Obstructions of the lower urinary tract are both common and life-threatening if complete and not addressed in a timely fashion. Numerous techniques are available to provide decompression, diversion, or re-established patency of the lower tract, each with their own benefits and risks. Choosing the appropriate method will depend on the individual case but will likely be determined by a number of factors, not limited to the patient’s overall stability and underlying reason for obstruction, comorbidities, the owner’s finances, the ultimate goal of the procedure (temporary versus permanent, internalized versus externalized, inpatient versus outpatient, the need for additional surgical procedures, or the need for subsequent therapies (chemotherapy, antibiotics, steroids, etc.). The most common causes of lower urinary tract obstruction in small animals include urolithiasis (canine) and FLUTD (feline), neoplasia, stricture, inflammation, foreign body (broken catheter) or neurological causes. Surgical options for lower urinary tract obstruction such as cystotomy, urethrostomy, prostatectomy, etc. will not be addressed here as it is beyond the scope of this discussion on tubes, balloons, and stents.

Retrograde transurethral catheterization is the most commonly performed and simple procedure for establishing a patent urethra in cases of tumor obstruction or when a urolith can be dislodged and flushed into the urinary bladder for future removal. Urethral catheters are widely available, inexpensive, and easy to place in most circumstances. Long-term use of urethral catheters has been associated with increased risk of urinary tract infections and the catheters can be removed by the patient, kink, or become obstructed. Long-term catheter placement is not an ideal option for urinary drainage and is typically reserved for short term relief until surgery can be performed or a response to a particular therapy (eg. radiation treatment for a malignant obstruction) can occur. The management of urethral trauma has recently been reported by the use of urethral catheterization alone (Meige 2008).

When retrograde transurethral catheterization is not possible, alternative methods of drainage are required. If the obstruction is secondary to a urethral tear from retrograde catheterization attempts (eg. feline urethral obstruction secondary to FLUTD) percutaneous antegrade urethral catheterization (PAUC) can be performed. This is a relatively simple, rapid, safe, and effective technique for establishing urethral catheterization in cats and dogs. Under fluoroscopic guidance an 18g catheter is advanced into the urinary bladder. Contrast is infused until the borders of the bladder and urethra are apparent (Figure 1A) and a 0.035” angled weasel wire is advanced down the urethra (Figure 1B). Once through-and-through wire access is achieved, a urinary catheter is advanced over the guidewire.
into the bladder (Figure 1C), and the guidewire is removed. The patient then receives additional stabilization until future therapies can be performed under improved patient status conditions.

If urethral access cannot be safely achieved in a retrograde or antegrade direction, immediate urinary bladder relief can be achieved with periodic cystocentesis or cystostomy tube placement. Periodic cystocentesis has been performed safely for many years but it must be understood that this is both only a temporary resolution and that the obstructed lower urinary tract combined with the possible post-obstructive diuresis can result in abdominal urine leakage (uroabdomen). This is perhaps of even greater concern in those patients with infected urine and/or urinary tract neoplasia. Cystostomy tubes can be safely placed surgically, through mini-laparotomies, using lap-assisted techniques, or interventionally (under ultrasonographic or fluoroscopic guidance). While there is no perfect approach to placement of a cystostomy tube, each has its benefits. Placement through one of the surgical techniques will provide the ability to perform a cystopexy facilitating safe premature or early removal of the tube. Even with the minimally-invasive techniques, these are likely long procedures than the percutaneous techniques which have the advantage of rapid placement but the disadvantage of no cystopexy. A 2-3mm deep skin incision is made where the catheter will be placed. An 18g catheter is advanced through the incision and into the urinary bladder, urine is obtained for culture, and contrast is injected until the bladder outline is apparent (Figure 2A). A 0.035” angled hydrophilic guidewire is advanced through the catheter and coiled in the urinary bladder (Figure 2B). The 18g catheter is removed over the wire and a 6Fr locking-loop drainage catheter is advance over the wire, into the urinary bladder, the catheter is coiled in the bladder and locked (Figure 2C). Placement of a small diameter cystostomy tube will likely make early or premature removal safer as long as the lower urinary tract obstruction has been relieved. It is unclear how long a percutaneously placed tube must remain in place for a tract to mature making removal safe. The author typically waits 5-7 days following safe re-establishment of the lower urinary tract providing a low-profile (5 or 6Fr) tube was placed initially. Placement of a urethral catheter to maintain bladder drainage can likely reduce this time period to 1-3 days (personal opinion). Complications of cystotomy tubes are not uncommon however. In one recent study (Beck 2007), infections (86%) and other complications including inadvertent tube removal, fistulous tract formation, tube breakage, etc. (49%) were reported and should be anticipated, particularly in those patient sin whom long-term use will be anticipated. While temporary use is likely associated with fewer complications, cystostomy tube use should perhaps be reconsidered in those patients in whom chemotherapy (neoplasia) or other immunosuppressive (proliferative urethritis, neoplasia) therapy is anticipated.

