Prevention and management of urinary catheter blockages in community settings

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Abstract
Self-management of long-term urinary catheters can be challenging for patients, and recurrent catheter blockages may cause concern among patients, carers and healthcare professionals. Catheter blockages are a significant challenge for nurses practising in community settings, because frequent and unplanned catheter changes can be costly to healthcare services in terms of time and resources. This article details evidence-based recommendations for the assessment and diagnosis of catheter blockages, as well as the identification of risk factors. It also explains the interventions that can be used to prevent and manage catheter blockages and describes the role of the nurse in supporting patients with a long-term catheter in situ in community settings.

Aims and intended learning outcomes
The aim of this article is to enable nurses to understand their role in supporting patients who have, or are at risk of developing, urinary catheter blockages. After reading this article and completing the time out activities you should be able to:

» Understand the function of the bladder and the reasons why patients may require a long-term catheter.
» Identify risk factors for the development of catheter blockages.
» Outline the process for assessing and diagnosing catheter blockages.
» Explain the prevention and management interventions that can be used for catheter blockages.
» Support and monitor patients with long-term catheters in situ, and advise them about prevention and self-management strategies they could use to prevent blockages.

Introduction
The bladder is a hollow organ that functions as a temporary storage reservoir for urine. Its functional features are (Lue and Tanagho 2013):
» A capacity of 400-500mL.
» Sensation of fullness.
» Accommodation of volumes without change in intraluminal pressures.
» Ability to initiate and sustain contraction until empty.

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Peer review
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Keywords
catheterisation, clinical skills, community, community care, continence, nursing care, urinary catheters, urology

Why you should read this article:
● To enhance your knowledge of the assessment, diagnosis and management of long-term urinary catheter blockages in community settings
● To identify and support patients who are at risk of catheter blockages, and advise them about potential preventative strategies
● To count towards revalidation as part of your 35 hours of CPD, or you may wish to write a reflective account (UK readers)
● To contribute towards your professional development and local registration renewal requirements (non-UK readers)
Voluntary initiation and inhibition of voiding. Failure of one or more of these functional features of the bladder can mean that the patient requires intermittent or indwelling catheterisation. Long-term indwelling catheters are used by patients with conditions such as intractable urinary incontinence or chronic urinary retention. Chronic urinary retention can be secondary to a variety of conditions, such as enlarged prostate, underactive bladder, and neurological conditions such as spinal cord injury or multiple sclerosis (Boots et al 2009, Clinical Excellence Commission 2015, Shepherd et al 2017). National Institute for Health and Care Excellence (NICE) (2017) guidelines recommend an indwelling catheter for patients who are unable to perform intermittent catheterisation or are not amenable to toileting.

Catheterisation can be either urethral or suprapubic. Urethral catheters (Figure 1) are inserted into the bladder for the drainage of urine via the urethra, and are commonly used in patients who require assistance in voiding their bladder (Boots et al 2009), while suprapubic catheters are inserted into the bladder via the abdominal wall. The Foley catheter is the most frequently used type of catheter, which has an inflated balloon at the tip to keep the catheter in place. A closed drainage system is often used to reduce the risk of infection, in which the path from the tip of the catheter inserted into the bladder to the bag that collects urine is closed and should not be disconnected (European Association of Urology Nurses (EAUN) 2012).

It should be noted that the length of time that is considered to constitute long-term catheter use varies. For example, NICE (2017) defines long-term catheter use as more than 28 days, while the EAUN (2012) defines it as more than 14 days. In a Cochrane review by Shepherd et al (2017), most of the studies defined long-term catheter use as the urinary catheter remaining in situ for >28 days. The exact prevalence of long-term catheter use is not known. One study of 11 European countries identified that, in the UK, 3.8% of those aged 65 years and over who are receiving home care routinely use a long-term catheter (Sørbye et al 2005). Kohler-Ockmore and Feneley (1996) surveyed three UK community districts and found a long-term catheter prevalence of 0.07% in adults aged over 18 years, rising to 0.5% for those aged 75 years and over. Later evidence indicates that there are more than 90,000 long-term catheter users in the UK (Gage et al 2017).

Catheter blockages
The self-management of a long-term catheter can be challenging for patients (Wilde et al 2015). Moreover, in community settings, the longer the catheter remains in situ, the higher the risk of issues arising (Waskiewicz et al 2019), such as catheter blockages (Milo et al 2019). A catheter blockage is defined as anything that inhibits or completely stops the drainage of urine from the bladder through the catheter tube (Boots et al 2009). There are varying prevalence rates for catheter blockages among patients living with a long-term urinary catheter, ranging from 20% to 70% in community settings (Kohler-Ockmore and Feneley 1996, Wilde et al 2010, National Clinical Guideline Centre UK 2012, Maeda et al 2013, Grabe et al 2015).

