

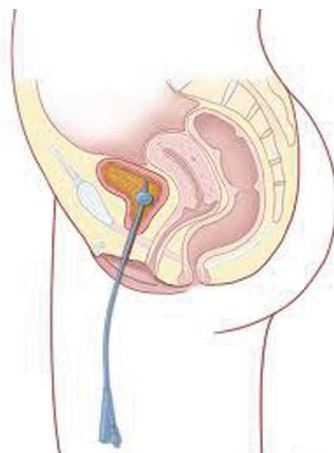
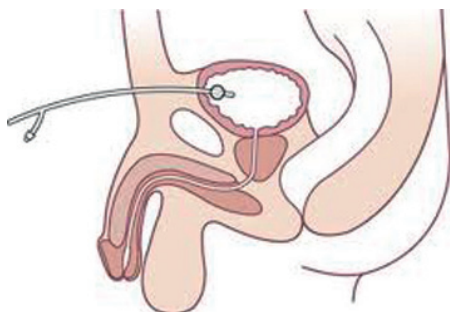
Evidence-based Guidelines for  
Best Practice in Urological Health Care

# Catheterisation

## Indwelling catheters in adults

Urethral and Suprapubic

2012





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# **Catheterisation**

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Urethral and Suprapubic

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# Introduction

The European Association of Urology Nurses (EAUN) was created in April 2000 to represent European urological nurses. The EAUN's underlying goal is to foster the highest standards of urological nursing care throughout Europe. With administrative, financial and advisory support from the European Association of Urology (EAU), the EAUN also encourages research and aspires to develop European standards for education and accreditation of urology nurses.

We believe that excellent healthcare goes beyond geographical boundaries. Improving current standards of urological nursing care has been top of our agenda, with the aim of directly helping our members develop or update their expertise. To fulfill this essential goal, we are publishing the latest addition to our Evidence-based Guidelines for Best Practice in Urological Health Care series, a comprehensive compilation of theoretical knowledge and practical guidelines on indwelling catheters. Although there is considerable literature on indwelling catheters, to our knowledge prior to this publication there was only limited evidence-based guidance for nurses available on this topic. The EAUN Guidelines Group believes there is a need to provide guidelines with recommendations clearly stating the level of evidence of each procedure with the aim of improving current practices and delivering a standard and reliable protocol.

In this booklet, we have included clear illustrations, extensive references and annotated procedures to help nurses to identify potential problem areas and efficiently carry out possible options for effective patient care. The working group decided to include topics such as indications and contraindications, equipment, nursing principles and interventions in the topic, catheter related care as well as instruction to patients and caregivers. We would also like to highlight the psychological and social aspects unique to the experience of patients with indwelling catheters as aspects which have a profound influence on the patient's quality of life.

With our emphasis on delivering these guidelines based on a consensus process, we intend to support nurses and practitioners who are already assessed as competent in this procedure. Although these guidelines aim to be comprehensive, effective practice can only be achieved if the nurse or practitioner has a clear and thorough knowledge of the anatomy under discussion and the necessary grasp and understanding of basic nursing principles.

This publication focuses on indwelling catheters both suprapubic and urethral. The guidelines only describe the procedure and material in adults and not for children. Furthermore, these guidelines are intended to complement, or provide support to, established clinical practice and should be used within the context of local policies and existing protocols.

This text is made available to all individual EAUN members, both electronically and in print. The full text can be accessed on the EAU website (<http://www.uroweb.org/nurses/nursing-guidelines/>) and the EAUN website ([www.eaun.uroweb.org](http://www.eaun.uroweb.org)). Hard copies can be ordered through the EAU website via the webshop (<https://www.uroweb.org/publications/eaun-good-practice/>) or by e-mail ([eaun@uroweb.org](mailto:eaun@uroweb.org)).

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# 1. Role of the nurse in different countries

The EAUN is a professional organisation of European nurses who have specialised in urological care. In Europe, there is a great variation in the education and competency of nurses in urology, with urological nurses having different activities and roles in various countries. It is therefore difficult for any guideline to fulfil all requirements. However, the EAUN Guidelines Working Group has tried to ensure that every nurse and health care professional may gain some benefit from using these guidelines.

## 2. Methodology

The EAUN Guidelines Working Group for indwelling catheters have prepared this guideline document to help nurses assess the evidence-based management of catheter care and to incorporate the guidelines' recommendations into their clinical practice. These guidelines are not meant to be proscriptive, nor will adherence to these guidelines guarantee a successful outcome in all cases. Ultimately, decisions regarding care must be made on a case-by-case basis by healthcare professionals after consultation with their patients using their clinical judgement, knowledge and expertise.

The expert panel consists of a multi-disciplinary team of nurse specialists and a urologist (see 'About the authors', chapter 16). Obviously in different countries, even in different areas, titles will differ within the speciality. For the purpose of this document we will refer to all nurses who are working with indwelling catheters as nurse specialists (NS).

