have identified other risk factors for feline UTIs (BOX 2); if the patient has one of these risk factors, urine culture is warranted.

Complementary Diagnostic Tests

**Complete Blood Count and Biochemistry Panel**
In a patient with urethral obstruction, a biochemistry panel can detect azotemia, electrolyte abnormalities, and acid-base disturbances, which guide emergency management. In nonobstructed patients, a complete blood count and biochemistry profile can be helpful to assess for comorbid conditions (e.g., pyelonephritis). Metabolic diseases that may increase the risk of UTI (BOX 2) can be excluded. Patients with calcium oxalate uroliths should be evaluated for hypercalcemia.

**Cytology**
Cytology of samples from the bladder wall can be used to diagnose certain neoplasms. Urine sediment examination may reveal urothelial cells, but these should be interpreted with caution. Histopathology of bladder biopsy samples may be required to make a definitive diagnosis of neoplasia.

**Imaging**
Although it does not allow evaluation of the distal urethra, abdominal ultrasonography may be used concurrently with radiography to assess the size and number of uroliths. It may also show anatomic abnormalities such as a thickened bladder wall, urachal remnant, or bladder mass.

Contrast urethrography is the best imaging method to evaluate for urethroliths. For a cat with chronic, persistent lower urinary tract signs, contrast cystourethrography can be helpful to rule out small stones before concluding the patient has FIC. Other imaging modalities are rarely required.

Cystoscopy may be performed at some referral centers. The procedure can be performed on a female cat using a 1.9-mm rigid cystoscope with a 10-French sheath. Cystoscopy for male cats is limited by the small diameter of the urethra. Endoscopy provides visualization only (without sample collection). Alternative options are to perform cystoscopy after perineal urethrostomy in a male cat or to obtain antegrade access via the urinary bladder intraoperatively. During cystourethroscopy, mass lesions, uroliths, certain anatomic abnormalities, and submucosal petechial hemorrhages (as seen with FIC) may be identified.

**SPECIFIC ETIOLOGIES**

**Uroliths**
Uroliths are present in approximately 15% to 20% of cats with FLUTD. The pathophysiology of urolith formation is incompletely understood. The 2 most common stone types are struvite and calcium oxalate, each accounting for greater than or equal to 40% of feline uroliths. Struvite uroliths are commonly moderately radiopaque and associated with an alkaline to neutral urine pH and calcium oxalate stones are associated with an acidic to neutral pH.

**Struvite**
Struvite uroliths are commonly moderately radiopaque and associated with neutral to alkaline urine. Unlike in dogs, most feline struvite uroliths form...

In general, struvite (i.e., magnesium ammonium phosphate) stones are associated with an alkaline to neutral urine pH and calcium oxalate stones are associated with an acidic to neutral pH.
in sterile urine. Struvite uroliths may be treated via surgical removal, voiding urohydropropulsion (BOX 3), or dissolution by medical management (BOX 4). Current recommendations are to attempt medical dissolution as first-line therapy unless there is a direct contraindication (e.g., dietary intolerance, urinary tract obstruction), since it is highly effective and avoids the risks of anesthesia and surgery. Medical dissolution of struvite stones requires feeding a canned diet that is formulated to avoid excessive magnesium and phosphorus and to maintain an acidic urine pH. Sterile struvite bladder stones usually dissolve in less than 5 weeks.

**Calcium Oxalate**

Calcium oxalate stones are radiopaque and are typically associated with neutral to acidic urine. These stones cannot be dissolved medically and require removal by voiding urohydropropulsion or surgery. Postoperative abdominal radiographs should be taken to ensure that all calculi are removed; incomplete removal has been reported in up to 20% of cats. An alternative method of removal for stones that are too large to pass through the urethra is percutaneous cystolithotomy, a minimally invasive procedure in which a cystoscope is passed into the bladder through a 1-cm surgical incision. All removed stones should be submitted for quantitative analysis, which is used to guide management to prevent recurrence. Cats with calcium oxalate stones should be evaluated for hypercalcemia, as this is a risk factor for calcium oxalate urolithiasis.

**Long-Term Management**

Cats that have formed a struvite or calcium oxalate stone are at an increased risk for recurrence, so long-term management and monitoring is warranted. However, the cause of calcium oxalate urolith formation in most cats remains largely unknown, making preventive recommendations difficult. Diets designed to prevent stone recurrence focus on decreasing concentrations of urinary solutes and crystal promoters and increasing stone inhibitors (TABLE 2). A diet can also help achieve urine pH targets.

Increased water intake is the cornerstone of preventing urolithiasis by promoting dilute urine (target USG <1.030) and increased frequency of urination to decrease urine retention time and thus time for crystal formation. Increased water intake may be achieved by feeding a canned diet or adding water (1 cup per cup of kibble) to dry food before feeding. Feeding 2 to 3 meals a day (versus a single meal) may also promote increased water intake. Other strategies to increase water intake include using a water fountain, special bowls, or running faucets. However, the benefit of these strategies is unproven.

