Nursing management of paediatric urethral catheterisation

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Summary

This article outlines evidence-based approaches to paediatric catheterisation in acute care settings. The reasons for catheterisation, anatomy and physiology of the urinary system and the procedure and potential complications are discussed.

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Keywords

Paediatrics; Urinary catheters; Urinary system and disorders

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Aims and intended learning outcomes

The aim of this article is to outline and discuss evidence-based approaches to paediatric urethral catheterisation in an acute care setting. Nurses have a responsibility to deliver care based on current evidence, best practice and, where applicable, validated research (Marklew 2004). The responsibility of maintaining professional knowledge and competence is outlined in the Nursing and Midwifery Council's *Code of Professional Conduct*, which states that nurses are accountable for their practice (NMC 2004).

After reading this article you should be able to:

- Identify the anatomy of the urinary system in males and females.
- Explain the possible anatomical features that are not conducive to urethral catheterisation.
- List the equipment required for catheterisation.
- Discuss the issues in relation to consent and preparation before urethral catheterisation.
- Describe the procedure involved in catheterising a child.

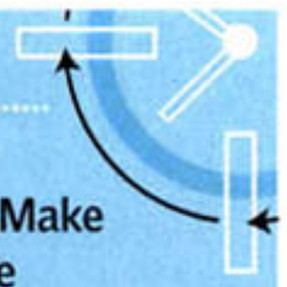
Introduction

Bladder catheterisation dates back to 300BC. There are reports of catheters being made from dried reeds, palm leaves, animal skins and cheese glue (Cule 1980). This was followed by the development of metal catheters using gold, tin, lead and silver (Robinson 2001). More malleable materials became available in 1844 following perfection of the vulcanisation of rubber (Woodward 1997). In 1934, Foley designed the inflation balloon to retain the catheter in the bladder (Stewart 1999).

Urinary catheterisation is the insertion of a tube into the bladder, using aseptic technique, for the purpose of evacuating or instilling fluid (Mallett and Dougherty 2000). Catheterisation has physical, mental and social implications beyond the drainage of urine (Pomfret 1996). The promotion of best nursing practice in catheter care is integral to enhancing good patient care (Robinson 2001).

The Department of Health (DH 2001) states that indwelling urethral catheters should only be used after considering alternative methods of management (National Institute for Clinical Excellence 2003). Indwelling urethral catheterisation should be considered a last resort for bladder management (Simpson 2001, DH 2003). There may be alternatives to an indwelling catheter, which include intermittent catheterisation, medication, voiding programmes or incontinence pads (Simpson 1999).

Time out 1



Identify a child in your care who required urethral catheterisation. Make brief notes on the rationale for the procedure and anticipated length of time for catheterisation.

Reasons for catheterisation

Short-term, judicious use of an indwelling urethral catheter is a safe and effective strategy to maintain bladder and renal health and contributes to improved outcomes (Griffiths and Fernandez 2005).

Acute retention Acute urinary retention is a condition characterised by a sudden inability to micturate or a failure to void 12 hours after return to the ward following surgery, in addition to a palpable bladder (Choong and Emberton 2000). This can occasionally be idiopathic, however, it is more likely to be a result of a surgical procedure, drug-related event, or the use of spinal or epidural anaesthesia (Cropper *et al* 2003). A recent audit showed only a small percentage of urinary retention in children with epidural infusions (Cropper *et al* 2003). Acute retention can also be secondary to constipation, spinal injury or urethral outflow obstruction. Clinical examination of the abdomen can be unreliable when detecting retention and distressing for the child (Cropper *et al* 2003). Ultrasound can be useful to predict bladder volume (Addison 2000), although ultrasound equipment is not always available at the bedside. Ultrasound is valuable as it is quick, safe, non-invasive and carries no risk of trauma or infection (Robinson 2003).

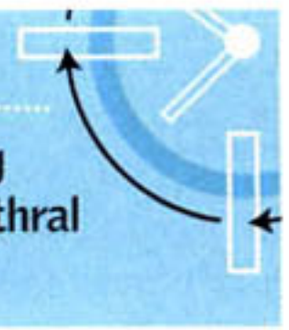
If a child has urinary retention, it is often more preferable to insert an intermittent catheter to relieve retention and hence release pressure on the urinary sphincter (Jolley 1997). An indwelling catheter should be inserted only if problems persist or if there are associated complicating factors, such as pelvic trauma.

If acute retention is the primary reason for admission then the underlying pathophysiology should be explored. It is likely that assessment of bowel function, neurology and urogenital status would be investigated.