### 2.1 Literature search

The information offered in this guideline was obtained through a systematic literature search and through review of current procedures undertaken in various member countries of the EAUN. All group members participated in the critical assessment of the scientific papers identified. Bibliographical databases consulted included Embase, Medline and the Cochrane library database CENTRAL. The search was based on the keywords (listed below). The question for which the references were searched was: "Is there any evidence for indwelling catheterisation for nursing interventions in different care situations such as preparation, insertion or care of indwelling catheters as well as catheter materials or complications?" Both Embase and Medline were searched using both 'Free text' and the respective thesauri MeSH and Emtree. The time frame covered in the searches was January 2000 - September 2010. If a topic was not covered by the results of the search, earlier references were used. Additional search on bags, deflation of the balloon, valves, removal of the catheter and stabilisation was carried out by the Working Group.

Whenever possible, the Guidelines Working Group have graded treatment recommendations using a three-grade recommendation system (A to C) and inserted levels of evidence to help



readers assess the validity of the statements made. The aim of this practice is to ensure a clear transparency between the underlying evidence and a recommendation given. This system is further described in the Tables 1 and 2. (see section 2.8)

## 2.2 Limitations of the search

The search was performed in September 2010. In Medline and Embase the search results were limited to randomised controlled trials (RCTs), in Central to Controlled Clinical Trials and to meta-analysis and systematic reviews. In all databases, output was limited to human studies and English language publications.

## 2.3 Search keywords

Keywords

- Activity of daily living
- Balloon
- Bladder instillation and meSH term Intravesical administration
- Bladder washout/bladder lavage
- Catheter associated urinary tract infection
- Coping
- Cranberry
- Deflation
- Education
- Stabilisation
- Fluid balance
- Glycerine
- Indwelling catheter bladder
- Indwelling catheter urinary
- Indwelling urinary catheter
- Suprapubic catheterisation
- Information
- Nursing assessment (MeSH)
- Patient education
- Prevention of Urinary tract infection
- Removal catheter
- Sexuality
- Silver coated catheters
- Social issues
- Stabilisation
- Urethral catheterisation and disinfection
- Urinary catheter
- Urinary catheter and complication
- Urinary catheter infection
- Urinary catheterisation
- Urinary catheterisation nursing

- Urinary drainage bag
- Urinary drainage system
- Urinary tract infection

## **2.4 Search results**

EAUN commissioned a company to do an initial search on catheterisation which resulted in a total of 1,086 abstracts from scientific publications. After reading the abstracts, 242 were left and full text articles of them were made available to the working group. It was a policy decision to restrict the search in this way, though the group were aware that more complex strategies were possible, and would be encouraged in the context of a formal systematic review. In the process of working with the articles new references were found and added to the reference list, if they were relevant for the topic and cited in the text. Additionally, scientific articles mentioned by the reviewers in November 2011 and considered useful by the working group, were included.

## **2.5 Disclosures**

The EAUN Guidelines Working Group members have provided disclosure statements of all relationships that might be a potential source of conflict of interest. The information has been stored in the EAU database. This Guidelines document was developed with the financial support of the EAU.

The EAUN is a non-profit organisation and funding is limited to administrative assistance and travel and meeting expenses. No honoraria or other reimbursements have been provided.

## **2.6 Limitations of document**

The EAUN acknowledge and accept the limitations of this document. It has to be emphasised that current guidelines provide information about the treatment of an individual patient according to a standardised approach. The information should be considered as providing recommendations without legal implications. The intended readership is the pan-European practising urology nurse and nurses working in a related field.

Cost-effectiveness considerations and non-clinical questions are best addressed locally and therefore fall outside the remit of these guidelines. Other stakeholders, except patient representatives, have not been involved in producing this document.

## **2.7 Review process**

The Working Group included an extensive number of topics, which are not always only applicable to catheterisation, but decided to include them because they make the guideline more complete. A blinded review was carried out by specialised nurses and urologists in

various countries. The Working Group revised the document based on the comments received. A final version was approved by the EAUN Board and the EAU Executive responsible for EAUN activities.

## 2.8 Rating system

The recommendations provided in these documents are based on a rating system modified from that produced by the Oxford Centre for Evidence-based Medicine. [1] Some of the literature was not easy to grade. If, however, the EAUN Working Group thought the information would be useful in practice, it is ranked as level of evidence 4 and grade of recommendation C. Low level evidence indicates that no higher level evidence was found in the literature when writing this guideline, but cannot be regarded as an indication of the importance of the topic or recommendation for daily practice.