**Urinary Tract Infection**

UTI should be suspected if pyuria and/or bacteriuria are present on urinalysis, but a quantitative culture of urine collected by cystocentesis is required to confirm the diagnosis. Infections are usually the result of ascending bacteria, and *Escherichia coli* is the most common causative agent. The
incidence of UTI in cats with FLUTD varies between studies, apparently related to geographic location, age of the cat, and comorbidities. Risk factors for UTI are listed in BOX 2.

Culture and susceptibility testing should be used to guide antimicrobial therapy. If the bacteria are widely susceptible and the infection is not complicated by concurrent conditions, treatment with oral amoxicillin (11 to 15 mg/kg PO q8 to 12h) for 7 to 14 days is recommended. A shorter course of antimicrobial therapy (3 to 5 days) has been recommended, but research to support this in cats is limited. If an underlying condition is identified (e.g., uroliths, congenital anomaly), it should be corrected, if possible.

Neoplasia
Feline lower urinary tract neoplasia is very uncommon. The most common type is urothelial cell carcinoma (UCC, formerly called transitional cell carcinoma). The median age of cats presenting with lower urinary tract neoplasia is 10 to 15 years, which is substantially older than cats with FIC. However, lymphoma can occur in cats as young as 1 year of age. Lower urinary tract neoplasia is diagnosed using ultrasonography or contrast cystourethrogram paired with cytology or histopathology. Median survival time for cats treated with surgery, chemotherapy, nonsteroidal anti-inflammatory drugs, or a combination of these modalities is approximately 8.5 to 12 months.

Feline Idiopathic Cystitis
FIC has also been called feline interstitial cystitis, idiopathic FLUTD, feline urologic syndrome, and Pandora syndrome. The most common age at initial presentation is 2 to 7 years. Cats with FIC typically present with acute signs of lower urinary tract inflammation that resolve spontaneously after 4 to 7 days (80% to 90% of cases). There is no single diagnostic test to confirm FIC, and diagnosis is based on exclusion of other etiologies for FLUTD. FIC may have variable presentations, including urethral obstruction (15% to 20% of cases; more common in cats without systemic hypercalcemia).

<table>
<thead>
<tr>
<th>BOX 4 Approach to Medical Dissolution of Struvite Cystoliths</th>
<th>STRUVITE UROLITHS</th>
<th>CALCIUM OXALATE UROLITHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition cat to a canned calculolytic diet over a 7-day period</td>
<td>Over 7 days, transition to a canned therapeutic diet formulated to prevent urolith recurrence</td>
<td></td>
</tr>
<tr>
<td>Most feline struvite uroliths are sterile, but if a UTI is confirmed, treat with an appropriate antibiotic for the duration of the dissolution protocol</td>
<td>Consider implementing strategies to encourage water intake</td>
<td></td>
</tr>
<tr>
<td>Reevaluate at 2-week intervals with urinalyses and abdominal radiographs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Targets: urine pH &lt;6.5 and USG &lt;1.030</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continue medical management for 1 month beyond medical dissolution of stones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If stones have not reduced significantly in size at 1-month recheck, consider whether owner is complying with exclusively feeding calculolytic diet versus if stone composition is not struvite</td>
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</table>

<table>
<thead>
<tr>
<th>TABLE 2 Approach to Prevention of Feline Struvite and Calcium Oxalate Uroliths</th>
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<tbody>
<tr>
<td>STRUVITE UROLITHS</td>
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<tr>
<td>-------------------</td>
</tr>
<tr>
<td><strong>General</strong></td>
</tr>
<tr>
<td>Over 7 days, transition to a canned therapeutic diet formulated to prevent urolith recurrence</td>
</tr>
<tr>
<td>Consider implementing strategies to encourage water intake</td>
</tr>
<tr>
<td><strong>Targets</strong></td>
</tr>
<tr>
<td>No struvite crystals</td>
</tr>
<tr>
<td>pH &lt;6.5</td>
</tr>
<tr>
<td>USG &lt;1.030</td>
</tr>
<tr>
<td>No or few calcium oxalate crystals</td>
</tr>
<tr>
<td>pH &gt;6.2</td>
</tr>
<tr>
<td>USG &lt;1.030</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
</tr>
<tr>
<td>Evaluate urinalysis after 1 month and then every 3 months</td>
</tr>
<tr>
<td>Perform abdominal radiographs every 3-6 months or if cat exhibits lower urinary tract signs</td>
</tr>
<tr>
<td>Perform abdominal radiographs every 3-6 months or if cat exhibits lower urinary tract signs</td>
</tr>
<tr>
<td><strong>Adjustments</strong></td>
</tr>
<tr>
<td>Add oral urine acidifiers (methionine or ammonium chloride) only if average urine pH &gt;6.5</td>
</tr>
<tr>
<td>If urine is persistently acidic, add oral potassium citrate (50–75 mg/kg PO q12h)</td>
</tr>
<tr>
<td>If repeated calcium oxalate urolith formation occurs, add oral hydrochlorothiazide (1–2 mg/kg PO q12h); do not use in cats with hypercalcemia</td>
</tr>
</tbody>
</table>

