Urethral obstruction, occurring in more male than female cats, can occur from urine sediment or mineral stones causing mechanical obstruction of the urethra, from inflammation of the urethra, or from urethra spasm. This is a life threatening medical emergency and requires immediate recognition and treatment. The nursing team is instrumental in recognition, preparation for safe anesthesia, and monitoring the hospitalized cat.

Cats that present to the veterinary hospital with a urinary obstruction are often misunderstood by their owners, and may go hours to days without receiving appropriate medical attention. Cats with a urinary obstruction can present to the veterinary hospital for a variety of medical complaints including straining in the litter box (often mistaken by owners for constipation), frequent trips to the litter box, hiding, vocalizing, painful abdomen, vomiting, and collapse. Due to these non-specific complaints, a high suspicion for urinary obstruction should be maintained during the triage process. If you suspect any animal to have a urinary tract obstruction gentle palpation of their bladder should be performed to confirm your suspicions and immediate treatment started.

If you palpate a turgid bladder (not all cats with a urinary obstruction will present with a large bladder, do not let a small but hard bladder fool you) this patient needs to move to the top of the list of tasks for your day. Thinking ahead to the procedures necessary for a patient suffering from urinary obstruction (anesthesia, possibly major surgery) a complete physical exam with vitals always needs to be performed and abnormalities addressed.

Pain management is extremely important in these cats upon presentation to the hospital. Not only is a urinary obstruction known to be a painful condition, but patient compliance is much improved with the addition of opioids. If possible, treatment prior to de-obstruction should include a pure mu-opioid such as oxymorphone or hydromorphone but buprenorphine is acceptable as well. Pain management is important throughout the hospital stay for these cats and into their transition back home.

IV fluids are also necessary in blocked cats, especially as they prepare for the necessary anesthesia to pass a urinary catheter. While not appropriate to leave a blocked cat on hours of IV fluids, starting the diuresis immediately prior to anesthesia will help to improve or maintain blood pressure, dilute out azotemia and hyperkalemia, and improve perfusion.

Radiographs or abdominal ultrasound should be considered with any case of urinary obstruction. The presence of stones and other urine sediment will be evident on a radiograph, and bladder, prostatic and urethral cancers will be evident on ultrasound. The owners should be made aware of the entire picture when moving forward with treatment.

A minimum amount of blood work should be performed before anesthetizing any patient for relief of obstruction. Even in seemingly healthy patients a PCV/TS, electrolytes, and renal parameters should be evaluated. Urinary obstructions present for significant periods of time (>24 hours) can cause electrolyte abnormalities and elevation in BUN and serum creatinine. The most immediate danger in 'sick' blocked cats comes from dangerous elevations in potassium. Most of the body's potassium resides inside the cell, and circulating plasma potassium levels are low compared to serum sodium and chloride. When potassium
cannot be excreted out of the body by the failing kidneys into urine, serum levels start to rise. Potassium is necessary for nerve impulses and cardiac and muscle function. Extremely elevated levels will change the resting membrane potential of cells resulting in conduction abnormalities in the heart. If it is not corrected, death from cardiac failure can occur. Hyperkalemia must be addressed before de-obstruction occurs. Even without blood results, physical exam findings and looking at an ECG tracing can alert you hyperkalemia. In many hyperkalemic patients you can see tall, wide T-waves on the ECG, a classic sign of hyperkalemia. Many of these cats are “sicker” on presentation, and may suffer from bradycardia, hypothermia, and hypotension.

If there are cardiac arrhythmias evident, hyperkalemia can first be treated with calcium gluconate (10% calcium gluconate at 50-100mg/kg slowly IV). Calcium gluconate will not directly affect the levels of potassium in the blood but it will decrease the amount of damage to cardiac muscle from the potassium. Immediate improvement in ECG tracings can be seen just after treatment with calcium gluconate. To treat the high potassium levels, injections of dextrose or dextrose and regular insulin can be used. Insulin acts as the key that opens up cells to take in glucose. When glucose enters the cell potassium follows closely behind. So by giving regular insulin (0.25-0.5 unit/kg IV) to a severely hyperkalemic patient you can begin to lower the level of circulating potassium. For moderate hyperkalemia, an injection of 50% dextrose can work the same way. Any patient that receives IV insulin needs dextrose added to their IV fluids and frequent blood glucose checks.

Azotemia is a common finding in cats suffering from a urinary obstruction. As the bladder cannot be emptied, pressure increases in the ureters and kidneys. This pressure decreases the rate at which the kidneys can filter and increases in BUN and creatinine occur. In most cases, with relief of the obstruction and IV fluid diuresis we see kidney chemistry values return to normal. Some cats may experience lifelong kidney damage as the result of a urinary obstruction. Because of their compromised kidneys, anesthesia on these cats can be challenging. Fluid therapy should be started early in the process and continued in the hospital until values return to normal or a plateau is reached.

When treating a hyperkalemic or azotemic blocked cat, a cystocentesis can be performed to relieve the pressure in their bladder and help to stabilize the cat prior to anesthesia and unblocking. While possibly considered a risky procedure, cystocentesis performed in cats suffering from urethral obstruction can halt the progression of renal damage and bring immediate relief to the cat. While risk exists for tearing the potentially friable bladder wall during the procedure, the benefit to the patient outweighs the risk. Appropriate pain management and patient positioning can reduce the risk of sudden movement and bladder wall laceration.