**Table 1: Level of evidence (LE)**

Level	Type of evidence
1a	• Evidence obtained from meta-analysis of randomised trials
1b	• Evidence obtained from at least one randomised trial
2a	• Evidence obtained from one well-designed controlled study without randomisation
2b	• Evidence obtained from at least one other type of well-designed quasi-experimental study
3	• Evidence obtained from well-designed non-experimental studies, such as comparative studies, correlation studies and case reports
4	• Evidence obtained from expert committee reports or opinions or clinical experience of respected authorities

**Table 2: Grade of recommendation (GR)**

Grade	Type of evidence - Nature of recommendations
A	• Based on clinical studies of good quality and consistency addressing the specific recommendations and including at least one randomised trial
B	• Based on well-conducted clinical studies, but without randomised clinical trials
C	• Made despite the absence of directly applicable clinical studies of good quality

The evidence-based nursing definition from Behrens 2004 says: “Integration of the latest, highest level scientific research into the daily nursing practice, with regard to theoretical knowledge, nursing experience, the ideas of the patient and available resources”. [2] There are 4 components for nursing decisions: personal clinical experience from the nurse, existing resources, patient wishes and ideas and results of nursing science. [3] This citation

states that not only the literature is relevant, but that also the experience of nurses as well as of patients is necessary for decision making. Subsequently, it is not only the written guideline that is relevant for nursing practice.

# 3. Terminology (definitions)

A catheter is a thin hollow flexible tube which can be inserted in the bladder either through the urethra (urethral) or suprapubic channel to drain the urine.

## 3.1 Transurethral or suprapubic catheterisation

Transurethral indwelling catheterisation or urinary catheterisation is defined as passage of a catheter into the urinary bladder via the urethra (urethral catheter). MeSH term [4] (Fig. 1 and 2). Transurethral indwelling catheterisation is also called urethral catheterisation. In this document we only use the term urethral catheterisation.

Suprapubic catheterisation is the insertion of a catheter into the bladder via the anterior abdominal wall. (Fig. 3 and 4)

### Urethral catheterisation



Fig. 1 Female  
(Source: unknown)

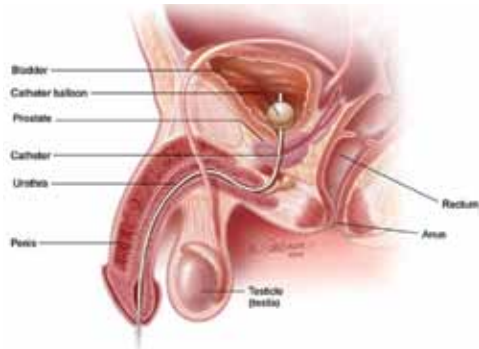


Fig. 2 Male  
(Source: Urologyhealth.org, permission see page 65)

### Suprapubic catheterisation

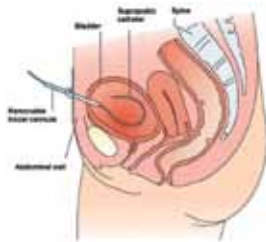


Fig. 3 Without balloon  
(Source: Hospital Santa Maria Lleida, permission see page 65)



Fig. 4 With balloon  
(Source: unknown)

## **3.2 Short-term or long-term catheterisation**

What is called short-term or long-term use in catheterisation depends on the indication. For practical reasons this guideline considers a short-term catheter to remain in situ for no longer than 14 days. [5]

Accordingly, long-term catheters remain in situ for a period exceeding 14 days, usually because of urinary retention secondary to disease conditions. [5]

## **3.3 Closed drainage system**

A closed catheter drainage system is an aseptic system in which the path from the tip of the catheter inserted into the bladder, to the bag which catches urine, is closed and should not be disconnected. This in order to eliminate inoculation of the urinary tract with bacteria via the catheter drainage tubing and from the collection bag. [6]

The term 'closed drainage' is, however, not strictly accurate as there are numerous portals of entry for pathogens and the system must be opened to allow emptying and be disconnected when the drainage bag is changed.

# 4. Alternatives, indications and contraindications

## 4.1 Alternatives to placing an indwelling catheter

An indwelling catheter should only be placed when there is a clear indication. It should not stay in place longer than necessary. It is important first to consider alternatives before placing an indwelling catheter; a catheter is the last resort when other options have failed or proved to be insufficient. To insert a catheter only for the comfort of the nursing staff is irresponsible.

The following alternatives to an indwelling catheter should be considered:

1. Male external catheter [7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20]
2. Intermittent catheterisation by a nurse or family and intermittent self catheterisation by the patient [8, 12, 13, 15, 16, 17, 18]
3. Continence pad / containment product [10, 15]

Recommendations	LE	GR
• Use of a male external catheter as an alternative to an indwelling urethral catheter in cooperative male patients without urinary retention or bladder outlet obstruction	3	B
• In appropriate patients use of a suprapubic catheter, male external or intermittent catheter are preferable to an indwelling urethral catheter [20]	2b	B
• Consider other methods for management, including male external catheters or intermittent catheterisation, when appropriate [13]	1b	A
• Avoid use of urinary catheters in patients and nursing home residents for management of incontinence [16]	1b	B
• Intermittent catheterisation is preferable to indwelling urethral or suprapubic catheters in patients with bladder emptying dysfunction [16]	1b	B
• Intermittent catheterisation should be used in preference to an indwelling catheter if it is clinically appropriate and a practical option for the patient	1b	A
• There is a lower rate of infection in those with a suprapubic rather than urethral catheters despite the former being used for two weeks or longer [8, 21]	4	C
• To insert a catheter only for the comfort of the nursing personnel is irresponsible	4	C

