POST DIALYSIS
Use aspetic technique (as outlined above).
1. Flush arterial and venous lumens with a minimum of 10 ml of sterile saline.

WARNING: To avoid damage to vessels and viscous, infusion pressures must not exceed 25 psi (172 kPa). The use of a 10 ml or larger syringe is recommended because smaller syringes generate more pressure than larger syringes.

2. Inject heparin solution into both the arterial and venous lumens of the catheter. The appropriate heparin solution concentration and flushing frequency should be based on hospital protocol. Heparin solution of 1,000 to 5,000 units/ml has been found to be effective for maintaining the patency of hemodialysis and hemapheresis catheters. When injecting heparin solution, inject quickly and clamp extension while under positive pressure. Heparin solution volume to lock each lumen must be equal to the priming volume of each lumen. Large size catheters volumes are marked on each lumen.

3. Clean catheter Luer-lock connectors per hospital protocol. Attach sterile end caps to both the arterial and venous clamping extension pieces.

WARNING: To prevent systemic hypotension of the patient, the heparin solution must be aspirated out of both lumens immediately prior to using the catheter. In most instances, no further heparin solution injection is necessary for 48-72 hours, provided the catheter has not been aspirated or flushed.

CATHETER REMOVAL
Evaluate the catheter routinely and promptly remove any nonessential catheter† per physician’s orders. The white retention cuff facilitates tissue in-growth. The catheter must be surgically removed. Free the cuff from the tissue and pull the catheter gently and smoothly. After removing the catheter, apply manual pressure to the puncture site for 10-15 minutes until no signs of bleeding are present. Then apply sterile, transparent, semipermeable dressing or dressing per hospital protocol for a minimum of 8 hours. Follow hospital protocol regarding bedrest after catheter removal.

DOISALY
After use, this product may be a potential biohazard. Handle and dispose of in accordance with accepted medical practice and all applicable local, state and federal laws and regulations.

TROUBLESHOOTING
PATIENT WITH FEVER
Patient with fever and chills following the procedure may be indicative of catheter-related bacteremia. If bacteremia is present, removal of the catheter may be indicated.

INSUFFICIENT FLOW
Excessive force must not be used to flush an obstructed lumen. Insufficient blood flow may be caused by an occluded tip resulting from clotting of blood cells within the catheter. The catheter may need to be reintroduced for clotting or fibrinolytic therapy.

If the catheter is obstructed it may need to be reinsufflated with saline and/or a suction device used to remove the obstruction. The catheter may then need to be exchanged for a new one.

If the obstruction persists, the catheter should be exchanged for a new one. If a new catheter is inserted and does not function properly, the catheter tip may need to be aspirated to remove blood clots or fibrin plugs.

If the catheter is obstructed but does not function properly, the catheter should be exchanged for a new one.

REFERENCES
**INSERTION TECHNIQUE (1) Percutaneous Placement Procedure of the Reliance XX catheter with cuff using the Bard Access Systems, Inc. split sheath introducer:**

For percutaneous placement, the catheter is inserted either in the subclavian vein or internal jugular vein through a split sheath introducer. It has been reported that right side, internal jugular placement is the preferred location of consideration for percutaneous insertion.1-5 The patient should be placed in Trendelenburg position with the head turned to the opposite side of the entry site.

A (COMMON STEPS)

**CATHETERS MUST BE INSERTED UNDER STRICT ASEPTIC CONDITIONS.**

- The patient should be adequately hydrated and should receive prophylactic antibiotics before percutaneous insertion.
- The procedure should be performed in a sterile environment. The operator should wear a cap, mask, sterile gown, sterile gloves, and use a large sterile drape to cover the patient.
- Perampanel is used as a covering agent, leaving the extension catheter for percutaneous placement.
- All necessary equipment should be sterilized and ready for use.
- All necessary equipment should be sterilized and ready for use.

1. Provide a sterile field throughout the procedure. The operator should wear a cap, mask, sterile gown, sterile gloves, and use a large sterile drape to cover the patient.
2. Position the white retention cuff approximately midway between the skin exit site and the venous entry site, 3 cm minimum, from the vessel exit site and for percutaneous insertion.6,9 The patient should be placed in Trendelenburg position with the head turned to the opposite side of the entry site.

**WARNING:**

- Cardiac arrhythmias may result if the guidewire and/or stylet is allowed to touch the walls of the right atrium.
- Chlorhexidine gluconate should be used for skin disinfection. Acetone and PEG-containing ointments can cause failure of this device and should not be used with polyurethane catheters.
- Bacitracin patches or bacitracin zinc ointments (e.g., Polysporin* ointment) are the preferred alternative.

