A Surgical Guide
provided by Drs. Allyson Berent and Chick Weisse
Figure 1: The Subcutaneous Ureteral Bypass (SUB™) device.

A) Lateral fluoroscopic image of a cat patient after SUB™ placement showing the nephrostomy catheter, cystostomy catheter, and shunting subcutaneous injection port.

B) The SUB™ device put together outside of the patient.

EQUIPMENT NEEDED

1. An 18-gauge over-the-needle catheter - not included in the SUB kit.
2. Sterile cyanoacrylate tissue glue - not included in the SUB kit.
3. 22-gauge Huber needle with a T-connector and 3-way stop-cock (not in picture).
4. A 0.035” angled-tipped hydrophilic guide wire - not included in the SUB kit.
5. Shunting port (small port for small cats and small dogs; large port for larger cats and dogs). This should be flushed with a Huber needle to ensure patency of both ends.
7. 6.5 French locking-loop nephrostomy catheter with Dacron cuff and silicone sleeve. The hollow cannula should be within the lumen of the catheter to keep it straight, the string should be pulled snug to keep it flush and the sharp stylette should be removed when placed over the guide wire.
8. 7 French bladder catheter with hollow cannula and sharp stylette.

SUB™ KIT CONTENTS

SUB1001K - for cats and small dogs
- Small Shunting Port
- 6.5 French locking loop & insertion stylette
- 7 French bladder catheter & insertion stylette
- 2 x 22 gauge Huber needles
- 1 x 22 gauge Huber infusion set
- Surgical Instructions

SUB2001K - for larger dogs
- Large Shunting Port
- 6.5 French locking loop & insertion stylette
- 7 French bladder catheter & insertion stylette
- 2 x 22 gauge Huber needles
- 1 x 22 gauge Huber infusion set
- Surgical Instructions
The placement of nephrostomy catheters in veterinary medicine was recently reported, and has been met with excellent success when the appropriate device is used. The biggest limitation is the externalized drainage, requiring careful management and hospitalization to prevent infection and dislodgement. The development of an indwelling SUB™ device (Figure 1) using a combination locking-loop nephrostomy catheter attached via a dual-armed shunting port to a multi-fenestrated cystostomy catheter allows a nephrostomy tube to remain indwelling long-term. A similar bypass device in humans has been used for human patients with extensive urinary tract malignancies, ureteral strictures secondary to renal transplantation, when ureteral stenting is ineffective, or when traditional surgery fails or is contraindicated. It has been shown to reduce complications associated with externalized nephrostomy tubes and improve quality of life. The SUB™ device is designed for veterinary patients and contains a locking-loop design to prevent migration and a shunting port in the subcutaneous space that is used for flushing and sampling; a design unique to this system to help maintain long-term patency.

The use of the SUB™ device has recently been described in cats and dogs. These devices have been successfully in place for up to 3.5 years. The shunting port that is secured to the ventral abdominal wall connects the nephrostomy and cystostomy catheters, allowing sampling and flushing of the device. If there is concern of patency, or need for renal pelvic culture, this can be easily obtained through this subcutaneous port. This avoids the need for high risk interventions or diagnostics. It is important for the operator to have appropriate training with this device prior to considering its use on a clinical patient. Please contact Dr. Berent (Allyson.Berent@gmail.com) or Dr. Weisse (Chick.Weisse@gmail.com) prior to use of the SUB™.

Complications encountered with this device are uncommon and can often be avoided with proper placement. These include 1) leakage at the nephrostomy/cystostomy tube or shunting port. This issue has been resolved with the addition of the Dacron cuff design and careful locking of the string at the port (<5%) (see below), 2) hemorrhage during nephrostomy tube placement (<1%), 3) system occlusion with blood clots, purulent debris, or stones (5%) (with the new recommendation of flushing the system through the shunting port routinely [every 3-6 months], occlusion of the catheter rarely occurs), 4) kinking of the catheter during placement, and 5) UTIs (seen 35% pre-op and 15% post-op). Most of these complications can be avoided with careful placement and thorough leak testing upon completion of the procedure (see below).

The use of a SUB for feline and canine patients with a ureteral obstruction can be considered a functional option when other traditional therapies have failed or are contraindicated. At this time, in the authors’ practice, this device is considered to have less short- and long-term complications in cats than many other alternatives when appropriate training is obtained. Care should be taken, as the longest device is only in place for 3.5 years so outcomes beyond this point cannot be ascertained.
PREPARATION
Before proceeding with the surgery each part of the system should be prepared by flushing the catheters, wires and port to ensure patency and make sure each piece is moist.