Post-operative urine monitoring Children who are critically unwell following injury, trauma or emergency surgery are likely to have a urethral catheter inserted to monitor fluid balance and assess specific gravity (to monitor hydration levels) (Willock and Jewkes 2000). Specific gravity values range from 1000-1030gm/ml and relate to the concentration of particles in a solution, with the higher levels indicating increasing dehydration. As an adjunct to monitoring urine output for some elective surgery, urinary catheters are also used to act as stents to the operated site, for example, reimplantation of ureter and hypospadias repair. Skin and wound integrity are the primary reasons for catheter insertion in children who have certain types of surgery, for example, posterior sagittal anorectoplasty, a technique to repair anorectal malformations such as high imperforate anus.

Urinary drainage allows wound healing, minimising infection, pain and discomfort for the child. More complex surgery involves the positioning of urinary catheters, which can remain *in situ* for several weeks. For example, augmentation cystoplasty requires complete bladder drainage during the healing process and the child often has both a urethral and suprapubic catheter inserted to minimise post-operative risk of bladder perforation.

Time out 2



Choose and review one underlying pathophysiological reason for urethral catheterisation in children.

Anatomy and physiology of the urinary system

The urinary system consists of two kidneys, a bladder and urethra (Figure 1). The kidneys lie one on either side of the vertebral column between the 12th thoracic and third lumbar vertebrae. They are situated behind the peritoneum and attached by adipose tissue to the posterior abdominal wall. Urine flows from the kidneys to the bladder via the ureters. A child should be expected to produce 1ml/kg/hour of urine. If the output is below 0.5ml/kg/hour, concern is usually raised but this will depend on the child's renal function, which should be outlined by medical staff.

The ureters The ureters are hollow tubes that extend from the renal pelvis to the posterior wall of the bladder. Each ureter comprises four layers, transitional epithelium, connective tissue, smooth muscle and adventitia (connective tissue with elastic and collagenous fibres). The peristaltic activity of the ureters facilitates the flow of urine from the renal pelvis to the bladder. Therefore, gentle pressure is exerted by the ureter as the urine is squeezed down it and into the bladder. The ureters enter the bladder on the trigone (the most sensitive area of the bladder located at its base) through a tunnel that

functions as a valve to prevent backflow of urine. This valve is fundamental in restricting the flow of urine from the bladder back up the ureter to the kidney. If this does happen it is called vesicoureteric reflux. If the ureter is too short and there is a failure in the valve mechanism, this predisposes the patient to vesicoureteric reflux (Thomas 2002). However, as the ureter tunnel grows with the child there is often a reduction or disappearance of vesicoureteric reflux. If, however, the ureter enters the bladder in the wrong position this will not necessarily change with time and may necessitate surgical intervention such as an ectopic ureter.

Vesicoureteric reflux is clinically significant as it plays a role in urinary tract infection, which in turn can lead to ill health, failure to thrive, renal scarring (reflux neuropathy), and possibly dysfunctional voiding coupled with continence problems in childhood. In the longer term renal scarring can lead to hypertension, complications in pregnancy and end-stage renal failure. Vesicoureteric reflux is graded from I to V, the higher the grade the more severe the reflux and the greater the risk of renal scarring (Thomas 2002).

Initial treatment options for vesicoureteric reflux include prophylactic antibiotics until such an age when it may have resolved. Should there be a reoccurrence or no resolution of symptoms, then further intervention may be necessary.

Interventions include a subureteric Teflon® injection (STING) procedure or reimplantation of ureters. STING is the endoscopic treatment of vesicoureteric reflux by injecting a small amount of specialist material under the bladder mucosa in the area of the refluxing ureteric opening. This does not involve open surgery and is undertaken as a day case. Ureteric reimplantation, however, involves open surgery in which the ureters are removed from their existing position and reimplanted, often higher in the bladder.