2. Apply a cover dressing, leaving the extension catheter for percutaneous insertion.6,9 The patient should be placed in Trendelenburg position with the head turned to the opposite side of the entry site.

**INSERTION TECHNIQUE (2) Surgical Cutdown Procedure:**

The catheter is inserted into the superior vena cava via the subclavian vein, external jugular vein or the internal jugular vein (standard operating room procedure). For surgical cutdown procedure, the patient should be placed in Trendelenburg position with the head turned to the opposite side of the entry site.

1. Go to A (Common Steps).
2. Skip B (Common Steps).
4. Locate the desired vessel for introduction. Make a small incision in the wall of the arteriotomy. 6,10,11,12,13
5. Make a small incision in the desired exit site of the catheter, in the area between the ribs and right sternal border. Make the incision just large enough to accommodate the implantable cuff.
6. Go to B (Common Steps).
7. Insert the catheter through a small venotomy in the selected vein. Advance the catheter tip. Catheter tip placement, tip orientation and proper length selection is left to the discretion of the physician. However, routine a guidewire should always follow the initial insertion to confirm proper placement of the catheter tip prior to use. The recommended tip location is at the junction of the superior vena cava and the right atrium. The guidewire should be confirmed by fluoroscopy.
8. For optimal product performance, do not insert any portion of the cuff into the vein.
**WARNING:**

- Cardiac arrhythmias may result if the guidewire is allowed to touch the walls of the right atrium.
- Remove the guidewire while applying forward pressure on the catheter so it does not withdraw.

9. Go to D (Common Steps)

**INSERTION TECHNIQUE (3) Sheathless Procedure:**

For sheathless placement, the catheter is preferably inserted into the internal jugular vein. For the sheathless procedure, the patient should be placed in Trendelenburg position with the head turned to the opposite side of the entry site.

1. Go to A (Common Steps).
2. Go to B (Common Steps).
4. **WARNING:**

- The vena cava is typically composed of two layers, inner and outer, and the catheter is intended to be placed within the inner layer. However, routine a guidewire should always follow the initial insertion to confirm proper placement of the catheter tip prior to use. The recommended tip location is at the junction of the superior vena cava and the right atrium. The guidewire should be confirmed by fluoroscopy.

5. If using a microtunneler, gently withdraw and remove the small sheath, while holding the small sheath in position.
6. Remove the needle while holding the guidewire in place. Wipe the guidewire clean and secure it in place.

**WARNING:**

- If the microtunneler guidewire must be withdrawn while the needle is inserted, remove both the needle and wire as a unit to prevent the needle from damaging or shearing the guidewire.
- Advise the patient that the guidewire will slide if the microtunelers are not secure. Advance the guidewire under sterile conditions into the desired location in the vessel.

7. Gently withdraw and remove the needle, while holding the guidewire in position.**

**WARNING:**

- Do not pull back standard guidewire over needle bevel as this could sever the end of the guidewire. The introducer guidewire must be removed first.
8. Make a small incision at the insertion site. Make a second incision at the desired exit site of the catheter.
9. Go to B (Common Steps)

**C (PERCUTANEOUS PLACEMENT)**

1. Fill the catheter lumens with heparinized saline. It is recommended that the venules, as indicated by the blue luer locator,

**WARNING:**

- Cardiac arrhythmias may result if the guidewire and/or stylet is allowed to touch the walls of the right atrium.
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2. Advance the dilator sheath introducer assembly over the exposed guidewire into the vessel.
3. Inject heparin solution into each lumen in amounts equal to the priming volumes as printed on the catheter clamps. Be sure to clamp each lumen immediately.
4. WARNING: Failure to clamp extensions when not in use may lead to air embolism.
5. CAUTION: Care should be taken not to advance the split sheath introducer into the artery as a potential kink would create an impasse to the catheter.

6. To prevent air embolism and/or blood loss, put patient in Trendelenburg position and always place thumb over the exposed orifice of the sheath introducer.

**WARNING:**

- The vena cava is typically composed of two layers, inner and outer, and the catheter is intended to be placed within the inner layer. However, routine a guidewire should always follow the initial insertion to confirm proper placement of the catheter tip prior to use. The recommended tip location is at the junction of the superior vena cava and the right atrium. The guidewire should be confirmed by fluoroscopy.