Catheter blockages are a significant clinical challenge for patients and nurses (Grabe et al 2015), and the patient may experience anxiety related to the increased risk of a medical emergency that these blockages present. For patients who require assistance to manage their catheter, blockages can be a daunting and distressing experience. Frequent and unplanned catheter changes resulting from catheter blockages can also be costly to healthcare services in terms of time and resources (Feneley et al 2015).

Risk factors for catheter blockages
A variety of clinical factors may lead to the development of a catheter blockage. It is important that nurses providing catheter care in community settings are aware of the risk factors for catheter blockages, so that they can implement preventative self-management strategies with the patient and/or their carer.

One risk factor for catheter blockages is a low volume of urine output, which may occur as a result of inadequate fluid intake or diaphoresis (excessive sweating) (Queensland Spinal Cord Injuries Service 2017). Other risk factors include reduced urine flow because of a kinked catheter tube, and external pressure resulting from constipation, suboptimal positioning of the drainage bag or straps, or a full drainage bag resulting in reflux back into the bladder (Wilde et al 2010, Maeda et al 2013, Queensland Spinal Cord Injuries Service 2017). A catheter blockage can be a daunting and distressing experience. Frequent and unplanned catheter changes resulting from catheter blockages can also be costly to healthcare services in terms of time and resources (Feneley et al 2015).
Injuries Service 2017). Blood clots can contribute to catheter blockages if the clots are too large to travel through the lumen of the catheter, causing obstruction of the urine (New South Wales Agency for Clinical Innovation 2012). If a patient is found to have blood clots, they must be referred to specialist urology services in a timely manner for further investigation and management.

Causes of catheter blockages include debris, biofilm formation and catheter encrustation (EAUN 2012). Bacteriuria (the presence of bacteria in the urine) occurs in all patients who have a catheter in situ for 30 days or longer, even with the use of a closed drainage system (Grabe et al 2015). Encrustation occurs when the catheter acquires a crystalline biofilm as a result of the presence of urease-producing bacteria, most commonly from Proteus mirabilis, but this may also be from Pseudomonas aeruginosa, Staphylococcus aureus, Klebsiella, Serratia, Morganella morganii, Providencia and Enterobacter (Feneley et al 2012, Gibney 2016). Urine is usually acidic; however, these organisms generate ammonia from urea, thus increasing the pH level of the urine so it becomes alkaline (Nzakizwanayo et al 2016). This alkaline environment is ideal for crystalline formation, which most commonly comprises struvite (magnesium ammonium phosphate) or apatite (a form of calcium phosphate) (Stickler 2014). Deposits of these mineral salts adhere to the internal and external surface of the catheter in a crystalline biofilm (Davis 2019), leading to occlusion of the catheter lumen.

TIME OUT 1
Consider the patients you encounter in your clinical area. Do you think any of them might be at risk of a catheter blockage? What steps would you take to assess and diagnose a patient with a catheter blockage?

Assessment and diagnosis
Catheter blockages are a medical emergency (EAUN 2012). If a catheter blockage is not managed in a safe and timely manner, it may lead to urosepsis (sepsis caused by a urinary tract infection), increased risk of pyelonephritis (inflammation of the kidney), bladder and kidney stones, septicemia and endotoxic shock (Stickler 2014). The signs of a urinary catheter blockage are outlined in Box 1.

The effective management of catheter blockages requires a structured assessment to identify the cause of the blockage (Royal College of Nursing (RCN) 2019). This involves the nurse:

» Taking a thorough clinical and catheter history, including documenting the length of time a catheter remains functional before issues arise for each patient (Gibney 2016).
» Assessing all potential external causes of a catheter blockage, such as restrictive clothing, a kinked catheter tube or suboptimal bag positioning. If there is still no urine flow after these potential causes are identified and addressed, the nurse needs to decide what the appropriate treatment is, and the urgency of this treatment.
» Checking the patient’s vital signs, and assessing the patient’s bladder fullness and pain through palpation and the use of a bladder scanner (Sparks et al 2004, EAUN 2012).
» Assessing the patient’s fluid balance by monitoring their oral intake and urine output over 24 hours.

Autonomic dysreflexia
Autonomic dysreflexia, also known as autonomic hyperreflexia, is a potentially life-threatening condition that affects individuals with a spinal cord injury above the major splanchic outflow – typically the T6 level or above (Karlsson 1999). Widespread reflex activity of the sympathetic nervous system below the level of the spinal cord injury results in uncontrolled overactivity of the sympathetic system, because of isolation of the cord below the injury from normal vasomotor regulation in the brainstem (Blackmer 2003). Noradrenaline (norepinephrine) is released, which causes vasoconstriction that results in a sudden rise in blood pressure and usually a headache.

