

Preventing healthcare-associated infections when using urinary catheters

Healthcare-associated infections (HCAI) cause additional morbidity and in some instances mortality to patients. Avoiding HCAI is a major health priority and none is more vulnerable than an infant. Although the recently published national evidence-based guidelines for preventing infections associated with indwelling urethral catheters are focussed on adults and children over the age of one year, the principles are equally applicable to newborns and infants.

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Assessing the need for catheterisation

The Department of Health guidelines¹ are unequivocal in asserting that urinary catheterisation places a patient at significant risk of acquiring a urinary tract infection and that catheterisation should be avoided if at all possible. However, infants may require catheterisation for a number of reasons such as acute urinary retention, postoperative care including urine monitoring, maintaining skin and wound integrity or in certain operations when the catheter acts as a stent for the operation site².

When a urinary tract infection is suspected there is an obvious need to collect a sample of urine for testing. The draft NICE guidelines published in October 2006, for managing urinary tract infections in children³, recommend a clean catch specimen as the method of choice for collecting a sample of urine and if that is not possible then to use a urine collection pad. If neither of these methods is possible then either a catheter sample or suprapubic aspiration should be considered. However a study by Crain and Gershel⁴ recommended that when an infection is suspected in febrile infants younger than eight weeks of age, a suprapubic or catheter-obtained urine specimen for culture should be collected.

In order to perform the urinalysis a minimum amount of urine needs to be obtained and although catheterisation is normally performed successfully, without complications, both urethral and suprapubic catheterisations are not without risks. In order to reduce these risks the use of a precatheterisation bladder scan to check for bladder volume has been recommended as one means of reducing

inappropriate catheterisation and avoiding the infant having to be subjected to further invasive procedures until a significant volume of urine is available⁵⁻⁷.

Selection of catheter type

To reduce any risk associated with catheterisation it is important that care is taken when selecting the most appropriate catheter to use, in relation to the material, type and size of catheter. There are many types of catheters available and it is important, when selecting one to consider the reason for catheterisation, anticipated duration and relevant patient history¹.

Although latex catheters are commonly used in adults, their flexibility and the high wall thickness to diameter ratio make them a poor choice for infants⁸. In addition latex catheters are more prone to encrustation and may trigger the risk of latex allergy. Consequently they should not be used for children with conditions which require multiple surgery such as neural tube defects and urogenital anomalies⁹⁻¹⁰. In these instances silicone catheters should be used instead.

There are two types of catheters commonly used, an intermittent nelaton catheter (a simple straight tube with one hole at the side or top) and a Foley indwelling catheter, which has a self retaining balloon. Although there is little literature available relating to the catheterisation of neonates and infants there appears to be an emerging theme that Foley catheters should not be used if at all possible with the younger infants and neonates, due to the risk of serious urethral injury if the balloon is mistakenly inflated while still in the urethra⁸. The balloon also increases the likelihood of bladder spasms⁸. As these infants are usually seriously ill and

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Key points

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1. Catheterisation should be avoided if at all possible to reduce the risk of urinary tract infection.
2. In neonates nelaton catheters are preferable to Foley catheters for urinary catheterisation.
3. Training in urinary catheterisation is essential to minimise the risk of complications and prevent unnecessary pain.
4. Catheters should be removed as soon as possible.
5. Staff need to be vigilant for the signs and symptoms of urinary tract infection in catheterised infants.

immobile, it is easier to retain a catheter externally with tape rather than internally with a balloon.

Currently the smallest Foley catheter available is a size 6FG (**FIGURE 1**) and in the past people have resorted to using feeding tubes for infant catheterisation. However, this practice is dangerous and contravenes the Medicine and Healthcare products Regulatory Agency's advice regarding only using devices fit for purpose¹¹. Levinson and Wojtulewicz¹² reported two cases of knot formation following urethral catheterisation using a size 5FG feeding tube. Similar knot formations have been reported elsewhere^{13,14} and Mayer et al. identified 19 cases, including the first reported instance of the catheter knotting within the penile urethra¹⁵. Recently nelaton catheters became available in a size 4FG which may be a more appropriate alternative (**FIGURE 2**).

Suprapubic catheterisation involves insertion of a special kind of Foley catheter through the skin into the bladder. It is not frequently carried out in neonates but may be used when urethral catheterisation is not possible, for example when an infant has been born with a congenital abnormality such as bladder extrophy. It is important to remember that although all catheters are licensed for urethral use very



FIGURE 1 Biocath Foley catheters.

Photo: Copyright Bard Limited



FIGURE 2 A selection of nelaton urinary catheters – 4, 6 and 8 FR.

Photo: Courtesy of Vygon (UK) Ltd.



FIGURE 3 Insertion of a urinary catheter. Photo courtesy of Astra Tech Ltd.

few are licensed for suprapubic use. Manufacturers' guidelines should always be followed and the catheter checked before it is used.