## 4.2 Indications for urethral catheterisation

1. Acute and chronic urinary retention. [9, 10, 15, 16, 22, 23, 24, 25, 26, 27]
2. Maintain a continuous outflow of urine for patients with voiding difficulties, as a result of neurological disorders that cause paralysis or loss of sensation affecting urination. [9, 10, 16, 22]
3. Need for accurate measurements of urinary output in critically ill patients. [9, 10, 15, 16, 22, 23, 24, 25, 26]
4. Perioperative use for selected surgical procedures. [9, 15, 16, 22, 23, 24]
5. Patients undergoing urological surgery or other surgery on contiguous structures of the genitourinary tract. [9, 10, 16, 23, 24, 25, 26]
6. Anticipated prolonged duration of surgery. [16, 25]
7. Need for intra-operative monitoring of urinary output. [16, 25]
8. To assist in healing of open sacral or perineal wounds in incontinent patients. [10, 16, 22, 24, 25]
9. Patient requires prolonged immobilisation (e.g. potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic fractures). [16, 25]
10. To allow bladder irrigation/lavage. [23, 24, 26]
11. To facilitate continence and maintain skin integrity (when conservative treatment methods have been unsuccessful). [9, 10, 15, 22, 24, 26]
12. To improve comfort for end of life care if needed. [9, 10, 16, 22, 23, 24, 25, 26]
13. Management of intractable incontinence. [24, 27]

## 4.3 Contraindications for urethral catheterisation

1. Acute prostatitis [23, 28]
2. Suspicion of urethral trauma [29]

## 4.4 Short-term versus long-term catheterisation

### Short-term catheterisation is mostly used:

1. During surgical procedures and post-operative care
2. For exact monitoring of urine output in acute illness
3. For relief of acute or chronic urinary retention
4. Instillation of medication directly in the bladder

### Long-term catheterisation can be necessary in:

1. Bladder outlet obstruction (BOO), in patients who are unsuitable for surgical relief of BOO
2. Chronic retention, often as a result of neurological injury or disease where intermittent catheterisation is not possible [21]
3. Debilitated, paralysed or comatose patients in presence of skin breakdown and infected pressure ulcers - only as a last resort when alternative non-invasive approaches are unsatisfactory or unsuccessful
4. Cases where a patient insists on this form of management after discussion of the risks. [30]



5. Intractable incontinence when all other measures have been tried and proven to be ineffective. [31]
6. Intractable urinary incontinence where catheterisation enhances the patient's quality of life – only as last resort when alternative non-invasive approaches are unsatisfactory or unsuccessful.

## 4.5 Indications for suprapubic catheterisation

In addition to the indications of the urethral catheterisation the following indications apply:

1. Acute and chronic urine retention that is not able to be adequately drained with a urethral catheter. [23, 24, 28, 32, 33, 34]
2. Preferred by patient due to patient needs e.g. wheelchair user, sexual issues. [9, 24]
3. Acute prostatitis. [23, 28]
4. Obstruction, stricture, abnormal urethral anatomy. [23]
5. Pelvic trauma. [23, 24]
6. Complications of long-term urethral catheterisation. [23]
7. When long-term catheterisation is used to manage incontinence. [23]
8. Complex urethral or abdominal surgery. [23]
9. Faecally incontinent patients who are constantly soiling urethral catheter. [23]

## 4.6 Contraindications for suprapubic catheterisation

1. Known or suspected carcinoma of the bladder. [12, 23, 24, 32, 35, 36, 37, 38, 39, 40, 41]
2. Suprapubic catheterisation is absolutely contraindicated in the absence of an easily palpable or ultrasonographically localised distended urinary bladder. [12, 23, 24, 35, 36, 37, 38, 39, 40]
3. Previous lower abdominal surgery. [24, 32, 35]
4. Coagulopathy (until the abnormality is corrected). [12, 24, 32]
5. Ascites. [24, 32]
6. Prosthetic devices in lower abdomen e.g. hernia mesh. [23, 32, 41]

## 4.7 Advantages of suprapubic catheterisation

There is little evidence-based research on the use of suprapubic catheters. However, experts believe that there may be several advantages to their use when compared with urethral catheterisation:

1. Less risk of urethral trauma, necrosis, or catheter-induced urethritis. [12, 23, 24, 32, 36, 37, 38, 39, 40, 43]
2. Reduced risk of catheter contamination with micro-organisms commonly found in the bowel. [12, 24, 36, 37, 38, 39, 40, 42, 43, 44]
3. Greater comfort, particularly for patients who are chair bound. [12, 23, 24, 32, 36, 37, 38, 42, 44, 40]
4. Easier access to the entry site for cleansing and catheter change. [12, 23, 24, 32, 36, 37, 39]