The procedure of relieving obstructing almost always requires general anesthesia. Alternatively, a coccygeal block can be performed which can greatly reduce the amount of anesthesia needed. A coccygeal block is a simple local block to perform that will block the perianal region and is perfect for relieving urethral spasms, passing a urinary catheter, and even used for tail amputations. 2% lidocaine (0.1-0.2ml/kg) will provide pain relief 5 minutes after injection and last about one hour. This allows for smooth anesthesia recovery. In the sickest patients, an injection of an opioid paired with a coccygeal block can allow unblocking to be performed without general anesthesia.

Remember that these patients may be suffering from some degree of acute kidney injury and need close, careful anesthesia monitoring. Their blood pressure should not be allowed to drop below 80 systolic/60 MAP in order to keep the kidneys perfused. The procedure should be performed in as sterile a manner as
possible. An assistant will often be required to pulse sterile saline through the urinary catheter to force the obstruction back into the bladder or force the urinary catheter past the obstruction. This process may take many different kinds of urinary catheters, so be prepared with a selection. The final indwelling urinary catheter should be made of a gentle material (silicone is most ideal) for long-term comfort. A post-procedure radiograph should be performed to confirm proper placement within the bladder.

With these cats, flushing the sediment from the bladder is an important step. Many cats are obstructed with sandy 'grit' composed of millions of tiny urine crystals. If not removed from the bladder this grit can obstruct the urinary catheter while the cat is in the hospital and increase chances or re-obstructing once the urinary catheter is removed. Flush saline in and out of the bladder, 20ml at a time, until the crystal content is dramatically decreased. If necessary, this may need to be performed at treatment times if the catheter becomes clogged.

Urethral tears are a potential complication of urinary obstruction. In most cases the tear is iatrogenic, caused by attempting to relieve the obstruction. If this occurs or is thought to occur, a contrast cystourethrogram should be performed to diagnose the tear. The next step may be surgery (perianal urethrostomy) if the tear is distal, or placement of a urinary catheter for 5-7 days to allow the urethra to heal. Stones can also cause pressure necrosis of the urethra and result in tearing; surgical correction is often required in those cases.

Once de-obstructed, the patient is ready for surgery to remove stones (if required) or for time in the hospital. Cats without a surgical problem can expect to have their urinary catheter in for at least 24 hours, or until the urine is clear. The cat should be on IV fluids for that time in the hospital. If the cat presented with azotemia those values should be monitored every 24 hours. Electrolyte abnormalities may need to be checked every 4-8 hours until they return to normal. ECG monitoring may be necessary if arrhythmias were present on admit. Many cats are started on a special diet to acidify their urine to help prevent further crystal formation, or on a stone dissolution diet. Once the urinary catheter is removed, these cats should be observed urinating in the hospital before returning home.

While hospitalized, any patient with an indwelling urinary catheter should have fluid ins and outs monitored. Every four hours the urine bag is emptied, urine quantified, and fluid rates adjusted as needed. Cats can experience post-obstruction diuresis where they produce urine at such a high rate they can actually become dehydrated while on IV fluids. This occurs because the kidneys temporarily lose their ability to reabsorb salt and water resulting in high urine output. Post-obstructive diuresis cannot be prevented, only managed until the kidneys return to normal function. The nursing team should be aware of normal urine output, and how to calculate urine ml/kg/hr output. Compare the fluid going in to the fluid coming out.

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\text{ml/kg/hr} = \frac{\text{amount of urine (ml)} \times \text{hours since last measured}}{\text{wt (kg)}}
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This formula will give you ml/kg/hr of urine produced. In previously obstructed animal urine output should be at least 2ml/kg/hr. If the urine output is higher than the fluids going in, an adjustment should be made until urine output slows.

On-going drug therapy for these patients should always consist of some form of pain management; oral buprenorphine (0.01-0.02mg/kg) works very well for cats, stronger opioids may be needed for comfort. Because urinary tract infections are rarely the cause of urinary obstructions and antibiotic use does not
prevent catheter associated urinary tract infections, antibiotics are not routinely used in blocked cats. If there is suspicion for infection, the urine can be cultured at the time of catheter removal and the cat treated as necessary. Smooth muscle relaxants are often prescribed for in hospital and go-home use, the most popular being phenoxybenzamine and prazosin. These drugs can help with urethral spasms and patient comfort both in the hospital and at home. NSAIDs in cats remain a controversial topic and at this time DoveLewis does not administer or prescribe NSAIDs in these cats.

Clients should be educated about home care for these cats. If crystalluria or cystic calculi were the reason for the obstruction then diet and increased water intake should be discussed. A growing number of cats are being diagnosed with Feline Idiopathic Cystitis, which is not treated only with diet. These cats may be prescribed anti-inflammatory medications, antidepressant medications, and/or glucosamine supplements to help manage the disease. These cats also need stress management, increased environmental enrichment, and possible pheromone treatment to help manage the disease.

In conclusion, urinary obstructions are a true emergency and need immediate treatment. Educate clients on the signs to watch for, the preventive measures they can impact, and when to come to the hospital. Be prepared to stabilize your patient and provide the best nursing care while they are in the hospital.

References:
Cooper, Edward, VMD, MS, DACVECC. *Feline Urethral Obstruction*. Proc. of IVECCS, TX, San Antonio. 135-38.