THE LAPAROTOMY
A ventral midline laparotomy is performed in order to expose the bladder and affected kidney. The peri-renal fat is gently and bluntly dissected off the caudal pole of the kidney exposing a 1-2 cm region of renal capsule (Figure 2a).

PLACING THE LOCKING LOOP NEPHROSTOMY CATHETER

The nephrostomy catheter should be prepared: The hollow canula is placed inside the pre-flushed 6.5 French locking-loop catheter (pre-loaded with the Dacron cuff and silicone sleeve) and the sharp stylette is discarded. The system should be flushed.

Locking Loop Nephrostomy Catheter
A) Catheter straight with hollow cannula and sharp stylette in place. There is a radiopaque mark that allows the operator to appreciate the end of the last hole of the pigtail catheter under fluoroscopy.
B) The sharp stylette is removed and the hollow trocar and catheter are placed over a guide wire (0.035”).
C) The hollow cannula is removed and the pigtail is made at the distal end of the catheter as the string is locked in place.

With the aid of fluoroscopy, the nephrostomy catheter is placed using the modified-Seldinger technique (Figure 2b, 3). An 18-ga over-the-needle catheter is used to puncture the renal pelvis from the caudal pole and a urine sample is obtained for culture (Figure 2b,3a). Iodinated contrast is injected to perform antegrade pyelography (Figure 3a). A 0.035” angle tipped hydrophilic guide wire is advanced through the 18-ga catheter and coiled inside the renal pelvis being careful to avoid perforation (Figure 2c,d; 3b,c). Once 1-2 loops are made inside the renal pelvis the catheter is removed while the wire is carefully secured with a hemostat at the renal capsule to avoid losing wire access.

The 6.5 Fr catheter with the hollow cannula (sharp stylette removed) is advanced over the guide wire into the renal parenchyma (Figure 2e, 3d). Once it enters the renal pelvis the hollow trocar is pulled back as the catheter is advanced over the guide wire. This can be very tight so be sure to pin the wire and catheter as the trocar is withdrawn (Figure 3d,e). Gentle twisting of the cannula and catheter help facilitate sliding along one another. The locking string is pulled to prevent catheter dislodgement and clamped with a hemostat to maintain tension (Figure 3e,5b).

Be sure not to clamp the catheter itself, but just the string at the junction of the catheter and the string.

The Dacron cuff is then gently advanced down the nephrostomy catheter to the renal capsule to keep the catheter snug in the renal pelvis (Figure 2f). Sterile cyanoacrylate glue is applied between the Dacron and the renal capsule to provide security and prevent leakage (Figure 2f).
Figure 2: Nephrostomy access into the kidney.

A) The peri-renal fat is bluntly dissected off the caudal pole of the kidney to expose the renal capsule.
B) An 18 ga. IV catheter is gently inserted into the dilated renal pelvis until a flash of urine is seen. Then under fluoroscopy a pyelogram is performed.
C) A 0.035" angled hydrophilic guide wire is advanced into the renal pelvis through the IV catheter under fluoroscopic guidance looping around the renal pelvis.
D) The 18 ga. catheter is then removed and the wire is secured with a hemostat.
E) The locking loop nephrostomy catheter is passed over the guide wire and advanced into the renal pelvis. Once the catheter is seen under fluoroscopy inside the renal pelvis the hollow trocar is withdrawn and the locking string is pulled to tighten.
F) The silicone/Dacron cuff and silicone sleeve is advanced to the renal capsule and sterile tissue glue is used to adhere the Dacron to the capsule.
Figure 3: The Modified-Seldinger technique being used for locking loop nephrostomy access.

A) 18 ga IV catheter (white arrow) being placed into the caudal pole of the renal pelvis and a pyelogram being performed.

B-C) A 0.035” angled hydrophilic guide wire (red arrow) advanced through the catheter and coiled inside the dilated renal pelvis.

D) The locking loop nephrostomy catheter (black arrow) is advanced over the guide wire and hollow cannula inside the renal pelvis allowing a curl to form over the wire (red arrow) within the renal pelvis.

E) Once the radiopaque mark is within the renal pelvis (black arrow) the wire and hollow trocar are removed and the string is locked. A pyelogram is performed to confirm no leakage and appropriate catheter placement. Notice the pigtail catheter loop is tight and locked with the mark within the large dilated pelvis.