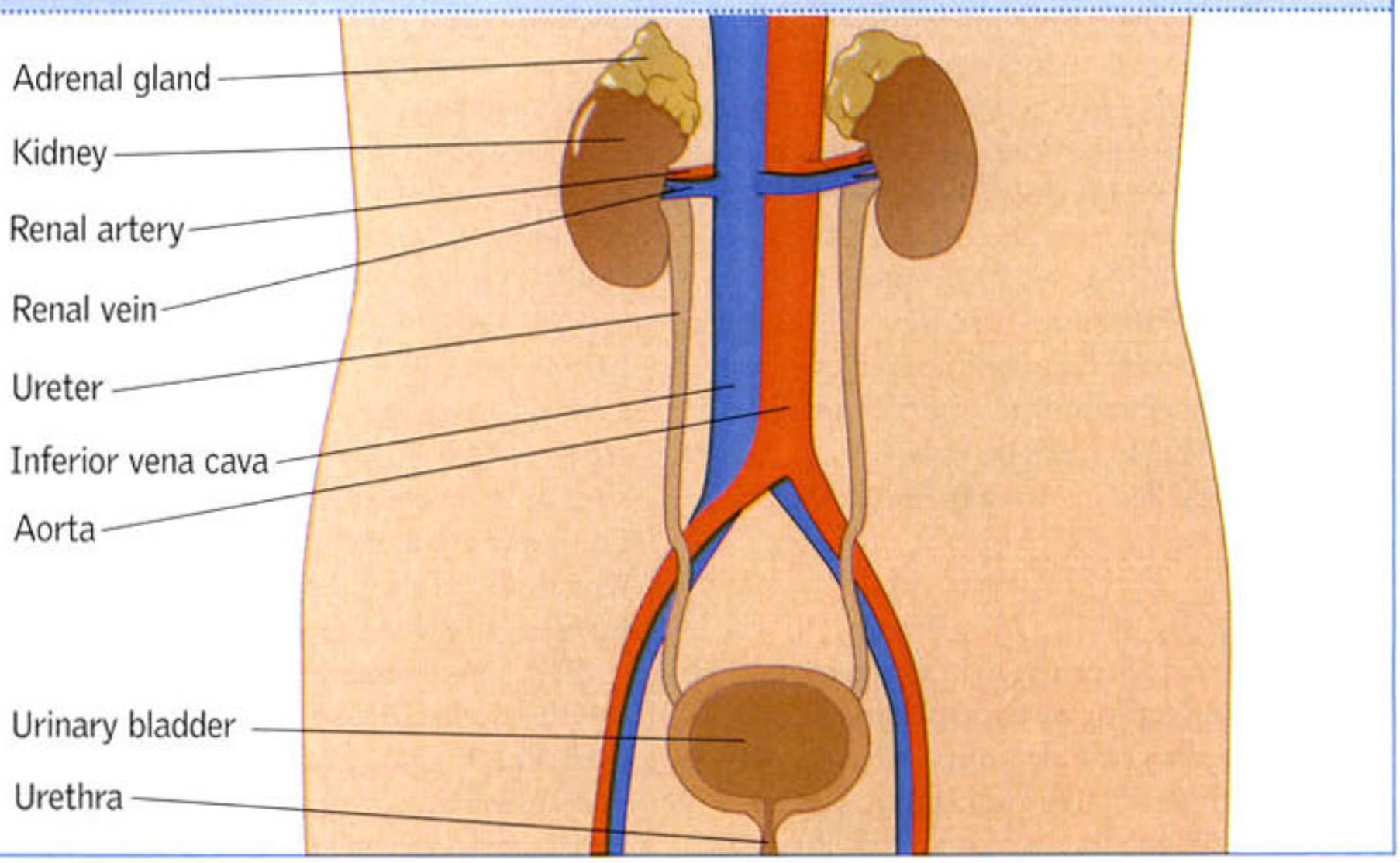
The bladder The bladder is a hollow, oval-shaped, muscular organ that sits in the abdominal cavity in infants and young children. This can make palpation of a full bladder easier than in adults and also facilitates the suprapubic aspiration of urine (Yeung 2002). The bladder has three layers and a rich blood and nerve supply. The inner layer of bladder mucosa consists of folds or rugae, which allow the bladder to expand and contract as it fills with urine. The middle layer, the detrusor, is made up of smooth muscle fibres, which account for its elasticity and capability to increase in capacity. The outer layer comprises connective tissue. The function of the bladder is to store urine at increasing volume and low pressure, therefore, maintaining the safety of the upper tracts.

The urethra In males the urethra extends from the neck of the bladder to the external urethral opening and it serves as the passage for elimination of urine and ejaculation of semen. It consists of two layers, inner mucous membrane (stratified squamous epithelium) and outer sub-mucous tissue. The length of the urethra will change with age; it penetrates through the prostate and the prostatic glands, and the ejaculatory duct opens into it. Three distinct areas are present: the prostatic, membranous and spongy regions.

Abnormalities of the urethra can include posterior urethral valves, which cause outflow

FIGURE 1

The urinary system



obstruction and can also lead to long-term damage to upper renal tracts. Posterior urethral valves are most commonly noted *in utero* but can also be found later with a presentation of frequency and day or night wetting. Catheterisation in this group can be difficult due to the nature of the urethral obstruction. Hypospadias is a failure of the urethral folds to close resulting in the external urethral orifice opening on the underside of the penis or on the perineum (Sanders and Baird 2003). Epispadias is where the urethra opens on the top (dorsal) aspect of the penis. Both of these birth defects can result in difficulties in urethral catheterisation. A non-retractile foreskin, which is usual under the age of approximately ten years, can also cause difficulties with catheterisation.

In females the urethra consists of three layers, inner (mucosa), middle layer of spongy tissue with a plexus of veins and outer layer of serosa, which is part of the bladder serosa. The external urethral orifice is located between the clitoris and vaginal opening. The female urethra runs down and along the anterior wall of the vagina. The space between the bladder and the uterus/anterior wall of the vagina, which is not enclosed in the peritoneum, is referred to as the pouch of Douglas. The urethral orifice can often be identified above the vaginal opening, however, if the child has a urogenital sinus then catheterisation needs to be undertaken under direct cystoscopy. A urogenital sinus exists where the urethra opens in the vagina and only one orifice can be identified externally.

Bladder control

Children are usually toilet trained between the ages of two and a half to four years (Zickler and Richardson 2004). Girls generally achieve dryness before boys; bladder control is usually gained before the age of six (Berk and Friman 1990).

A child's bladder volume can be calculated using the formula 30 x the child's age in years + 30. This is applicable until the child reaches the age of 12, when full adult volumes can be expected. Bladder volume in adults can range from 300-500ml but can vary between individuals (Zickler and Richardson 2004).

Consent

Catheterisation is a sensitive issue that requires effective communication, sensitivity and diplomacy skills – practitioner confidence can promote patient comfort and dignity (Robinson 2001). A child's rights can remain ambiguous where medical procedures such as catheterisation are to be undertaken (Lambrenos and McArthur 2003). Those with parental responsibility and healthcare professionals can override the child's wishes. An important role of the paediatric nurse is to act as the child's and adolescent's advocate. This involves ensuring their best interests are accounted for in any situation. Involving children in decision making about their treatment is one of the greatest challenges in paediatric practice (Brook 2000). The paediatric nurse's skills in negotiation and an understanding of child development levels play a vital role in explaining procedures and in gaining consent and assent. Catheterisation can be an unpleasant procedure for children and they should be involved in the process. Any decisions they can make, such as where it will take place, will give them some control over the situation. If the child is strongly opposed to the procedure reasons for this must be explored before any intervention is undertaken, with the practitioner considering the possibility of child protection issues. As all paediatric nurses are aware, parents should be encouraged to be present as this has been shown to reduce the child's anxiety during the procedure (Messeri *et al* 2004). The importance of the parents' role in supporting their child through the procedure must be emphasised. Parents can also act as a chaperone for the nurse conducting the procedure.

Restraint

Physical restraint is described as the positive application of force with the intention of overpowering the child (DH 1993). Clinical holding has been defined as positioning a child so that a medical procedure can be carried out in a safe and controlled manner, wherever possible with the consent of the child and his or her parent or carer (Lambrenos and McArthur 2003). Clinical holding should be seen as a last resort and with consideration of alternative strategies, staff training and documentation. Often strategies can be developed according to the child's development level and with knowledge of the child's personality and temperament. The inclusion of a play specialist in these procedures is paramount. She or he will have expertise in distraction and guided imagery. These skills are reported to be valuable during painful and stressful procedures (Bruce and Franck 2000). Preparation can include acting out the procedure with dolls and playing with products that will be involved in catheterisation.

If the child is anxious alternative techniques, such as guided imagery and distraction, could be used. Pharmacological interventions can be used that aid in relaxation and minimise discomfort, for example, Entonox® (Evans 2003). Entonox®

is a mixture of nitrous oxide and oxygen, which contains 50 per cent of each gas and acts as an analgesic, sedative and anxiolytic in children, with minimal risk of side effects (Bruce and Franck 2000). Administration of Entonox® is often managed within local guidance.

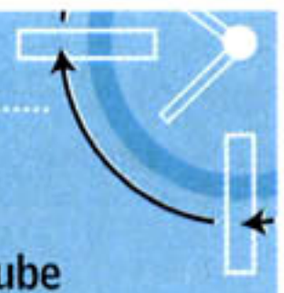
If Entonox® and other strategies fail, the use of sedation should be considered. Lawson (2000) stated that to allow a procedure to be performed or to avoid the psychological sequelae of a painful or unpleasant procedure, a patient's level of consciousness may need to be reduced. The goals of sedation are to guard the patient's safety and welfare, minimise physical discomfort or pain and minimise any negative psychological responses to treatment (American Academy of Pediatrics Committee on Drugs 1992). Informed consent, including an explanation of the procedure and sedation technique to be used, should be gained for all children undergoing sedation and incorporated in local policy and guidance (Morton and Oomen 1998). Consent should consist of written parental consent and verbal consent from the child or adolescent. Resuscitation equipment should be made available for any child undergoing sedation and the child should be closely monitored, as there is a risk of respiratory depression and hypoxaemia (Malviya *et al* 2000).

Catheterisation

Male and female members of staff who have been appropriately trained can catheterise male and female children. Patients have a right to be catheterised by someone of their own sex (Robinson 2004).