Catheter insertion

Catheterisation is an invasive procedure and recognised as 'painful' even in the young¹⁶. Kozet et al¹⁷, conducted a study comparing suprapubic catheterisation to urethral catheterisation in infants younger than two months and concluded that suprapubic aspiration was more painful than transurethral catheterisation. Austin et al¹⁸, also compared urethral catheterisation versus suprapubic catheterisation for urine collection and concluded that urethral catheterisation is a useful and safe alternative to suprapubic aspiration. These findings need to be taken into consideration when choosing the best method for obtaining a urine sample from young infants.

When undertaking such procedures in neonates every effort should be made to prevent unnecessary pain. In addition to applying topical anaesthesia and ensuring the catheter is well lubricated the use of pacifiers and sucking sucrose/breastmilk has been found to be beneficial in calming the child and reducing pain¹⁹. Selecting the most appropriate catheter helps to minimise trauma. Urinary catheters must be inserted using sterile equipment and an aseptic technique. When cleansing the urethral meatus prior to catheterisation expert opinion indicates that there is no advantage in using antiseptic preparations rather than sterile normal saline¹.

Healthcare workers should be trained

and assessed as competent to perform urinary catheterisation¹. To minimise the risk of any complications intermittent catheters should not be inserted too far into the bladder as this could predispose to knotting. Smith and Adam²⁰ suggest an insertion length of 5cm beyond visualisation of urine in female infants and 7.6-10cm in male newborns and toddlers. Foley catheters should be inserted to the hub prior to inflation of the balloon to ensure it is not in the urethra²¹. Hughes and Buescher²² suggest palpating the ventral base of the penis in infant boys while inflating the balloon to ensure it is not inflating in the urethra.

Perforation of the bladder is a rare complication of urethral catheterisation in infants but it has been reported as a secondary consequence to various conditions in neonates^{23,24}. Consequently, extra care should always be taken when catheterising this group of infants.

All catheters must be connected to a sterile closed drainage system or valve to reduce the incidence of catheter associated urinary tract infection (**FIGURE 3**).

Catheter maintenance

Following insertion of an indwelling catheter, accurate record keeping is important. The size, and make of catheter as well as reference number, lot number and expiry date should be documented. The longer a catheter is in place, the greater the danger. The need for a catheter should be reviewed daily and the catheter should be removed as soon as possible with the date and time of removal documented¹.

Maintaining a sterile, continuously

closed urinary drainage system is central to the prevention of infection¹. Whilst *in situ*, breaches of the closed system, for example unnecessary emptying, should be avoided. Hands must be decontaminated and clean, non-sterile gloves worn before manipulation of the system. On completion of the task and after removal of gloves, hands should again be decontaminated¹.

Education of parents, carers and healthcare workers

Understanding the care needs of neonates requiring catheterisation is a specialist skill. Regular education of healthcare workers and assessment of competence in undertaking catheterisation will help to reduce the risks of problems occurring¹. A number of studies have identified deficits in nurses' knowledge regarding selection of catheters and recommend the development of standardised policies in catheter selection and management supported by in-service educational programmes^{20,21,25}. One study²⁵ reported on a reduction in bleeding associated with urinary catheterisation in neonates following a review of policy and the introduction of improved procedures and evaluation of products used. After changes were implemented the incidence of haematuria dropped from 20.7% to 5.5% during the first evaluation period and to zero in the second.

A recent audit carried out in a children's hospital to evaluate practice relating to indwelling catheters recommended that novel approaches need to be developed to improve education of all disciplines in relation to catheterisation and that documentation needed to be improved². It suggested the use of computerised care plans and catheter care pathways as possible means of standardising practice.

The needs of parents and significant carers must not be overlooked. They should be informed of the need for catheterisation and educated on the importance of hand decontamination and not tampering with the system.

Conclusion

Neonates and infants may require urinary catheterisation to obtain a specimen of urine or for a longer period. Both involve a risk of infection and should only be undertaken when absolutely necessary and using a proficient and aseptic technique.

Signs and symptoms of urinary tract infections (UTI) in neonates and babies under the age of 1 year may be non specific and include:

- Fever
- Vomiting
- Lethargy
- Irritability

Occasionally the infant may present with:

- Poor feeding
- Failure to thrive

Rarely may also present with:

- Apparent abdominal pain
- Jaundice
- Haematuria
- Offensive urine

Screening for potential UTI should always be carried out therefore in any infant who appears unwell when the cause is not clearly identifiable.

TABLE 1 UTI in neonates and infants.

Healthcare workers involved in this procedure must be knowledgeable about the products available in order to select the most appropriate. If catheterisation is anticipated for a prolonged period, all involved in delivering care must be aware of the importance of hand hygiene and maintaining a closed system and the signs and symptoms of urinary tract infection (TABLE 1).