Malignant urethral obstructions can cause life-threatening biochemical changes in veterinary patients. Urothelial/Transitional cell carcinomas are the most common lower urinary tract tumors encountered in dogs, often involving the trigone, urethra, and/or prostate. Greater than 80% of these patients experience significant dysuria and approximately 10% of these patients progress to develop complete urinary tract obstruction. While chemotherapy has been demonstrated to result in improved survival times, substantial tumor responses are uncommon, complete cures are rare, and tumor progression is typical. Once signs of urinary obstruction occur, few good options exist. Cystostomy tube placement, transurethral resection, and surgical diversion have been described but are either invasive or associated with significant morbidity including need for manual urine drainage, tube dislodgement, urinary tract infection, incontinence, and/or surgical complications). More recently, transurethral placement of self-expanding metallic stents (SEMS) under fluoroscopic guidance has been described which results
in rapid and effective restoration of urethral patency and urine flow (Weisse, 2006). These procedures are performed on an out-patient basis and avoid the need for manual drainage and other surgical-associated complications. A recent study reported good results following urethral stent placement in 42 dogs; a major incontinence rate of 25% (3/4 dogs had minor or no incontinence) and median survival time of approximately 250 days if the patients received chemotherapy following stent placement (personal experience, publication pending). The cause of death in these patients is rarely due to repeat urinary obstruction; the most common cause of death is secondary to tumor metastases and signs of systemic illness. These stenting techniques have also been effective in cats as well as for benign urethral strictures.

The patient is placed under general anesthesia and positioned in lateral recumbency on a fluoroscopy table. A marker catheter is placed per rectum and gently advanced into the terminal colon over a floppy-tipped (soft, atraumatic) hydrophilic(lubricated coating) guidewire under fluoroscopic guidance. The patient’s prepuce or perineum is clipped, scrubbed, and draped. Guidewire and catheter access of the urethra and urinary bladder are obtained. Fluoroscopic guidance is used to direct the guidewire towards the bladder trigone. After achieving bladder access with the catheter, the urinary bladder is distended with an approximately 50:50 mixture of iohexol and sterile saline. Following bladder distension, a fluororun is recorded to determine stenosis length and normal urethral diameter (Figure 3 Top). The length of the urethral obstruction and maximal diameter of the adjacent normal urethra are extrapolated using the colonic marker catheter as a reference to account for magnification. An appropriately sized stent is chosen based upon these measurements. The stent diameter is chosen by increasing the maximal normal (adjacent to the stenosis/tumor) urethral diameter by approximately 10% to ensure adequate mucosal apposition and to minimize chance of migration. The stent length is chosen to span the narrowed lumen but not to extend further than 1cm cranially and 1 cm caudally when possible. The stent delivery system is advanced over-the-wire under fluoroscopic guidance and positioned across the malignant obstruction. Maintain back tension on the delivery system while completing stent deployment in one smooth step (Figure 3 Middle). Following stent deployment, the delivery system is withdrawn and removed over-the-wire. A repeat positive contrast cystourethrogram is performed to document immediate patency of the previously occluded urethra (Figure 3 Bottom). The urinary bladder is emptied and the catheter, and sheath if present, is removed and the animal is recovered from anesthesia without a urinary catheter in place. Immediate post-operative radiographs are obtained to document stent location, positioning, and urethral integrity (lack of contrast extravasation).

Patients are routinely discharged the day of the procedure and recheck appointments are generally made for ~1-2 weeks later that also includes an oncology consultation if not previously done.
References: