Allergy
Latex-based catheters have been identified as a potential risk to health. The problems of latex catheters include toxicity leading to urethritis, stricture formation, and the possibility of encrustation.

If sensitivity / allergy is known or suspected hydrogel-coated latex catheters are contra-indicated and an all silicone catheter must be used.

Be aware of the contra-indications to the use of anaesthetic lubricants gel e.g. lignocaine anaesthetic gel. Please refer to the manufacturers’ literature. If a local anaesthetic lubricant is contra-indicated then a sterile lubricating gel must be used refer to the Staffordshire and Shropshire Urology / Continence Formulary 2010.

Catheter Maintenance Solutions

Urinary pH
Catheterised patients with a pH over 6.8 will have alkaline urine which may result in encrustation of the catheter. The main cause of encrustation is the formation of struvite (magnesium ammonium phosphate salts) and calcium phosphate. Precipitation of these mineral salts from the urine occurs when it becomes alkaline because of the presence of urease producing bacteria.

Regular pH testing should be undertaken for patients whose catheter may be prone to blocking. This will allow for planned catheter changes to take place before the catheter blocks.

In most cases the blockage is caused by accumulation of mineral deposits precipitated onto the catheter surface from the urine. Precipitation occurs when the urine becomes alkaline (above pH7), usually as a result of colonization of catheter surfaces by bacteria which can release ammonia from the urine by splitting urea. Such bacteria are often present in the patient’s own bowel and can gain access to the catheter by migration across the skin surfaces even in the presence of stringent personal hygiene practices.

Pro-actively identification of patients who are recurrent ‘blockers’ will assist preventing catheter blockage through planned catheter changes. By establishing the length of time the catheter normally remains patent before blocking, may identify a ‘pattern of catheter life’ for the individual. However for some patients with very rapid catheter blockage, the frequency of catheter change required may be unsatisfactory.

Catheter maintenance solutions have been developed to provide another way to reduce the problem of persistently blocking catheters by instilling a solution into the catheter to dissolve some of the mineral deposits. Whilst it is unlikely that maintenance regimes using these solutions will prevent blockage completely they may help to extend ‘catheter life’ to a more acceptable period.

The following table provides a summary of the four main catheter maintenance solutions available on prescription and their uses. However it should be noted that not all solutions are available from manufacturers and that volumes and delivery devices vary between manufacturers.
Catheter maintenance solutions should only be used as part of a management plan to optimise catheter life by reducing the risk of encrustation, diminishing blockage and reducing trauma on catheter removal. The pH of the urine should be established and monitored regularly to ensure the effectiveness of CMS interventions.

Routine use of catheter maintenance solutions should be avoided due to the risk of damage to the epithelial lining of the bladder and risk of infection from disrupting the closed drainage system. Please note that Catheter solutions are a (POM) prescription only medication.

### Catheter maintenance solutions available in the UK

<table>
<thead>
<tr>
<th>Solution</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal Saline pH = 7</strong></td>
<td>Normal saline can be used to irrigate catheters that block with pus, blood clots or debris by gently washing this material out. It is very effective for clients with reconstructed bladder where there is a large amount of mucus produced. Normal saline has a neutral pH and will not dissolve catheter encrustation and therefore is not recommended if a catheter is regularly blocking due to encrustation by mineral deposits.</td>
</tr>
<tr>
<td><strong>Solution G pH = 3-4</strong></td>
<td>Solution G works by dissolving the mineral deposits composed of struvite and calcium phosphate which are formed in alkaline urine. Solution G contains magnesium oxide to reduce irritation of the bladder mucus caused by an acidic solution.</td>
</tr>
<tr>
<td><strong>Solution R pH = 2</strong></td>
<td>Solution R is a stronger acidic solution that Solution G which can be effective at dissolving severe encrustation. However it should be used with caution because it is more acidic than Solution G and does not contain magnesium oxide to reduce tissue irritation. It can be helpful in circumstances where Solution G has been tried unsuccessfully. It can also be useful prior to catheter change for patients who experience discomfort when the catheter is withdrawn because of encrustation on and around the tip (Getliffe, 1996). It is not recommended that Solution R is used on a frequent and regular basis as a prophylactic catheter care regime.</td>
</tr>
<tr>
<td><strong>Chlorhexidine 0.02% pH = 7</strong></td>
<td>An antiseptic solution aimed at preventing or reducing bacterial growth, in particular E.coli and klebsiella species (but will not prevent bacterial biofilm formation on catheter surfaces). Although commonly used in the past as an antiseptic bladder washout, chlorhexidine is no longer recommended Stickler &amp; Chawla, 1987) and its use may contribute to development of resistant species.</td>
</tr>
</tbody>
</table>

**Note:** There are few patients who cannot tolerate the use of catheter maintenance solution. These patients usually complain of pain and discomfort on instillation of the solution. For these patients the only option is to change the catheter more frequently to prevent encrustation building up.

**Delivery devices for catheter maintenance solutions**

Solutions are most commonly available in sterile devices designed for

a) Gravity feed or b) by gentle pressure and agitation through a bellows action. Volumes are usually 50mls or 100mls. One manufacturer provides a twin 30ml device which
facilitates two sequential catheter washes which avoids breaking the “closed system”
twice.

Urethral Catheterisation

The following sections are taken from the ACA Notes on Good Practice – Urinary
Catheterisation (2007).

Non-deflating balloons

DO:
- Try a different syringe
- Leave syringe attached, with the plunger removed for 20mins
- Check if the patient is constipated
- ‘Milk’ the catheter along its length to remove or unblock any obstructions
  caused by debris or encrustation

DO NOT:
- Attempt to burst the balloon by over inflating it
- Never cut the catheter or the inflation arm
- Never leave a catheter in situ for longer than the recommended time

If the balloon still does not deflate arrange a referral to secondary care, so the patient
can be referred for x-ray or ultrasound to control balloon deflation and also for
cystoscopy to remove any fragments of balloon.

Failure of urine to drain

First determine if the catheter was previously draining. If this is the case:
- Check for any mechanical obstruction – kinked tubing, occlusion of tubing by
  leg straps, bag higher that the level of the bladder
- Check for constipation, and if present treat appropriately
- Check for occlusion of the catheter eyes with anaesthetic gel or bladder
  mucosa, if so; gently instil sterile water to clear the eyes
- If the catheter does not start draining, change the catheter and inspect the old
  catheter for encrustation by cutting it lengthways along the lumen. If the
  catheter eyes and channel appear patent, after inspection, question whether
  the blockage be due to spasm?
- Consider the patient’s general condition, could they be dehydrated?
- If a new catheter does not drain:
  - Check if the catheter is in the urethra rather than the bladder
  - Check that the catheter is the correct length to ensure that the catheter
    eyes are in the bladder.

Haematuria

May be caused by trauma, infection or renal/bladder pathology, if it is severe medical
help should be sought urgently; the patient should be treated for shock and monitored
for clots and blockage. If it is occult, refer the patient for medical investigation, e.g.
cystoscopy.

Bypassing
- If urine is bypassing first check for kinked tubing or constipation. If there is
  bladder spasm or irritation consider:
Anticholinergic/antimuscarinics medication.

- A smaller catheter size
- The balloon size
- Catheter material (consider possible latex allergy)
- If there is encrustation, change the catheter and inspect for encrustation (see above)

Pain or Discomfort

- Cramping pain is common when a catheter is first inserted, the pain should subside within 24 hours. If it persists, there is probably bladder spasm and antimuscarinic therapy should be considered as above
- Urethral discomfort is possibly due to distension of the urethra by a catheter which is too large or by occlusion of the paraurethral glands; Changing to a smaller catheter will resolve this problem.

Suprapubic Catheterisation

This section includes some clinical situations that have been documented. The solutions tend to be practice based rather than research based as there is still much work to be done researching supra-pubic catheters.

- Antibiotic cover: Antibiotic prophylaxis is not recommended for changing urinary catheters including supra pubic catheters in patients at risk of infective endocarditis.
- An all-silicone catheter may be difficult to remove at routine catheter change. All-silicone catheters seem to ‘stick’ within the tract, requiring a great deal of traction to remove them. This is because of the deflated balloon not conforming on removal of the water and forming a cuff. Hydrogel coated latex catheters are now increasingly used in supra-pubic sites, unless the patient is allergic to latex.
- Bypassing urine urethrally usually occurs when the urethral closing pressure is less than any bladder contraction (spasm). In female patients this may be resolved by surgical occlusion of the urethra.
- Blockage is dealt with in the same way as urethral catheters, pH monitoring and the use of catheter maintenance solutions, see catheter maintenance solutions section.
- Over-granulation of the insertion site. This may be due to an over sized initial incision, or a response to a foreign body, i.e. the catheter. Solution – change the direction of the lay of the catheter against the abdomen by changing leg of bag attachment, or taping the catheter into a different direction. Over-granulated areas can be treated with application of silver nitrate stick as per manufacturers guidance