5. More appropriate in respect to a person's sexual activity (intercourse). [23, 24, 32, 37]
6. Can be blocked off and the ability to void urethral assessed prior to removal of the suprapubic catheter. [12, 23, 24, 32, 36, 37, 38, 39, 40, 43, 44]

**Limitations of suprapubic catheters:**

1. Insertion is an invasive procedure with the risk of bleeding and visceral injury. [45]
2. The patient may still leak urine via the urethra. [45]
3. Specialised training may be required for healthcare professionals and carers for the changing of a suprapubic catheter. [45]
4. Patients with artificial heart valves may require antibiotic therapy prior to initial insertion or routine catheter change; however this will depend on local healthcare management policy.
5. Patients on anticoagulant therapy will require their coagulation levels checking prior to insertion of a suprapubic catheter. Anticoagulant therapy and coagulations levels will depend on local healthcare management policy.

*See 4.1 for alternatives.*

*See Appendix A Decision flowchart for indwelling catheterisation*

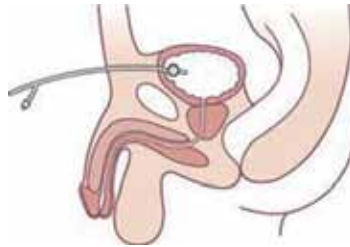
# 5. Equipment and products

## 5.1 Types of catheters

A catheter is a thin hollow tube which can be inserted in the bladder either through the urethra or suprapubic.



*Fig. 5 Female urethral catheter*  
(Source: unknown)



*Fig. 6 Male suprapubic catheter*  
(Source: unknown)

### 5.1.1 One-way catheter

The catheter has only one channel for drainage, has no balloon and is available in coated and uncoated versions. This catheter is often referred to as “straight” catheter. This type of catheter is not intended to remain in the bladder for a long period of time but is used for:

1. Intermittent catheterisation and collection of urine representative of the bladder
2. Treating urethral strictures
3. Instillation of drugs in the bladder (instillation catheter with Luer-lock)
4. Urodynamic and other investigations
5. Suprapubic catheterisation without balloon



*Fig. 7 One-way catheters 1 to 5 (top to bottom) for the various uses as mentioned in the listing above this figure.*  
(Source: T. Schwennesen)

For more information on intermittent catheterisation see EAUN guideline Urethral catheterisation (2006).

### 5.1.2 Two-way catheter

In 1853, Jean Francois Reybard developed the first indwelling catheter with an inflated balloon to secure its place in the bladder. One channel is used for urine and one for the balloon. (Fig. 8)

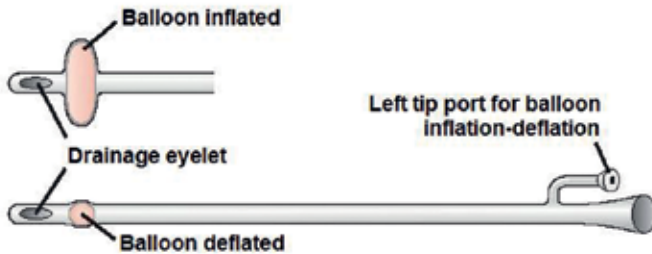


Fig. 8 Two-way catheter with an inflated and deflated balloon

(Source: Essential Clinical Procedures, permission see page 65)

In 1932 Dr. Frederick Foley redesigned this catheter and the Foley catheter is currently the most frequently used device for management of urinary dysfunction. [46]

### 5.1.3 Three-way catheter

Three-way catheters are available with a third channel to facilitate continuous bladder irrigation. This catheter is primarily used following urological surgery or in case of bleeding from a bladder or prostate tumour and the bladder may need continuous or intermittent irrigation to clear blood clots or debris. [47] (Fig. 9)

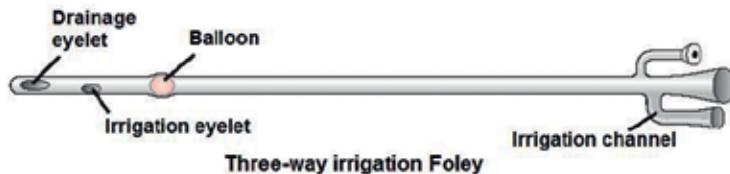


Fig. 9 Three-way catheter with irrigation channel

(Source: Essential Clinical Procedures, permission see page 65)

### 5.1.4 Catheter with integrated temperature sensor

A silicone catheter with an integrated temperature sensor is available. (Fig. 10) It is a special catheter which is sometimes used within intensive care and during certain surgical procedures. The catheter has a sensor near the tip, to measure the temperature of the urine in the bladder. This is an appropriate means of determining “deep” body or core temperature.