Practice surrounding catheterisation can often be ritualistic rather than evidence based. Healthcare professionals should be able to justify their clinical decisions by referring to up-to-date research; in today's health care, practice that is based solely on custom cannot be condoned. Some clinical areas do not stock paediatric catheters and feeding tubes are sometimes used to catheterise children (Smith 2003). Inappropriate use of feeding tubes can result in knotting and harm to the patient (Foster *et al* 1992). If clinicians are using inappropriate catheters or products not specifically designed for use as urinary catheters, there are concerns relating to risk assessment and practitioner liability (Medical Devices Agency 2001).

Time out 3



What size and type of catheter would you choose to insert in an eight-year-old boy with a neural tube defect such as spina bifida?
A suggested answer is provided on page 60.

Catheter materials The most commonly used catheter materials are:

- Polytetrafluorethylene. These catheters have a smooth outer surface that is less likely to be rejected thus reducing trauma and irritation (Stewart 1999).
- Silicone elastomer. A latex catheter with silicone bonding to the outer and inner surface, thereby reducing the potential for encrustation (Robinson 2001).
- Polymer hydromer. Latex is bonded with polymer hydromer to create a material suitable for long-term catheter use (Robinson 2001).
- Silicone. Catheters made of 100 per cent silicone are thin walled and so provide a larger lumen than coated catheters.
- Hydrogel-coated latex allows secretions from the urethral mucosa to be absorbed into the catheter causing it to soften, making it more pliable and comfortable. These catheters are also less prone to encrustation and bacterial colonisation (Stewart 1999).

Latex-coated catheters are most susceptible to encrustation. The water in a silicone balloon tends to diffuse more quickly than a latex one and the rigid construction tends to make them less comfortable for patients than hydrogel-coated latex (Simpson 2001). Latex-coated catheters should not be used in those who are at risk of latex allergy. The coating does not appear to provide complete protection against an allergic reaction to the underlying latex (Woodward 1997).

Risk management is an integral part of the clinical governance framework; patients must be adequately assessed before the procedure is carried out (Scally and Donaldson 1998). Children who have a chronic illness, most notably those with neural tube defects, urogenital anomalies and atopy, are at greatest risk from latex allergy (Sapan *et al* 2002). Latex hypersensitivity can result in urticaria, asthma, contact dermatitis and anaphylaxis (Sapan *et al* 2002), urethritis and urethral strictures (Woodward 1997).

There is little research evidence on the most appropriate catheter material for use in paediatric catheterisation (Smith 2003). Hydrogel-coated latex and 100 per cent silicone catheters are commonly used in clinical practice.

Catheter size Charrière (Ch) is the measurement used to express catheter diameter. One Ch unit is 0.33mm in diameter. The smallest diameter catheter should be used that will effectively empty the bladder (Pellowe *et al* 2001). A diameter that is too large can cause urethral irritation due to distension of the urethral mucosa tissue, bypassing and subsequent damage.

Recommended catheter sizes in the paediatric population are shown in Table 1. These are the authors' recommendations only and each individual child must be assessed for body size and weight.

Catheter length must also be considered when choosing a product. There are three lengths available: paediatric (30cm), male (40-44cm) and female (23-26cm). If a female-length catheter is used to catheterise a male patient, either accidentally or due to poor equipment supplies, it can result in urethral trauma. The catheter selected for use should promote a high rate of patient tolerance and a low rate of infection and rejection (Stewart 1999).

There is no advantage in using an antiseptic preparation for cleansing the urethral meatus before catheterisation (DH 2001). It is advisable to use sterile saline on sterile gauze to cleanse the area before catheterisation.

A local anaesthetic gel (2% lidocaine) introduced into the urethra acts as a lubricant, reducing surface friction between the catheter surface and urethral wall (Doherty 1999). The importance of using a lubricant in transurethral intervention cannot be dismissed (Gerard and Sueppel 1997). The anatomy of the urethra makes it sensitive to minor injury with the potential consequence of stricture, which in turn has implications for urine flow and possible later infection. Ideally the lubricant gel should be used three to five minutes before insertion but this can increase the child's anxiety and the length of the procedure, so is often only achievable with older adolescents. It is possible that insertion of a local anaesthetic agent can cause stinging and this should be explained to the child before instillation. Lidocaine is the agent that numbs the local area, therefore any child at risk of an adverse reaction from lidocaine, such as systemic side effects, should be closely monitored (British National Formulary (BNF) 2005). In a younger, less concordant group, the anaesthetic gel can be applied as lubrication directly onto the catheter.

TABLE 1

Recommended urethral catheter sizes in the paediatric population

Age in years	Charrière (Ch) size
0-2	6Ch
2-5	6-8Ch
5-10	8-10Ch
10-16	10-12Ch

If it is difficult to catheterise the child, do not force the catheter as this can cause trauma. Instead, contact a member of the medical staff or a specialist nurse. Problems that may cause difficulties in paediatric catheterisation include urethral stricture, post-urethral valves and hypospadias. Labial adhesions can cause some concern when catheterising a pre-pubescent girl as the labia appear to be stuck together. This can be treated with the application of oestrogen cream but in an emergency situation contact a member of the medical team for advice. Occasionally when catheterising a female patient the catheter may enter the vagina. Do not remove and reuse it but leave it *in situ* as a marker and recommence the procedure with a new sterile catheter (Robinson 2004).