F) The device once within the patient. The head is to the top of the image. The nephrostomy catheter (black arrows) is connected to the caudal male adaptor of the port and the bladder catheter (yellow arrows) is connected to the cranial male adaptor.

G) Contrast study being performed using a Huber needle through the port to confirm bladder and kidney patency.

H) Lateral fluoroscopic image similar to image (F) with the kidney catheter attached caudally (black arrows) and the bladder catheter attached cranially.
PLACING THE URINARY BLADDER CATHETER

The urinary bladder catheter is now placed (Figure 4). First, using 3-0 monocryl suture a purse string suture pattern is made at the apex of the bladder (Figure 4a). In the center of this purse string a #11 blade is used to puncture a small hole into the bladder lumen (Figure 4b). Next, the loaded cystostomy catheter, with the hollow cannula and the sharp stylette, is advanced through the incision and into the urinary bladder lumen (Figure 4c,d). The sharp stylette is discarded, the catheter is advanced until the Dacron cuff is against the serosal surface of the bladder, and the purse-string suture is secured and tied. Using 3-0 monocryl suture the Dacron cuff is sutured to the bladder wall (full thickness) using 3 or 4 sutures (Figure 4e). Notice how the suture is passed through both the superficial silicone ring and the deeper Dacron disc (Figure 4e). Sterile cyanoacrylate glue is used to further secure the Dacron to the serosal surface of the urinary bladder (Figure 4f). Once secure, saline is infused through the hollow trocar and the seal is leak tested. Once satisfied with no leak the hollow cannula is removed.

**Figure 4: Placing the cystoscopy catheter.**

A) A purse string suture is made at the apex of the bladder.
B) A #11 blade is used to make a stab incision in the center of the purse string.
C-D) The bladder catheter is advanced through the stab incision with the hollow trocar and sharp stylette in place.
   Then the purse string is secured around the catheter and tied.
E) The silicone/Dacron cuff is sutured in 1 or 2 spots
F) Tissue glude is applied to the Dacron cuff adhering to the serosal surface of the bladder and an additional 2 sutures are placed to secure the catheter to the bladder wall.
PLACING THE CATHETERS THROUGH THE BODY WALL

Finally, the skin and subcutaneous tissues immediately lateral to the ventral abdominal incision on the ipsilateral side of the nephrostomy tube is dissected down to the abdominal musculature (Figure 5a). Both catheters are passed gently through the body wall. Using blunt dissection with a mosquito hemostat a puncture is made through the body wall and into the abdomen (Figure 5b). The ends of the hemostat carefully clamp the locking string at the end of the nephrostomy catheter and the string and catheter are pulled through the body wall in unison (Figure 5b,c). Do not clamp the catheter itself. Once the kidney catheter is through the body wall the string is kept locked and the blue cuff is placed over the end of the catheter (tapered end first), (Figure 5c) while holding the string tight manually to maintain the lock. Then the barb of the shunting port is advanced onto the catheter (Figure 5d, 6).

Figure 5: Placing the catheters through the body wall.

A) The ventral abdominal fat is gently dissected off the body wall from the incision laterally on the ipsilateral side of the obstructed kidney.

B) Using small hemostats a stab incision is bluntly made through the body wall and into the abdomen where the kidney catheter will be placed. This is typically done caudal to the port. Once through the body wall the string at the junction of the catheter end is engaged (white arrow) and the other hemostat is removed so the catheter can be pulled through the body wall.

C) The string and catheter are pulled through the rectus muscle maintaining the locking string and the blue boot is placed over the string (tapered side first) and onto the nephrostomy catheter.

D) The string is wedged between the first rung of the barb on the shunting port and the catheter to maintain the lock (white arrow). The string is cut distally toward the port (See figure 6), the catheter is advanced onto the barb and the blue boot is pulled up over the junction.
Figure 5: Placing the catheters through the body wall continued.

E) The same is done on the bladder catheter side as this is pulled to the cranial aspect of the incision and port. This is pulled through the body wall by grasping the catheter directly with the hemostat. Once through the body wall the end of the catheter is cleanly cut with a scissor prior to attaching to the port. The blue boot is placed on this catheter.

F) The bladder side is attached to the shunting port as with the kidney side the blue boot is pulled up to the junction.

G) The port is sutured to the body wall using permanent suture through all 4 eyelets.

H) The Huber needle inserted through the silicone diaphragm of the port for leak and patency testing.
Once the first rung of the barb is within the catheter the string will be wedged between the barb and the catheter, locking the string. A #11 blade is then used to cut the string against the metal barb (Figure 6). Then the catheter is advanced over all of the barbs so that it is snug (Figure 6c,d).

The string should not be hanging out of the end of the catheter once it is advanced or this creates a site that can leak. Keeping the string within the catheter will keep the seal between the catheter and the port to prevent leakage (Figure 6c,d). The pre-loaded blue cuff is advanced over the catheter to the port (Figure 5e). The same is done on the bladder catheter side (Figure 5e).

To pull this catheter through the body wall the tip is clamped with a hemostat as there is no string. Since the end of the catheter could get damaged the tip of the catheter is cut with a scissors so the very end is discarded (Figure 5e).

The blue cuff is advanced over the catheter, ensuring the tapered end goes down the catheter and the thicker blunt end is towards the shunting port. Finally the shunting port is attached to the bladder catheter.
Figure 7: Ventrodorsal (A) and lateral (B) fluoroscopic images after SUB placement showing the kidney catheter attached to the caudal part of the port and the bladder catheter on the cranial part of the port.

Care should be taken to ensure there is enough space made for the shunting port with both arms and the blue cuffs. This prevents the catheter from kinking. The bladder catheter is usually secured to the cranial barb of the shunting port and the kidney catheter to the caudal barb (Figure 3f). This too prevents kinking by making a nice gentle loop within the abdomen prior to passing through the body wall. The excess catheter should remain in the abdomen.

Once this system is closed one suture is placed (non-absorbable synthetic 3-0) through the ventral rectus sheath and the port to secure it in place and the system is carefully flushed. Using a 22-gauge Huber needle, saline is initially used to flush the system while both sides of the tubing is gently digitally compressed in the abdomen. This tests the port to ensure there is no leak. If it is flushing through than the catheter is not being compressed enough and care should be taken not to over distend the renal pelvis. Once no leak is confirmed than a 50% mixture of contrast and saline is used to flush the entire system under fluoroscopic guidance. This should be done using digital subtraction radiography to better visualize any leak. Care should be taken to monitor that the renal pelvis and bladder fill and drain easily.

The catheters need to be examined carefully at the renal capsule entry point, apex of the bladder entry point and both sides of the shunting port for any leakage.

In addition all catheters should be examined for any kinks (Figure 3f,g; 9d,e).

The port is then secured to the abdominal wall using permanent suture material (2-0 synthetic non-absorbable) (Figure 5f,g). An additional non-absorbable suture can be placed around each blue cuff at the level of the metallic port to ensure no leakage occurs on either end (Figure 5g), but this is not routinely done or necessary. The subcutaneous tunnel is closed routinely and any dead space addressed. Typically, topical bupivacaine is placed in the SQ pocket around the port to provide additional analgesia.

Do not make these tacking sutures too tight; they should be gently and appositionally placed. This will prevent subsequent muscle necrosis, suture loosening, and movement or migration of the port.

Once complete, a fluoroscopy image is taken in both VD and lateral to ensure no kinks are seen and the catheter is well situated in the renal pelvis and urinary bladder (Figure 7). An abdominal wrap is placed for the first 24 hours post-operatively.
FLUSHING PROCEDURE

Flushing of the SUB (Figure 8) through the port to ensure no encrustation and full patency can be done using a 22-ga Huber needle. This is typically done preventatively every 3-6 months, but can be done more frequently if patency or leakage is of any concern.

We typically perform this under ultrasound guidance, but it can also be done using fluoroscopy (Figure 8, 9a-c).

The skin over the port is clipped of fur and aseptically prepared. An extension set with a 3-way stop-cock is used with one empty syringe for urine sampling and one syringe filled with sterile saline (ultrasound-guidance) or a 1:1 dilution of iohexol and saline (fluoroscopic-guided flush). The shunting port is palpated under the skin and the flat silicone insertion site is isolated (Figure 8). Using sterile technique the Huber needle is advanced through the skin, into the silicone diaphragm until metal is reached. This must be done in a perpendicular manner (Figure 8). Once the needle is inside the shunting port a urine sample is obtained (Figure 8b). If no urine is withdrawn than the needle is either not deep enough into the access port, at the wrong angle, or the system is occluded. Once urine is obtained (and submitted for urine culture and urinalysis) the syringe with saline (+/- contrast) is used to inject the system. The renal pelvis should always be monitored during this procedure with either ultrasound or fluoroscopy the ensure it is not being over-distended.

Figure 8: Flushing the SUB device in a cat with bilateral devices located under the nipples (white arrows) and renal hematuria causing dried solidified blood stones. The head is to the right of each image.

A) The right access port is being palpated and the Huber needle (blue arrow) is being advanced into the silicone diaphragm of the port in a perpendicular manner.
B) Once in place urine sample is taken for analysis and culture and to ensure access is appropriate (red arrow). Then, using a 2 way stopcock and T-connector sterile saline (yellow arrow) is infused into the port.
C) The infusion is monitored using ultrasound guidance to ensure the renal pelvis does not get overdistended and bubbles are seen in the pelvis and urinary bladder during infusion.
D) Flushing of saline into the renal pelvis under ultrasound guidance. The red arrow is the SUB catheter in the renal pelvis and the yellow arrows are the saline bubbles made during infusion.
E) Ultrasound of the catheter (red arrow) in the bladder.
F) Saline infusion into the bladder under ultrasound guidance showing the saline bubbles (yellow arrow) coming out of the cystostomy catheter (red arrow).
**Ultrasound Guidance Technique:** The sterile saline is carefully injected into the port while the renal pelvis is being monitored with ultrasound guidance (Figure 8d). The renal pelvis should be measured prior to injection and then seen to enlarge as the pelvis is flushed. Once saline is seen to enter the renal pelvis, usually small air bubbles are seen, the fluid is withdrawn to avoid over distension. Next the ultrasound probe should be placed over the bladder apex and the port should be flushed again to see fluid enters the urinary bladder through the SUB cystostomy tube (Figure 8 e,f). Again, bubbles are usually seen (Figure 8f). Care must be taken NOT to overfill the renal pelvis during monitoring of the urinary bladder.

**Fluoroscopic Guidance Technique:** If the flush is being done under fluoroscopic guidance than a solution of iohexol:sterile saline is made in a 1:1 dilution in a 10 mL syringe. Ultrasound is not needed for the flush but should be used prior to the flush to get an accurate renal pelvis size measurement to ensure proper function of the SUB device. The patient is placed under the fluoroscopic unit in dorsal recumbency and the port area is clipped and scrubbed aseptically as described above. The fluoroscopy image should be aligned with the patient so that the kidney, port and bladder are seen in the image. After the urine sample is obtained, to ensure proper needle placement, the contrast solution is injected into the port. Careful monitoring of the contrast should be seen using fluoroscopy traveling from the port, up the catheter, to the kidney while the renal pelvis fills (Figure 9b,c). This is ideally done using digital subtraction radiography (DSA), as long as the patient is not moving (Figure 9c). If the patient is not sedated than DSA is more difficult. The pelvis should not be over-distended and the injection should be done slowly (2-3 mL is all that is needed typically). At the same time the urinary bladder should be filling with contrast. Then all of the contrast should be easily withdrawn from the bladder and renal pelvis. If contrast is used for the flushing, the author then injects 2-3 mL of sterile saline to wash the catheter of contrast material.

**COMPLICATIONS AND PROGNOSIS (Figure 9)**

A) Lateral image of a cat with a SUB device. During fluoroscopic flushing at the end of the procedure the cystostomy catheter (black arrows) is seen to fill with contrast but the nephrostomy tube (white arrows) is not filling. This was due to a severe pyonephrosis and with serial flushing the catheter eventually cleared and started flowing (B).

C) A digital subtraction image of a cat with transitional cell carcinoma after ureteral and urethral diversion. There is a ureteral stent on one side and an internalized ureteral bypass on the other side. During cystography contrast is seen advancing up the ureteral stent and bypass and leaking out of the kidney (yellow arrow) at the previous catheter access point.

D-E) A kinked (red arrow) SUB device in a cat.

F) After manipulation of the kink digitally it straightened out.

Figure 9: Fluoroscopic images showing some complications that can be seen with the SUB device.
The SUB device is not meant to replace traditional surgery for ureteral obstructions, but rather is an alternative when traditional surgery either fails, is contraindicated, or has a high risk of re-obstruction.

