



Guideline for Managing Patency Problems with Peripherally Inserted Central (Venous) Catheters (PICCs)

Patency problems

- **Patency problems are common** in PICCs and include:
 - no flashback of blood
 - sluggish flow
 - complete blockage
- **Possible causes**
 - clotted blood in the catheter (most likely cause)
 - fibrin sheath
 - malpositioned catheter
 - drug precipitation
 - build up of lipids (parenteral nutrition)

Preventing patency problems: good flushing techniques

- **Use a brisk ‘push-pause’ flushing technique** routinely when flushing the catheter – i.e. flush briskly, pausing briefly after approximately each ml of fluid.
- **Use a “positive pressure finish” when you lock the catheter** – i.e. clamp the line while you are flushing in the final ml. If there is no clamp remove the syringe from the Bionector (or similar) while you are still injecting the final ml.

Managing patency problems

- **No flashback of blood**
 - Ask the patient to take deep breaths and try different positions. Flush briskly using 10mls 0.9% sodium chloride injection. If this fails use a thrombolytic (see below).
- **Catheter flow is sluggish**
 - Ask the patient to take deep breaths and try different positions. Flush briskly with 10mls 0.9% sodium chloride injection. If this fails consider using urokinase (see below).
- **Catheter is completely blocked**
 - Use a 3-way tap technique to instil thrombolytic into catheter (see below).

What is a thrombolytic?

- **A thrombolytic** is a drug capable of breaking up a thrombus.
- **Urokinase** is the most common thrombolytic used for unblocking midlines and central venous catheters: usually 10,000 units dissolved in 3mls 0.9% sodium chloride injection: 5,000units in 1.5ml per lumen.
- **A thrombolytic should always be prescribed.** Check for any allergy
- **Heparin and Hepsal are NOT thrombolytics:** they are capable only of inhibiting thrombus formation.



When should you use a thrombolytic?

- Use a thrombolytic to improve patency in the following situations:
 - flashback of blood is absent
 - free-flow of fluids is sluggish or intermittent
 - resistance is felt when flushing
 - the catheter/lumen is completely blocked

NOTE – if patient had required more than 2 Urokinase pushes in the last 2 months discuss with a senior medical colleague. Note that urokinase is of human origin and is not antigenic. Therefore there is no limit to the number of urokinase treatments a patient can have so long as urokinase has not given them an allergic reaction.

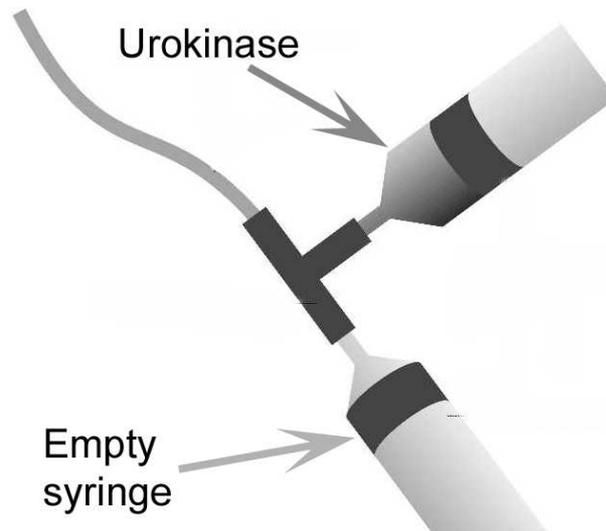
How to use urokinase

- **Make sure that urokinase is prescribed on the drug chart.**
- **Make sure that the pre-printed prescription for 0.9% sodium chloride for flushing on the PRN drug chart is signed by a doctor.**
- **Check that the patient is not allergic to urokinase or to any of the excipients in the formulation** (for example mannitol)
- Urokinase should be used with caution if the patient is actively bleeding or is at risk of haemorrhage (eg. Coagulopathy, thrombocytopenia, therapeutic anticoagulant therapy, following surgery or cerebrovascular bleeding, immediately post-partum, severe hepatic disease). If in doubt discuss using urokinase with the on-call Consultant Haematologist.
- Obtain a 10,000 unit vial of urokinase from pharmacy.
- Reconstitute the 10,000 unit vial of urokinase with 3ml of 0.9% sodium chloride injection.
- **Instil 1.5ml (5,000 units) of the reconstituted urokinase into each lumen of the catheter and wait 1-2 hours (or longer if desirable e.g. outpatients).** But note that if the lumen is completely blocked do NOT force the urokinase into the catheter: **see instructions for *Using Urokinase in a Completely Blocked Catheter* (Below).**
- **Following instillation of Urokinase , assess catheter patency again. NB It is best to try to flush the catheter with 0.9% sodium chloride injection prior to attempting to obtain flashback, otherwise there is a risk of creating a further blockage in the line before you have cleared it.** NB The dose of urokinase flushed into the patient is very small. However the cautions above should be considered for patients who are actively bleeding or at high risk of bleeding. Also note that flushing urokinase into the patient is unlicensed but is common accepted practice.
- If full function has not returned consider repeating **the instillation of urokinase and leave in for longer – several hours or overnight if possible.**
- **If the procedure fails to restore function** consider whether lipids / drug precipitation could be causing a blockage. If not, refer to medical staff: **Chest X-Ray may reveal malpositioned catheter.**

Using urokinase in a completely blocked catheter.

- **Attach 3-way-tap & syringes** see right. (NB 3-way taps are now contraindicated for routing IV use but are still available for this procedure)
- **Open clamp** (if there is one).
- **Open stopcock** to the empty 2ml syringe and the blocked catheter.
- **Pull back on the plunger of the empty 2ml syringe to create a vacuum in the catheter.** You will need to pull quite forcibly.
- **Maintain suction with one hand and with the other hand turn stopcock** so it is closed to the empty syringe and open to the 10ml syringe containing urokinase, which will be sucked into the catheter. Don't worry if it seems that very little urokinase is sucked in: even a tiny volume will reach several cm into the catheter. Repeat this process several times.

Diagram 1.
Three-way Tap Technique



- **Leave for 1-2 hours or longer if preferred.** DO NOT CLAMP CATHETER as this will prevent the urokinase from penetrating into the line.
- **After this time, assess the catheter by** attempting to flush the catheter using 0.9% sodium chloride injection in a 10ml syringe. Do not use excessive force. (It is best NOT to try aspirating before flushing at this stage as you may block the catheter again). "Test" the lumen to see if it flushes, and if patent then draw back the urokinase and flush with 10ml of 0.9% sodium chloride injection.
- **If the catheter is still completely blocked,** repeat the procedure: sometimes you will need to do it several times before it works. Sometimes leaving the urokinase in overnight seems to help¹. Don't worry about overdosing the patient: if the catheter is blocked none of the drug will actually have been flushed into the blood stream.
- **Once the catheter can be flushed, check for flashback.** If flashback is absent, administer urokinase as described above.
- **If the procedure fails** despite repeated attempts consult the insertion team or medical team with a view to removing the catheter.
- If the urokinase used correctly (see above) fails to restore function, **it may be worth investigating further using fluoroscopy which may reveal a fibrin sheath.**

What if the urokinase fails to restore function?

- If the urokinase used correctly (see above) fails to restore function, **a Chest X-Ray should be carried out as soon as practicable to check the position of the line. If a Chest-Ray shows that the catheter is correctly placed, it may be worth investigating further using fluoroscopy which may reveal a fibrin sheath.**

¹ Mayo DJ "Administering Urokinase: Clearing the Way" Nursing98 December