Once the catheter is inserted into the urethra urine should drain out of the hub. When this has happened the catheter should be inserted a further 2cm before inflation of the balloon. The catheter balloon is inflated using sterile water to the correct amount indicated on the catheter packaging and hub (Robinson 2003). If sterile saline is used to fill the balloon this can cause crystallisation in the inflation channel and difficulty in deflating the balloon. Tap or boiled (cooled) water will stagnate and may cross through the balloon membrane into the bladder causing infection (Robinson 2001). Catheter balloon infill amounts in paediatrics can vary from 1ml-5ml. Partial or over-inflation of the balloon is not recommended as it can cause asymmetrical inflation meaning that the position of the balloon is lopsided in the bladder, resulting in irritation and an increased incidence of spasm. Other risks of over-inflating the balloon include obstruction of drainage, erosion to bladder wall, urinary bypassing, haematuria and rupture of the catheter balloon (Robinson 2003).

Drainage system As soon as the catheter is inserted it should be attached to a sterile drainage bag. The breaking of the closed system should be kept to a minimum, as this is a recognised site of possible introduction of bacteria and infection. Nurses have a key role to play in maintaining the closed urinary drainage system (Winn 1996). Breaches in the closed system, such as unnecessary emptying of the urinary bag or taking of urine samples, should be avoided (DH 2001, 2003). Before emptying a catheter bag it is recommended that hands are washed with bactericidal soap and that disposable gloves are worn. The outlet tap should be cleaned with a swab saturated with 70% isopropyl alcohol before and after emptying the bag (Mallett and Dougherty 2000). Drainage bags should be changed every five to seven days, although there is little evidence to support this.

Securing a catheter Finding the right tape, strapping, self-holding cushioned foam or leg

pouch to secure a catheter is important to minimise trauma and reduce discomfort on changing (Sanders 2002). Literature suggests that using straps to secure the catheter to the patient's thigh can restrict drainage (Marklew 2004) and potentially cause vascular restriction (Hanchett 2002) or that adhesive tape could have a detrimental effect on the catheter material (Pomfret 1991) or cause localised skin reactions (Hanchett 2002). However, if the child is active it is often necessary to secure the catheter to prevent trauma and possible accidental removal. There are specially designed dressings for securing catheters and these can be used along with a hydrocolloid dressing to cushion the hub away from the child's skin and prevent pressure areas developing.

Removal of a catheter This should be undertaken as soon as the child's condition allows. Latex-coated and silicone catheters absorb water and may increase in overall diameter. Care should be taken to avoid urethral trauma on catheter removal. Silicone catheter balloons can also double cuff – that is, fail to evenly deflate resulting in an increase in the external diameter of the balloon. Care should be taken to remove them as gently as possible. Silicone catheters may lose water from the balloon while in use and therefore less water may be retrieved from the balloon than was instilled initially or is expected. If difficulties are experienced on catheter removal, contact medical staff or the urology team for advice.

Time out 4

How would you evaluate the standard of catheterisation within your practice area? Can you identify any areas for change or improvement? Discuss this with a colleague and record your responses.

Time out 5

What details should be documented following the insertion of a urethral catheter and why? Where should these details be documented? What is the current practice in your clinical area?

Documentation

The maintenance of a catheter management record or diary is essential in the care of patients with an indwelling catheter (Simpson 2001). When a catheter is inserted the following information should be recorded in the child's notes:

- Batch number.
- Size of catheter.
- Type of catheter.
- Volume and type of fluid used to fill the balloon.
- Date and time of insertion.
- Name of the practitioner who inserted the catheter.
- Analgesia given.
- Consent obtained.

Batch number and expiry date should be recorded so that in the event of a faulty catheter, it can be reported to the manufacturer and/or the DH and easily traced (Stewart 1999). The use of care pathways for a child with a urethral catheter ensures that practice is evidence based and can provide practitioners with autonomy to influence early removal. Care pathways such as these are currently in use with adult patients (Logan 2003).

Complications associated with catheterisation

Urinary tract infection Catheterisation of the urinary tract is thought to be the most common risk factor for acquired urinary tract infection (UTI), therefore infection prevention recommendations should focus on strategies such as limiting urinary catheter use, aseptic technique during insertion and care and maintenance of the closed system (Langley *et al* 2001).

Catheterisation of the urethra is considered the major risk factor for nosocomial UTIs in children (Davies *et al* 1992). Many complications can occur as a result of indwelling catheters and the nurse should think critically and proactively to overcome these.