Considering that over 85% of cats have concurrent nephroliths and the median number of stones per ureter is 4, a majority of cases seem to benefit from this approach in the authors’ practice. The device should only be placed by those experienced with the technique and those that are appropriately trained, as these cases are technically challenging and can become very complicated. The acute decompression success rates are high (>98%), but training is mandatory. In the authors’ experience\textsuperscript{2,3} patency of the device was evident long-term (~94%), followed for a median of 18 months (range: 30-1275 days), with improvement in the creatinine concentrations in 98% of patients after placement. SUB™ catheter occlusion with stone debris was seen in 5% of cases and blood clots in 1%. Since starting the practice of routine prophylactic flushing, obstruction has not been a major issue. Complications are more common during and immediately after placement, and this too is rare (~5%). These include immediate leakage at the nephrostomy tube site (resolved with the new Dacron cuff design); hemorrhage during nephrostomy tube placement, and ultimate obstruction with a blood clot requiring infusion of tissue plasminogen activator; leakage at the junction of the port and the catheter requiring a small skin incision to tighten the boot and release the string; and kinking of the catheter as it enters the body wall.

Overall, the use of a SUB for feline and canine patients with a ureteral obstruction can be considered a functional option when other traditional therapies have failed or are contraindicated. Again, operators should be well versed in interventional techniques and devices, the possible complications, and appropriately trained in the use of this device before trying this in a clinical patient.

**SUBCUTANEOUS URETERAL BYPASS - SUB-SYSTEM™**

A New Therapeutic Option for Dogs & Cats to Bypass Ureteral Obstructions
designed and developed in collaboration with veterinarians.

Please email allyson.berent@gmail.com or chick.weisse@gmail.com if you have any questions or need additional information on the surgical implantation procedure of the SUB™ device.
**MISCELLANEOUS**

In the traditional SUB™ device kit, there are 2 port sizes (small and large). The smaller port is ideal for small thin cats and small dogs, but the larger port is used in overweight cats and medium/larger dogs. Additionally, there are 2 connectors that can be used: 1) a 3-way shunting port called The PantsPort™, and 2) an internalized metallic male-to-male barbed adaptor (Figure 10).

1) The **3-way PantsPort™** allows you to connect both kidneys to a single bladder catheter for bilateral ureteral obstructions. The authors’ prefer each kidney to have its own port when possible as flushing each side individually is ideal, but the pants port saves a fair amount of anesthesia time in compromised patients.

2) The **internalized male-to-male barbed adaptor** is used when the patient is not tolerating general anesthesia and the time it takes to secure the catheters subcutaneously is not possible. This allows a fast connection to be made, with the same premise to lock the string and advance the blue cuffs, but there is no need to secure these connections to the body wall. It is left free within the abdomen. This does not allow flushing and sampling in the long-term.

![3-way PantsPort™](image1) ![Internalized Male-to-Male Barbed Adaptor](image2)

*Figure 10: Miscellaneous equipment that can be used during ureteral bypass placement.*

A) This is a 3-way “PantsPort™” that can be used for bilateral ureteral obstructions where there are 2 kidney catheters and one bladder catheter that are all connected to one port.

B) This is a male-male barbed adaptor that will connect the kidney to bladder catheter and remain internalized. This provides bypass without an access port so it is not subcutaneous. This allows for faster placement but does not allow the device to be serially flushed in the future.

**REFERENCES**


*Please Email - allyson.berent@gmail.com or chick.weisse@gmail.com if you have any questions or if you need additional information on the surgical implantation procedure of the SUB™ device.*
The Subcutaneous Ureteral Bypass device is a unique system designed for use in veterinary patients, dogs and cats.

The SUB is a long-term indwelling device that consists of a combination locking-loop nephrostomy catheter attached via a dual-armed shunting port to a multi-fenestrated cystostomy catheter.

**ORDERING INFORMATION**

**SUB1001K** - For use in cats and small dogs
- **Contents:**
  - Le Petite Shunting Port
  - 6.5 French locking loop & insertion stylette
  - 7 French bladder catheter & insertion stylette
  - 2 x 22 Gauge Huber needles
  - 1 x 22 gauge Huber infusion set
  - Surgical suggestions

**SUB2001K** - For use in larger dogs
- **Contents:**
  - Le Port Shunting Port
  - 6.5 French locking loop & insertion stylette
  - 7 French bladder catheter & insertion stylette
  - 2 x 22 Gauge Huber needles
  - 1 x 22 gauge Huber infusion set
  - Surgical suggestions

**EQUIPMENT YOU WILL NEED THAT IS NOT INCLUDED IN THE SUB KIT**
1. An 18-gauge over-the-needle catheter - not included in the SUB kit.
2. Sterile cyanoacrylate tissue glue - not included in the SUB kit.
3. A 0.035” angled-tipped hydrophilic guide wire - not included in the SUB kit.

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