*In cats without systemic hypercalcemia.*
male cats\(^6\)), frequently recurring episodes (2% to 15% of cases), or chronic persistent signs (2% to 15% of cases).\(^4\) In some cats, FIC is associated with comorbidities, such as gastrointestinal or respiratory tract signs.\(^4\) Furthermore, spontaneous resolution of clinical signs may be mistaken for response to empirical therapy (e.g., treatment with antibiotics). All of these factors may lead to misdiagnosis.

Urethral obstruction is often due to urethral plugs or classified as idiopathic. Urethral plugs consist of a matrix (mucoprotein and inflammatory debris) and aggregates of crystals (predominantly struvite).\(^20\) Acute management involves stabilizing the patient and alleviating urethral obstruction (BOX 5). Following discharge from the hospital, management for FIC should be implemented.

**Etiology**

The etiology of FIC is complex and incompletely understood, but it appears to involve a complex interaction between the urinary bladder, nervous system, adrenal glands, and environmental conditions.\(^4\) Affected cats seem to have an excitatory sympathetic nervous system response with decreased adrenocortical function in response to stressful episodes and an associated increase in bladder wall permeability.\(^4,32\) Various studies have evaluated risk factors for FIC, which often include being middle-aged (average, 4 to 7 years), neutered, sedentary, and overweight.\(^4\) Environmental or behavioral risk factors, such as living indoors or living with another cat with which there is conflict, have also been recognized.\(^33,34\)

**Management**

The goals of managing FIC are to decrease the severity of clinical signs and increase the interval between episodes.\(^1\) It is important to help owners understand known predisposing factors and develop strategies to alleviate them.\(^1\) Multiple modalities are commonly used to manage FIC, including medications to provide analgesia and to decrease urethral spasm, dietary management, and environmental management (BOX 6) to meet the individual cat’s needs.

 Episodes of acute pain are managed with buprenorphine (0.01 mg/kg transmucosally q8h to 12h).\(^4\) An alpha antagonist (such as prazosin 0.25 to 1 mg/cat PO q8h to 12h)\(^31\) is given to decrease urethral spasm, particularly after alleviating urethral obstruction. Feeding recommendations are to gradually transition to a moist food (greater than 60% moisture) and to use additional strategies to increase water intake.\(^4\) A randomized, controlled clinical trial showed that feeding a urinary diet enriched with omega-3 fatty acids and antioxidants decreased the rate of recurrent episodes of FIC signs in cats.\(^37\)

Other suggested therapies for FIC have been shown to be ineffective or have been inadequately evaluated. Antibiotics should not be administered unless a urine culture by cystocentesis is positive.\(^1\) In cats with FIC,

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**BOX 5 Approach to the Feline Patient With Urethral Obstruction**\(^31\)

1. Diagnostics and management are performed simultaneously.

2. Diagnostics often include:
   - Packed cell volume/total solids
   - Biochemistry panel with electrolytes
   - Electrocardiogram
   - Urinalysis
   - Survey abdominal radiographs including the perineal region

3. Patient stabilization may include:
   - Administration of intravenous crystalloid fluids
   - Additional management of hyperkalemia with intravenous dextrose and insulin or intravenous calcium gluconate
   - Therapeutic cystocentesis

4. Relief of urethral obstruction includes:
   - Providing analgesia, sedation, and/or anesthesia
   - Sterile placement of a rigid urinary catheter into the urethra using hydropulsion to alleviate any obstruction
   - Sterile placement of an indwelling urinary catheter with a closed collection system

5. In-hospital care includes:
   - Urethral catheter care
   - Monitoring for postobstructive diuresis
   - Administering intravenous fluids, analgesia, and urethral relaxants

6. Additional recommendations are based on the cause of the obstruction:
   - Cats with obstruction due to a urethral plug or that is idiopathic are managed according to the guidelines for cats with FIC.
   - Cats with uroliths require a procedure to remove the stone and medical management to prevent recurrence.
   - Consider urine culture to evaluate for UTI secondary to urinary catheter placement.
an anti-inflammatory dose of prednisolone given for 10 days did not reduce clinical signs compared with placebo. There is insufficient evidence to recommend short-term treatment with amitriptyline, although long-term treatment has not been evaluated. There is also insufficient evidence to support the use of glucosamine. Feline facial pheromones may be considered for cats with signs of stress or if signs persist after implementation of multimodal environmental modification (MEMO). Cats with FIC that were given a single treatment of lactated Ringer’s solution subcutaneously did not show improvement, but other subcutaneous fluid protocols have not been evaluated. For any therapy, the potential benefit should be weighed against the potential for the treatment to be stressful to the cat suffering from FIC.