A UTI or bacteriuria (presence of bacteria in the urine) in a patient with a medium- to long-term (six to ten weeks) indwelling catheter is inevitable and unavoidable, due to the presence of a foreign body (catheter), proximity of the urinary system to the bowel and interventions required to manage a catheter (Trautner and Darouiche 2004). The use of antibiotics is only indicated when the patient is symptomatic (Simpson 2001). The risk of UTI increases with the length of time the catheter is *in situ* (Curran 2001). Once in the bladder, further ascent of bacteria can be facilitated if the child has vesicoureteric reflux (Poole 2002). The most common organisms causing UTI in the paediatric population are *Escherichia coli*, *Pseudomonas species* and Enterococcus (Lohr *et al* 1994). In children who have an underlying urinary tract malformation, it is common for less virulent bacterial species such as *Pseudomonas spp.*, *Staphylococcus aureus* or *S. epidermis* and streptococcus, Group B, to cause UTIs (Poole 2002).

Time out 6

What is the current protocol in your area of practice if a child's catheter is not draining? How would you involve other members of the multidisciplinary team if a catheter is blocked? For example, you could contact a member of the medical staff if flushing does not solve the blockage.

Blockage Common causes of blockage, bypassing or failure of urine to drain include (Getliffe 2003):

- Kinked or twisted tubing.
- Drainage bag above the level of the bladder.
- Drainage bag more than two thirds full.
- Constipation causing pressure of the urethra.
- Bladder spasm.
- Bladder calculi.
- Catheter encrustation by mineral deposits.

Increased fluid intake can aid in keeping indwelling catheters patent; the recommendations for adults are 2-3 litres a day (Stickler and Hughes 1999), 1,500ml per day for children over five years and up to 2,000ml for active teenagers (June Rogers, director, PromoCon, Disabled Living, Manchester, 2005, personal communication). Novel approaches may need to be sought to encourage children to increase their fluid intake such as sucking ice cubes or ice lollies, preferably frozen from natural juice to minimise excessive refined sugar intake.

If the catheter is not draining, it is important to check initially for kinks in the tubing and the position of the drainage bag; kinks are particularly prevalent when the child is active. Only after this has been done should the nurse consider other causes of blockage. Constipation is a possible cause of blockage as the loaded faeces can press on the bladder, restricting the urethra and causing internal kinking of the catheter thus preventing drainage (Rigby 1998). An assessment of usual bowel routine should be carried out, including whether the child is taking any medication that could increase the risk of constipation, for example, oxybutynin.

Blockage can additionally be caused by bacterial encrustation. Encrustation on the tip or around the eyes of the balloon area of the catheter can obstruct urine flow and may make

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it difficult to deflate the balloon (Britton and Wright 1990). Evidence regarding the use of regular or prophylactic bladder syringing, washouts, instillations and catheter maintenance solutions for long-term catheter management is not conclusive in terms of effectiveness in preventing blockage (Pomfret 2000). The instillation of bladder washouts breaks the closed system and can introduce micro-organisms into the bladder (Wilson 1998). Washouts can carry the risk of tissue damage, inflammatory reaction (Getliffe 1996) or reflux into the ureters.

Other reasons for blockage can include the formation of a vacuum, which sucks the bladder mucosa into the catheter eyes and prevents drainage (Simpson 2001). The positioning of the drainage bag should be 5cm to 30cm below the bladder. Failure to ensure this will significantly increase the risk of UTI, as there will be a possibility of reflux of microbe-laden urine into the bladder (Maki and Tambyah 2001).

If it is decided to 'flush' the catheter and the practitioner is aware of possible risk factors, only a small volume of solution is necessary. A catheter holds little more than 4ml and therefore to dissolve any encrustation, only small amounts of solution should be necessary to fill the lumen of the catheter and bathe the tip (Simpson 2001). Sterile saline is the solution of choice for any initial flushing of catheters.

Bladder spasms Any child with an indwelling catheter can experience bladder spasms, which are caused by irritation of the trigone by the catheter balloon. These are uncomfortable and cause the child sudden discomfort and distress. When bladder spasm occurs the bladder mucosa becomes clamped around the catheter and the eyes are occluded (Williams and Tonkin 2003). Medication can reduce the incidence of these spasms; both oxybutynin and tolterodine have been used successfully in children (Goessl *et al* 2000, Franco *et al* 2005). Oxybutynin is only licensed for use in children over the age of five and tolterodine is not licensed for children under 12. Many drugs prescribed for children in hospital are either not licensed for use in children or are prescribed outside the terms of their market authorisation (Kanneh 2002). These medications have side effects of dry mouth, constipation, dry skin, flushed face and, more rarely, sleep disturbances (BNF 2005). The practitioner should be aware of these side effects and discuss them with the family.