Common causes of autonomic dysreflexia from a urological source include: distended or hypertensive bladder, urinary catheter blockage, urinary tract infection, bladder or kidney stones, or insertion of a catheter (Murray et al 2019). It can also be caused iatrogenically by healthcare professionals, for example by clamping a catheter for a procedure, or accidental occlusion or kinking of the catheter tube (Krassioukov et al 2009). Autonomic dysreflexia is a medical

Key points

» Long-term indwelling catheters are used by patients with conditions such as intractable urinary incontinence or chronic urinary retention

» A catheter blockage is defined as anything that inhibits or completely stops the drainage of urine from the bladder through the catheter tube

» It is important that nurses providing catheter care in community settings are aware of the risk factors for catheter blockages, so that they can implement preventative self-management strategies with the patient and/or their carer

» A variety of interventions can be used to prevent and manage catheter blockages, including: manual bladder irrigation; the use of catheter maintenance solutions; optimising fluid intake; catheter changes; and selecting the optimal type of catheter to reduce the risk of blockages

# Box 1. Signs of a urinary catheter blockage

- Lower urinary tract symptoms, for example increased urinary frequency and/or urgency, urge incontinence and excessive passage of urine at night
- Severe pain
- Catheter bypassing
- Bladder irritability and spasms
- Sweating, tachycardia and hypotension
- Distended lower abdomen
- Urinary retention
- Urine failing to drain from the catheter
- Patients experience the need to void their bladder

(Waskiewicz et al 2019)
Prevention and management interventions

A variety of interventions can be used to prevent and manage catheter blockages, including:
- Manual bladder irrigation; the use of catheter maintenance solutions; optimising fluid intake; catheter changes; and selecting the optimal type of catheter to reduce the risk of blockages.

**Manual bladder irrigation**

Manual bladder irrigation is usually used for clearing clot retention and mucus build-up (EAUN 2012, RCN 2019). It involves flushing a urinary catheter with 0.9% sodium chloride, via gravity or manually using a catheter-tipped syringe, then undertaking a drawing back action to actively remove debris until the draw back fluid is clear. In community settings, caution must be taken when undertaking manual bladder irrigation in patients who have had open bladder surgery or a renal transplant. The nurse should document the indication for the manual bladder irrigation, the date and time, the fluid used, the result of the irrigation, and the colour and volume of the draw back fluid. The urine volume should be determined by calculating the difference between volume of fluid infused and output (Peate and Gil 2015).

An aseptic technique must be used for manual bladder irrigation and must be undertaken by a skilled and competent healthcare professional. If the catheter blockage cannot be resolved using this method, the nurse should replace (re-catheterise) the blocked indwelling catheter to attempt to restore urine output. Nurses must follow their local policy regarding this skill in the management of catheters. If manual bladder irrigation and re-catheterisation are unsuccessful, this is considered a medical emergency and the patient must attend their nearest emergency department.

**Catheter maintenance solutions**

Catheter maintenance solutions are used to prevent encrustation, rather than to remove encrustation that has already formed. Various types of catheter maintenance solutions are used for the prevention of long-term catheter blockages, including 0.9% sodium chloride, and acidic and antimicrobial solutions. The volume of solution used can also vary, as can the frequency of administration (EAUN 2012, RCN 2019). Therefore, the nurse should check their local policy when using these solutions.

Shepherd et al’s (2017) Cochrane review found insufficient evidence to determine whether prophylactic catheter maintenance solution policies were beneficial or harmful for patients with long-term catheters. These authors recommended a rigorous and methodologically robust randomised controlled trial to assess the clinical and cost effectiveness of catheter maintenance solution policies in patients with long-term catheters. The CATHETER II study is an ongoing randomised controlled trial that aims to provide robust evidence about the use of catheter maintenance solutions to prevent catheter blockages in the future (Abdel-Fattah 2019).

**TIME OUT 2**

If a patient presented with a urinary catheter blockage, what evidence-based nursing interventions might you undertake to preserve their safety? You may wish to discuss this with a colleague

**Optimising fluid intake**

It is recommended that patients increase their daily fluid intake to flush out bacteria, dilute their urine and reduce the risk of constipation, which can affect catheter drainage (Gibney 2016). Maintaining a consistent fluid intake can also assist in preventing the formation of crystals that cause encrustation and blockages (Wilde et al 2010, 2015, 2016).