References

1. Pratt R.J., Pellowe C.M., Wilson J.A. et al. epic2: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *J Hosp Infect* 2007; **65**(1): supplement 1: S1-69.
2. Bray L., Sanders C. Nursing management of paediatric urethral catheterisation. *Nursing Standard* 2006; **20**(24): 51-60.
3. National Institute for Clinical Excellence (Draft). Urinary tract infection: Diagnosis, treatment and long term management of urinary tract infection in children. October 2006. Expected publication date June 2007.
4. Crain E.F., Gershel J.C. Urinary tract infections in febrile infants younger than 8 weeks of age. *Pediatrics* 1990; **86**: 363-67.
5. Bis K.G., Slovis T.L. Accuracy of ultrasonic bladder volume measurement in children. *Pediatric Radiology* 1990; **20**: 457-60.
6. Chen L., Hsiao A.L., Moore C.L. et al. Utility of bedside bladder ultrasound before urethral catheterisation in young children. *Pediatrics* 2005; **115**(1): 108-11.
7. Munir V., Barnett P., South M. Does the use of volumetric bladder ultrasound improve the success

rate of suprapubic aspiration of urine? *Pediatric Emergency Care* 2002; **18**: 346-49.

8. Bukowski T.P., Freedman A.L. Urologists to the rescue. Catheterization problems of infants. *Contemporary Urology* 1999 November; 2-8.
9. Sapan N., Nacarkucuk E., Canitez Y. et al. Evaluation of the need for routine pre-operative latex allergy tests in children. *Pediatrics International* 2002; **44**(2): 157-62.
10. Simpson L. Indwelling urethral catheters. *Nursing Standard* 2001; **15**(46): 47-54.
11. Medicines and Healthcare products Regulatory Agency. Medical Device Alert MDA/2004/006. Available at www.mhra.gov.uk
12. Levison J., Wojtulewicz J. Adventitious knot formation complicating catheterization of the infant bladder. *J Paediatric Child Health* 2004; **40**(8): 493-94.
13. Anbu A.T. Urethral catheter knotting in preterm neonates. *Indian Pediatrics* 2004; **41**(6): 631-32.
14. Lodha A., Ly L., Brindle M., Daneman A., McNamara P.J. Intraurethral knot in a very low birthweight infant: Radiological recognition, surgical management and prevention. *Pediatric Radiology* 2005; **35**(7): 713-16.
15. Mayer E., Ankem M.K., Hartanto V.H., Barone J.G. Management of urethral catheter knot in a neonate. *Can J Urology* 2002; **9**(5): 1649-50.
16. Vaughan M., Paton E.A., Bush A. Does lidocaine gel alleviate the pain of bladder catheterization in young children? A randomized, controlled trial. *Pediatrics* 2005; **116**(4): 917-20.
17. Kozer E., Rosenbloom E., Goldman D., Lavy G., Rosenfeld N., Goldman M. Pain in infants who are younger than 2 months during suprapubic aspiration and transurethral bladder catheterization: A randomized, controlled study. *Pediatrics* 2006; **118**(1): 51-56.
18. Austin B.J., Bollard C., Gunn T.R. Is urethral catheterization a successful alternative to suprapubic aspiration in neonates? *J Paediatrics Child Health* 1999; **35**(1): 34-36.
19. Shah P.S., Aliwalas L.L., Shah V. Breastfeeding or breast milk for procedural pain in neonates. *Cochrane Database of Systematic Reviews* 2006, Issue 3. Art. No.: CD004950. DOI: 10.1002/14651858.CD004950.pub2.
20. Smith A.B., Adams L.L. Insertion of indwelling urethral catheters in infants and children: A survey of current nursing practice. *Pediatric Nursing* 1998; **24**(3): 229-34.
21. Carlson D., Mowery B.D. Standards to prevent complications of urinary catheterization in children: Should and should-nots. *J Soc Pediatric Nursing* 1997; **2**(1): 37-41.
22. Hughes W., Buescher E. The genitourinary tract. In: Hughes W., Buescher, eds. *Paediatric Procedures*. Philadelphia: WB Saunders 1980: 281-88.
23. Basha M., Subhani M., Mersal A., Saedi S.A., Balfe J.W. Urinary bladder perforation in a premature infant with Down Syndrome. *Pediatric Nephrology* 2003; **18**(11): 1189-90.
24. Salama H., AlJufairi M., Rejjal, al-Alaiyan S. Urinary bladder perforation in a very low birthweight infant. A case report. *J Perinatal Med* 2002; **30**(2): 188-91.
25. Elizondo A.P., Gilbert J., Wearden M.E., Lancos D., Adams J. Elimination of bleeding associated with urinary catheterization in neonates. *Neonatal Network* 2001; **20**(6): 25-34.