Catheter valves

These allow drainage of urine from a patient without the need for a permanently attached

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catheter bag (Stewart 1999). There is little evidence to support their use in the paediatric literature, although there are many advantages to their use in certain children. Addison (1999) describes the benefit of the flushing effect that can be achieved as the bladder is allowed to fill and empty. Simpson (2001) discusses how catheter valves remove the need for a drainage bag and hence can increase independence and self-esteem. The valve chosen must be easy to manipulate, leak-free, comfortable and inconspicuous (Fader *et al* 1997).

Time out 7

Consider how you would educate a child and his or her family to care for an indwelling urethral catheter, in the short and long term. How would you plan care for a child to minimise risk and potential complications?

Conclusion

This article focuses on supporting practitioners dealing with a paediatric population. It is vital that the catheterisation of children is evidence based and carried out by those who have received adequate training and preparation. The practitioner should be able to identify areas of possible risk and minimise these effectively. Thought and planning are essential to ensure that the procedure is aseptic and conducted in an appropriate manner, with consideration of the child's emotional and psychological wellbeing as well as physiological needs NS

Answer to Time out activity 3

- A size 8Ch, paediatric length, non-latex catheter would be suitable.

Time out 8

Now that you have completed this article, you may like to write a practice profile. Guidelines to help you are on page 64.

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Paediatric catheterisation

TEST YOUR KNOWLEDGE AND WIN A £50 BOOK TOKEN

HOW TO USE THIS ASSESSMENT

This self-assessment questionnaire (SAQ) will help you to test your knowledge. Each week you will find **ten multiple-choice questions which are broadly linked to the learning zone article.**

Note: There is only one correct answer for each question.

Ways to use this assessment

- You could 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 to update yourself before attempting the questions.

The answers will be published in *Nursing Standard* two weeks after the article appears.

Prize draw

Each week there is a draw for correct entries. Send your answers on a postcard to: Nursing Standard, The Heights, 59-65 Lowlands Road, Harrow, Middlesex HA1 3AW, or via email to: zena.latcham@rcnpublishing.co.uk

Ensure you include your name and address and the SAQ number. This is SAQ No 330. Entries must be received by 10am on Tuesday March 7 2006.

When you have completed your self-assessment, cut out this page and add it to your professional portfolio. You can record the amount of time it has taken you. Space has been provided for comments and additional reading. You might like to consider writing a practice profile, see page 63.

1. An alternative to an indwelling urethral catheter is:

a) Intermittent catheterisation ❑
b) Medication ❑
c) A voiding programme ❑
d) All of the above ❑

2. What complicating factor would require an indwelling catheter to be inserted in a child with acute urinary retention?

a) Urethral outflow obstruction ❑
b) Spinal injury ❑
c) Constipation ❑
d) Pelvic trauma ❑

3. What amount of urine should a child be expected to produce hourly?

a) 1ml/kg ❑
b) 2ml/kg ❑
c) 3ml/kg ❑
d) 4ml/kg ❑

4. Which of the following is an area of the male urethra:

a) Prostatic ❑
b) Detrusor ❑
c) Rugae ❑
d) Transitional epithelium ❑

5. Epispadias is the:

a) Urethra opening in the vagina ❑
b) Urethra opening on dorsal aspect of the penis ❑
c) Urethra opening on ventral aspect of the penis ❑
d) Non-retractile foreskin ❑

6. Which of the following is true?

a) Pharmacological interventions only should be used to reduce anxiety ❑
b) Children should always be physically restrained ❑
c) Children should be involved in decisions about catheterisation ❑
d) Parents should not be encouraged to be present during catheterisation ❑

7. Hypersensitivity to latex can result in:

a) Asthma ❑
b) Contact dermatitis ❑
c) Anaphylaxis ❑
d) All of the above ❑

8. What is the recommended size of catheter for children aged between two and five?

a) 6 ❑
b) 6-8 ❑
c) 8-10 ❑
d) 10-12 ❑

9. A cause of catheter blockage is:

a) Urinary tract infection ❑
b) Kinked tubing ❑
c) Antibiotics ❑
d) *Staphylococcus aureus* ❑

10. What is a suitable local anaesthetic for urethral catheterisation?

a) 2% lidocaine ❑
b) Nitrous oxide ❑
c) 5% lidocaine ❑
d) Tetracaine ❑

This self-assessment questionnaire was compiled by Lisa Berry

Report back

This activity has taken me ____ hours to complete.

Other comments:

_____

_____

_____

Now that I have read this article and completed this assessment, I think my knowledge is:

Excellent ❑
Good ❑
Satisfactory ❑
Unsatisfactory ❑
Poor ❑

As a result of this I intend to:

_____

_____

_____

Answers

Answers to SAQ no. 328

1. a 2. a 3. c 4. b 5. b
6. a 7. d 8. d 9. d 10. c