- The proximal end of the guidewire must be inserted into the vena cava end hole of the dilator. First, advance the microintroducer guidewire into the sheath introducer (red). Then, sequentially dilate (guiding dilators over the guidewire), the vena cava puncture site to accommodate the dilate catheter (dilate catheter at least the same French size as the catheter, and preferably to 1.5 F larger). This will reduce the drag on the arterial tip in the skin tunnel. After positioning a microtuneler, slide the sheath found on the tunneler over the venous tip/microtuneler connection and ensure the open end of sheath is covering the arterial tip. Confirm position of tip in the skin tunnel (standard operating room procedure). For surgical cutdown procedure, the patient should be placed in Trendelenburg position with the head turned to the opposite side of the entry site.

**WARNING:**

- Cardiac arrhythmias may result if the guidewires and/or stylet is allowed to touch the walls of the right atrium.

7. The proximal end of the guidewire must be inserted into the vena cava end hole of the dilatormost tips, the catheter should be passed through the arterial lumen until it extends out the arterial lumen connector (red).
8. To minimize the risk of air embolism, clamp the venous extension leg (indicated by the blue Luer-lock connector).

**WARNING:**

- The vena cava is typically composed of two layers, inner and outer, and the catheter is intended to be placed within the inner layer. However, routine a guidewire should always follow the initial insertion to confirm proper placement of the catheter tip prior to use. The recommended tip location is at the junction of the superior vena cava and the right atrium. The guidewire should be confirmed by fluoroscopy.

9. Advance the catheter over the needle tip, while the needle tip is inserted into the vena cava. For catheters with depth markings, markings are in one centimeter increments.

10. The catheter should not be forced through the vessel. Do not withdraw through the tunnel.

**CARE AND MAINTENANCE**

The care and maintenance of the catheter requires well-trained, skilled personnel following a detailed protocol. The protocol should include a directive that the catheter is not to be used for any purpose other than the prescribed therapy.

**ACCESSING CATHETER, CAP CHANGES, DRESSING CHANGES**

- Experienced personnel
- Use aseptic technique
- Protect hands hygiene
- Clean gloves to access catheter and remove dressing and sterile gloves for dressings changes
- Surgical mask (for the patient and 1 for the health care provider)

**WARNING:**

- The vena cava is typically composed of two layers, inner and outer, and the catheter is intended to be placed within the inner layer. However, routine a guidewire should always follow the initial insertion to confirm proper placement of the catheter tip prior to use. The recommended tip location is at the junction of the superior vena cava and the right atrium. The guidewire should be confirmed by fluoroscopy.

- Catheter exit site should be examined for signs of infection and dressings should be changed at each dialysis treatment.

- Catheter Luer-lock connectors with end caps attached should be secured locked to 3 to 5 minutes in polivinidone iodine and then allowed to dry before separation.

- Catheter exit site should be examined for signs of inflammation, swelling and tenderness. Notify physician immediately if signs of infection are present.

**Exit Site Cleaning14**

- Use aseptic technique (as outlined above)
- Clean the exit site at each dialysis treatment with chlorhexidine gluconate unless contraindicated. Apply antiseptic per manufacturer’s recommendations. Allow to air dry completely.
- Cover the exit site with sterile, impermeable dressing or per hospital protocol.

**Recommended Catheter Locking Solutions**

**WARNING:** Acetone and PEG-containing ointments can cause failure of this device and should not be used with polyurethane catheters.

Catheter Luer-lock Connectors/End Caps:

- Povidone iodine (allow connectors/end caps to soak for 3 to 5 minutes) 15

**WARNING:**

- Alcohol should not be used to lock, soak or decontaminate polyurethane Dialysis Catheters because alcohol is known to degrade polyurethane catheters over time with repeated and prolonged exposure.

- Hand cleaner solutions are not intended to be used for disinfecting our dialysis catheter Luer-lock connectors.

**Exit Site:**

- Chlorhexidine gluconate 2% solution (preferred) 6,9, 11, 12, 13
- Chlorhexidine gluconate 4% solution
- Dilute aqueous sodium hypochlorite solution
- Povidone iodine
- Hydrogen peroxide
- Chlorhexidine patches
- Bacitracin zinc ointments in petrolatum bases

**WARNING:** Acetone and PEG-containing ointments can cause failure of this device and should not be used with polyurethane catheters. Chlorhexidine patches or bacitracin zinc ointments (e.g., Polysporin* ointment) are the preferred alternative.