CONCLUSION
Lower urinary tract signs in cats may be due to several etiologies that are typically indistinguishable without further diagnostic testing. In an individual cat, there may be a single cause or multiple concurrent disorders, so a thorough and systematic approach is warranted. Diagnostic evaluation for an individual may include

<table>
<thead>
<tr>
<th>BOX 6 Multimodal Environmental Modification for Cats with FIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>The American Association of Feline Practitioners and the International Society of Feline Medicine have described the 5 pillars of a healthy feline environment that support a cat’s physical health, emotional wellbeing, and interactions with humans and other animals in its environment:</td>
</tr>
<tr>
<td>Fulfilling these environmental needs is fundamental to preventing or correcting house-soiling behavior. Adaptations to meet them are known as multimodal environmental modification (MEMO) (<a href="#">TABLE A</a>). Environmental enrichment and stress reduction are key to the management of cats with FIC. A prospective observational study evaluating the effects of MEMO in cats with FIC showed that there were significant reductions in lower urinary tract signs, fearfulness, and nervousness after 10 months.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE A Selected Strategies Used in Multimodal Environmental Modification (MEMO)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENVIRONMENTAL COMPONENT</strong></td>
</tr>
</tbody>
</table>
| Social interactions | ◼ Limit ability of indoor cat to see outdoor cats  
◼ Provide a safe place for cat to avoid stressful interactions (e.g., with dog, child, or other cat)  
◼ Keep interactions with the cat as predictable and consistent as possible |
| Physical resources | ◼ Provide distinct areas for sleeping, feeding, and elimination  
◼ Provide comfortable sites to rest, hide, climb, and perch (multiple areas if there are multiple cats in the home)  
◼ Evaluate cat’s preferences for toys  
◼ Provide access to a window to look through |
| Nutrition | ◼ Hide food in various locations or provide food in a puzzle feeder  
◼ Provide multiple feeding stations out of sight from one another if there are multiple cats in the home  
◼ Feed away from machinery that may be startling  
◼ Allow free access to fresh water  
◼ Investigate individual cat’s preferences (e.g., running water, bottled water) |
| Elimination | ◼ Ensure litterbox is at least 1.5 times the length of the cat to permit digging, posturing, and covering behaviors  
◼ Provide multiple litterboxes that are out of sight of one another  
◼ Position litterbox away from disruptive noises  
◼ Consider individual cat preferences  
◼ Practice excellent litterbox hygiene |
| Body care and activity | ◼ Provide sites for appropriate scratching behavior  
◼ Consider individual preferences (substrates, surface position)  
◼ Provide permitted materials to chew (e.g., cat grass, live catnip)  
◼ Rotate a variety of toys  
◼ Consider providing a treat after play to parallel a successful hunt |
urinalysis, diagnostic imaging, and urine culture. If no cause is found after thorough evaluation, a diagnosis of FIC is made.¹

References


Johanna Heseltine
Dr. Heseltine is a clinical assistant professor at Texas A&M University. She received her DVM from the University of Saskatchewan and then completed a rotating small animal internship at the University of Prince Edward Island. She completed her master's degree and small animal internal medicine residency at Virginia Tech and is a Diplomate of the American College of Veterinary Medicine (small animal internal medicine). Dr. Heseltine has held faculty and teaching positions and worked in private specialty practice. She is interested in a broad range of internal medicine disorders of small animals.
For a cat presenting with feline lower urinary tract disease, which of the following is not a risk factor for urinary tract infection?

a. Feeding a calculolytic diet
b. Female sex
c. Urolithiasis
d. Previous perineal urethrostomy

Which of the following is not a feeding recommendation for cats with feline idiopathic cystitis?

a. Transition to a new diet gradually
b. Feed a canned diet
c. Add water to dry kibble
d. Feed in close proximity to litterbox and water bowl

Which of the following is not a component of multimodal environmental modification?

a. Obtaining a second cat as a companion to the first
b. Maintaining excellent litterbox hygiene
c. Providing multiple comfortable rest areas
d. Offering food and water away from noisy appliances

Hypercalcemia increases the risk for which cause of feline lower urinary tract disease?

a. Struvite urethral plugs
b. Feline interstitial cystitis
c. Urothelial cell carcinoma
d. Calcium oxalate stones

What is the most common age at presentation for feline interstitial cystitis?

a. 0–24 months
b. 2–7 years
c. 7–12 years
d. >12 years