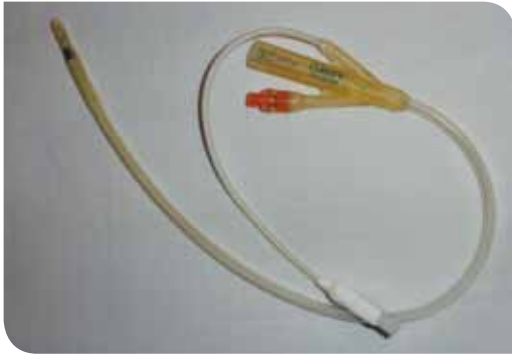


Fig. 10 Catheter with a temperature sensor (Source: C. Vandewinkel)

### 5.1.5 Suprapubic catheter

The suprapubic catheter is an alternative to the urethral catheter and is inserted into the bladder surgically, often under local anaesthesia. In some countries the procedure is done by a doctor and in other countries by a clinical nurse specialist. Suprapubic catheters can be divided in different types:

1. Foley balloon catheter; similar to the one used for urethral catheterisation. (Fig. 11)
2. Catheter without a balloon; requires a suture to secure it in place. [48] (Fig. 12)
3. Foley balloon catheter with an open end. (Fig. 13)



Fig. 11 Suprapubic catheter with a balloon  
(Source: Hospital Santa Maria Lleida, permission see page 65)

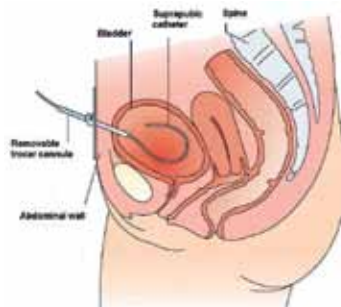


Fig. 12 Suprapubic catheter without a balloon  
(Source: unknown)

A catheter with an open end has no “eyes” but an open end tip and is referred to as a “council” tip. This type of catheter can be used when changing a fine bore suprapubic catheter to a long-term catheter and when changing a long-term suprapubic catheter – all procedures over a guide wire.



*Fig. 13 Open end catheter with a guide wire and a close-up picture where the guide wire enters the catheter (Source: T. Schwennesen)*

Different types of suprapubic sets for application are available. This sterile set includes for example a catheter, insertion trocar and plug. (Fig. 14)



*Fig. 14 Catheter set (Source: T. Schwennesen)*

## 5.2 Catheter material

Catheters are available in various materials. Issues that should be considered when choosing a catheter are ease of use, tissue compatibility, allergy (latex), tendency for encrustation and formation of biofilm, comfort for the patient, e.g. [49] Some manufacturers produce catheters without phthalates and PVC-free catheters because PVC includes chlorine and plasticisers which are environmentally hazardous.

### 5.2.1 Catheters material

#### Latex

Latex, made from natural rubber is a flexible material but it has some disadvantages. Because of the potential discomfort due to high surface friction, vulnerability to rapid encrustation by mineral deposits from the urine and the implication of latex allergic reactions in the development of urethritis and urethral stricture or anaphylaxis, the use of latex catheters is restricted to short-term indwelling and commonly avoided if possible. [21]

## **Silicone**

The silicone catheter (100% silicone) is very gentle for the tissue and is hypoallergenic. Because it is uncoated it has a relatively large lumen and has a reduced tendency to encrustation.

While silicone causes less tissue irritation and potential damages, the catheter balloon has a tendency to lose fluid which increases the risk of displacement.

The silicone catheters also have a greater risk for developing a cuff when deflated which can result in uncomfortable catheter removal or urethral trauma. [50]

A Cochrane review from 2007 did not find sufficient evidence to determine the best type of indwelling urinary catheter for long-term bladder drainage in adults. [51] However, silicone catheters might be preferable to other catheter materials to reduce the risk of encrustation in long-term catheterised patients.

## **PTFE (polytetrafluoroethylene)**

PTFE-coated latex catheters or Teflon has been developed to protect the urethra against latex. The absorption of water is reduced due to the Teflon coating. It is smoother than plain latex, which helps to prevent encrustation and irritation. Do not use this catheter for patients who are sensitive for latex. [49]

## **Silicone-coated/silicone elastomer-coated**

Silicone elastomer coated catheters are latex catheters coated inside and out with silicone. The catheter has the strength and flexibility of latex and the durability and reduced encrustation typical of 100% silicone catheters. [52]

## **Hydrogel-coated**

Hydrogel coated catheters are soft and highly biocompatible. Because they are hydrophilic, they absorb fluid to form a soft cushion around the catheter, and reduce friction and urethral irritations. [52]

## **Silver-coated catheter**

One type of coating combines a thin layer of silver alloy with hydrogel which is antiseptic. Silver-hydrogel coated catheters are available in latex and silicone.

Silver alloy coated catheters significantly reduce the incidence of asymptomatic bacteriuria, but only for less than 1 week. There is some evidence of reduced risk for symptomatic UTI. Therefore, they may be useful in some settings. [12] Another type, silver oxide coated catheters are not associated with a statistically significant reduction in bacteriuria. [21, 45]

## **Nitrofurazone-coated catheter**

A catheter coated with nitrofurazone is also available. Nitrofurazone should be distinguished from the medicine “Nitrofurantoin”. Nitrofurazone is a bactericidal compound which is used as an antibiotic.