Additional simple and cost-effective methods of potentially reducing the development of encrustation include the regular intake of lemon juice or prune juice, along with decreasing the intake of sodium and sucrose (Marcone Marchitti et al 2015a). Prune juice and liquids containing citrate are natural products that inhibit crystal formation and can assist in delaying or preventing encrustation and catheter blockages (Marcone Marchitti et al 2015a). The EAUN (2012) guidelines also recommend optimising fluid intake and using lemon juice supplements to reduce the incidence and severity of encrustation.

Educating the patient and/or their carer about observing changes in the colour of their urine may also remind them of the need to increase their fluid intake to reduce the risk of blockages, thus increasing the length of time that the catheter remains functional (Wilde et al 2016).

**Catheter changes**

One of the main risk factors for bacteriuria and encrustation is the length of time a urinary catheter remains in situ; therefore, catheter changes are required to reduce the risk of blockages (Marcone Marchitti et al 2015b). Clinical guidelines do not recommend a ‘one-size-fits-all’ routine schedule for catheter changes, but rather recommend that the schedule should be based on the length of time that a urinary catheter remains functional for each patient (EAUN 2012, Murphy et al 2018). Therefore, the frequency of catheter changes will be dependent on each patient’s needs; however, the catheter should not remain in situ beyond the manufacturer’s recommended timeframe.

**Optimal type of catheter to prevent blockages**

Of the various types of Foley catheters available, silicone catheters have been shown to display optimal performance in preventing encrustation because of
their relatively large lumen size and since they can remain in situ for longer than other types of catheter (Marcone Marchitti et al 2015a). The EAUN (2012) guidelines recommend a 100% silicone catheter for patients who have a latex allergy and for those who experience frequent catheter blockages.

The use of silver alloy-coated catheters has been shown to reduce the occurrence of asymptomatic bacteriuria, although these studies focused on catheters that were in situ for less than one week (Maeda et al 2017). Furthermore, Pickard et al (2012) identified that silver alloy-coated short-term catheters were not effective in reducing the incidence of symptomatic catheter-associated urinary tract infections (CAUTIs).

Preventing catheter-associated urinary tract infections

Patients with a urinary catheter in situ are at risk of CAUTIs, and the use of an aseptic technique for catheter insertion and a closed drainage system do not remove this risk completely (Marcone Marchitti et al 2015a). The bladder’s natural ability to fill and empty provides a means of eliminating or ‘flushing out’ bacteria from the urinary tract. Therefore, patients with long-term urinary catheters are at increased risk of CAUTIs, because they will not have this ability (Stickler and Feneley 2010).

The use of a catheter valve will allow the bladder to fill and flush and can remove the need for a drainage bag, which can improve patients’ quality of life and is believed to reduce the risk of catheter blockages and CAUTIs; however, this claim is lacking in robust clinical evidence (Murphy et al 2018). The catheter valve may not be suitable for all patients and clinical assessment is required (Simpson 2017). The routine use of antibiotics to prevent or treat asymptomatic CAUTIs or bacteriuria is not recommended; however, if an infection is suspected, the catheter should be replaced and antibiotics commenced (Simpson 2017).

Role of the nurse

For patients in community settings with a long-term urinary catheter in situ, the nurse will have a major role in providing the patient and/or their carer with education and support, assisting in the daily management of their catheter, and addressing any complications that may arise (Murphy et al 2018). Maeda et al (2017) identified that suboptimal catheter care by the patient or their carer is associated with increasingly frequent catheter blockages. Thus, the nurse has an essential role in optimising the catheter care of patients in community settings, as well as providing support and encouragement.

Providing education to patients and their carers includes encouraging self-management and proactive self-monitoring of their catheter. This is important to enable patients and their carers to recognise other complications that can lead to catheter blockages and address these, for example by removing kinks in the catheter tube, repositioning the drainage bag or straps, regularly emptying the drainage bag, and preventing constipation (Gibney 2016).

Nurses should plan catheter changes before the development of a catheter blockage by (Murphy et al 2018):

» Undertaking ongoing monitoring of the catheter.
» Recording the initial insertion date.
» Scheduling the date of the catheter change.
» Documenting any catheter blockages.
» Identifying issues that arise to determine the functionality of each patient’s urinary catheter. Nurses are required to document any episodes of CAUTIs, use of antibiotics, the condition of the catheter tip, next recommended date of change, and any changes to the type of catheter or drainage bag (Simpson 2017). Concise and accurate documentation is important to provide relevant information to the various healthcare professionals who may be involved in the patient’s ongoing care.