Antibiotic-impregnated catheters may decrease the frequency of asymptomatic bacteriuria within 1 week. According to Tenke (2008) there is, however, no evidence that antibiotic-impregnated catheters decrease symptomatic infection. Therefore, they cannot be recommended routinely. [12, 45] Potential toxicity and/or antibiotic resistance using antimicrobial catheters is unknown. [21] (LE: 4)

For selection of the most suitable material the specifications of the supplier can be helpful.

Recommendations	LE	GR
<ul style="list-style-type: none"> <li>• Silicone catheters (100%) might be preferable to other catheter materials to reduce the risk of encrustation in long-term catheterised patients who have frequent obstruction of the catheter [16]</li> </ul>	1b	B
<ul style="list-style-type: none"> <li>• Catheter materials designed for long-term use (100% silicone, silicone coating or hydrogel coating) should be used where catheter is expected to be used long-term (more than 2 weeks) [21, 51]</li> </ul>	Unresolved Issue	
<ul style="list-style-type: none"> <li>• Silver alloy coated catheters may reduce the risk of catheter-associated bacteriuria in hospitalised patients during short-term catheterisation (less than 1 week) [12, 53]</li> </ul>	1a	B
<ul style="list-style-type: none"> <li>• Antibiotic-impregnated catheters may decrease the frequency of asymptomatic bacteriuria in hospitalised patients within 1 week</li> </ul>	1a	B
<ul style="list-style-type: none"> <li>• There is no evidence that antibiotic-impregnated catheters decrease symptomatic infection and therefore they cannot be recommended routinely</li> </ul>	Unresolved Issue	

### 5.2.2 Catheter diameter size and length

Catheter diameter sizes are measured in Charrière (Ch or CH) also known as French Gauge (F, Fr or FG) and indicate the external diameter. 1 mm = 3 Ch and the sizes range from Ch 6 to 30.

For paediatric use: size 6-10

For adults:

- size 10 Clear urine, no debris, no grit (encrustation)
- size 12-14 Clear urine, no debris, no grit, no haematuria
- size 16 Slightly cloudy urine, light haematuria with or without small clots, none or mild grit, none or mild debris.
- size 18 Moderate to heavy grit, moderate to heavy debris.  
Haematuria with moderate clots
- size 20-24 Used for heavy haematuria, need for flushing [47]

The size of the catheter is marked at the inflation channel as well as with an (international) colour code. (Fig. 15)



Fig. 15 International colours of catheter size

(Source: Coloplast Denmark A/S, permission see page 65)



The inner lumen of the catheter varies quite a lot between different catheter materials e.g. latex and a silicone catheter, so inserting a larger Charrière catheter does not necessarily ensure a wider drainage channel. [48] (Fig. 16)

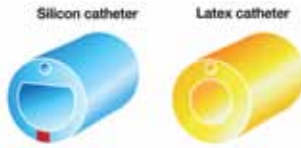


Fig. 16 Examples of silicon and latex catheter lumen

(Source: Coloplast Denmark A/S, permission see page 65)

### Length

The standard male catheter length of 41-45 cm can be used for males and females, but a shorter female length of 25 cm can be more comfortable and discrete for some women. However, a female catheter can be too short if the woman is severely obese and then a male size is to prefer.

The female length catheter should not be used for males as inflation of the balloon within the urethra can result in severe trauma. Paediatric catheters are normally about 30 cm long. [21]

Recommendations	LE	GR
<ul style="list-style-type: none"> <li>Unless otherwise clinically indicated, consider using the smallest bore catheter possible consistent with good drainage, to minimise bladder neck and urethral trauma [16]</li> </ul>	1b	B
<ul style="list-style-type: none"> <li>In urethral catheterisation the female length catheter should not be used for males as inflation of the balloon within the urethra will result in severe trauma. [21] Use male standard length for men in all situations</li> </ul>	4	C
<ul style="list-style-type: none"> <li>Male standard length is recommended for female patients who are bedbound, immobile, clinically obese with fat thighs, critically ill and post-operative and in emergency situations [23]</li> </ul>	4	C

### 5.2.3 Tip design

The standard tip of the catheter is round with two drainage eyes called a Nelaton catheter. (Fig. 17) For routine catheterisation, a straight-tipped catheter should be used. [52] In addition there are a variety of special catheters available on the market for specific use:

The Tiemann catheter with the curved tip is designed to negotiate the male prostatic curve and can be helpful for difficult insertions. [52]

The Tiemann indwelling catheter from hard latex for difficult catheterisation is only indicated for short-term use. (Fig. 18)

The Coudé tip catheter has a curved tip just like the Tiemann catheter but has one, two or three drainage eyes situated in the curved tip.