Nurses should be aware that all patients with a long-term catheter in situ are at risk of developing bladder stones, which are associated with the development of encrustation. Clinical guidelines recommend that patients who are suspected of having bladder stones are referred for a flexible cystoscopy to detect and remove the stones, to reduce the risk of any future catheter encrustation and blockages (EAUN 2012, Gibney 2016).

Conclusion

Nurse have an important role in supporting patients with a long-term catheter in situ in community settings. This role includes the assessment and diagnosis of catheter blockages, as well as the identification of risk factors. With an increase in the number of people living longer and in the number of patients being cared for in community settings rather than acute settings, the level of care provision required for people living with long-term catheters is expected to rise. Therefore, it is important that nurses have an understanding of effective long-term catheter management, and the prevention of catheter blockages, to provide optimal care.

TIME OUT 4

Consider the nursing support available for patients with long-term catheters in your local area. Could your local healthcare service do more to provide support for these patients? How could you improve the provision of services for patients with long-term catheters locally?

TIME OUT 5

Consider how the prevention and management of catheter blockages in community settings relates to The Code: Professional Standards of Practice and Behaviour for Nurses, Midwives and Nursing Associates (Nursing and Midwifery Council 2018) or, for non-UK readers, the requirements of your regulatory body.

TIME OUT 6

Now that you have completed the article, reflect on your practice in this area and consider writing a reflective account: rcni.com/reflective-account.
References


Marcone Marchitti C, Boarin M, Villa G (2015a) Encrustation blockage of urinary catheters: a way forward in prevention and blockage of long-term indwelling bladder catheters. a way forward in prevention and


1. What is the main function of the bladder?
   a) Filter waste products from the blood
   b) Temporary storage reservoir for urine
   c) Detoxify chemicals and metabolise drugs
   d) Temporary storage site for faeces

2. Patients with which of these conditions are most likely to require a long-term indwelling catheter?
   a) Chronic urinary retention
   b) Faecal incontinence
   c) Urinary tract infection
   d) Irritable bowel syndrome

3. One risk factor for catheter blockages is:
   a) High volume of urine output
   b) Acidic urine
   c) Reduced urine flow
   d) An empty drainage bag

4. Which of the following is not one of the signs of a urinary catheter blockage?
   a) Bradycardia
   b) Bladder irritability and spasms
   c) Urinary retention
   d) Catheter bypassing

5. As part of an assessment of a patient with a suspected catheter blockage, the nurse should:
   a) Check the patient’s vital signs
   b) Take a thorough clinical and catheter history
   c) Monitor the patient’s oral intake and urine output over the past 24 hours
   d) All of the above

6. What type of fluid is used in manual bladder irrigation?
   a) Antimicrobial solutions
   b) 0.9% sodium chloride
   c) Sterile water
   d) Lemon or prune juice

7. Which statement is false?
   a) The most common cause of encrustation is crystalline deposits caused by the urease-producing bacteria Proteus mirabilis
   b) Bacteriuria occurs in all patients who have a catheter in situ for 30 days or longer
   c) Catheter maintenance solutions can only be used to prevent encrustation, rather than to remove encrustation that has already formed
   d) Urine is usually alkaline, but it becomes acidic when colonised with bacteria

8. Which of these strategies is not recommended to prevent catheter blockages?
   a) Increase daily fluid intake
   b) Regular intake of lemon juice or prune juice
   c) Increase intake of sodium and sucrose
   d) Scheduled catheter changes, based on the length of time the catheter remains functional

9. Why are silicone catheters considered the optimal type in preventing encrustation?
   a) They must be replaced at least once per week
   b) They have a small lumen size
   c) They can remain in situ for longer than other types
   d) They do not require a drainage bag

10. The role of the nurse in supporting patients in community settings with a long-term catheter involves:
    a) Providing education and support to the patient and/or their carer
    b) Assisting in the daily management of the patient’s catheter
    c) Addressing any complications that may arise
    d) All of the above

How to complete this quiz
This multiple-choice quiz will help you to test your knowledge. It comprises ten questions that are broadly linked to the CPD article. There is one correct answer to each question.

- You can test your subject knowledge by attempting the questions before reading the article, and then go back over them to see if you would answer any differently.
- You might like to read the article before trying the questions.

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This multiple-choice quiz was compiled by Alex Bainbridge

The answers to this multiple-choice quiz are:
1. b 2. a 3. c 4. a 5. d
6. b 7. d 8. c 9. c 10. d

As a result of this I intend to:

This activity has taken ___ minutes/hours to complete. Now that I have read this article and completed this assessment, I think my knowledge is:

Excellent  [ ] Good  [ ] Satisfactory  [ ] Unsatisfactory  [ ] Poor  [ ]