Fig. 17 From top to bottom: Nelaton (latex), Nelaton (silicone) and Tiemann (silicone) (hard latex)

(Source: T. Schwennesen)



Fig. 18 Tiemann indwelling catheter

(Source: C. Vandewinkel)

Recommendations	LE	GR
• For routine catheterisation, a straight-tipped catheter should be used	4	C
• The Tiemann/Coudé tip catheter can be used where male catheterisation is complicated	4	C
• Tiemann/Coudé tipped catheters should be inserted with the tip pointed upward	4	C

#### 5.2.4 Balloon size and filling

When the catheter has been placed in the bladder the balloon can be inflated. (Fig. 2) Sterile water or sodium chloride can be used for latex catheters. Inflation of silicone catheters with water can sometimes lead to water loss from the balloon over time, with an associated risk of the catheter falling out. Some manufacturers recommend filling the balloon with a 10% aqueous glycerin solution. [21] Apart from the manufacturers' recommendations there are no studies available about water contra glycerin in the balloon. Some catheter manufacturers provide sterile pre-filled syringes with sterile water or glycerine 10% inside the packing.

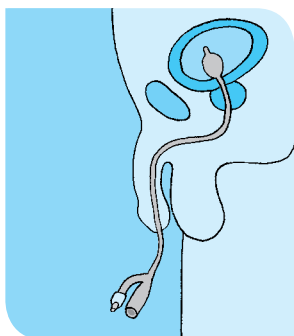


Fig. 19 Inflated balloon in the bladder

(Source: Rotherham District General Hospital, permission see page 65)

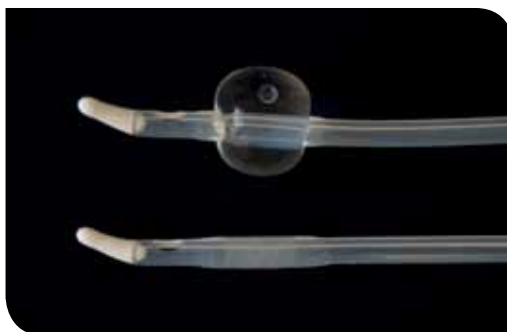


Fig. 20 Silicone Tiemann catheter with deflated and inflated balloon

(Source: T. Schwennesen)

The balloon size is indicated at the catheter connection behind the size of the catheter as a minimum and maximum ml or cc (cm<sup>3</sup>) e.g. Ch 12/ 10-15 ml.

Balloon size in adult catheters: 5-15 ml, 10 ml for standard use.

Balloon size in haematuria catheters: 15-30 ml.

The 30 ml balloon is designed specifically as a haemostat post urological procedure, and should not be used for routine catheterisation. [54]

The purpose of the retention balloon is to keep the catheter in place in the bladder. The use of a larger balloon size is mistakenly believed to be a solution to bypassing of urine. [48]

Under- or over inflation can cause occlusion of drainage eyes, irritate the bladder wall, and lead to bladder spasms. [52]

Furthermore, larger balloons tend to sit higher in the bladder with potential for increased residual urine volumes to collect below the catheter eyes. [21]

Always inflate the balloon according to the manufacturer's recommended volume at the packaging and at the inflation valve. [52]

Some manufacturers have catheters with an integrated balloon, which means that the balloon is at the same level as the catheter when it is deflated. It can be an advantage when removing a catheter with encrustations, because the encrustations are gathered around the deflated balloon cuff.

Recommendations	LE	GR
• Always inflate the balloon according to the manufacturer's instructions	4	C
• The 30 ml balloon is designed specifically as a haemostat post urological procedure, and should not be used for routine catheterisation	4	C

## 5.3 Drainage bags

### 5.3.1 Closed drainage system

When the catheter has been inserted using aseptic technique, it is directly connected to the sterile bag, because an aseptic closed drainage system minimises the risk of catheter-associated urinary tract infections (CAUTI). [55] Unnecessary disconnection of a closed drainage system should be avoided, but if it occurs the catheter and collecting system have to be replaced using aseptic technique and sterile equipment. [16]

There are several different bags available; selection of the bag depends on whether it is for short-term drainage at the hospital or for long-term use, the patient's mobility, cognitive function, daily life etc. The bags can have a variety of special features:

**Pre-connected drainage systems** are available in which the drainage bag is already connected to a drainage bag in a sterile pack and a tamper-evident seal protects the connection. The

use of urinary systems with pre-connected, sealed catheter-tubing junctions may reduce the occurrence of disconnection. [16] (Fig. 21)



*Fig. 21 Pre-connected drainage system (Source: C. Vandewinkel)*

**Anti-reflux valve** drainage bags are designed with either an anti-reflux valve or anti-reflux chamber to prevent reflux of contaminated urine from the bag into the tubing. [52] However, complex urinary drainage systems (utilising mechanisms for reducing bacterial entry such as antiseptic-release cartridges in the drain port) are not necessary for routine use. [16]

**Sampling port:** most drainage bags have a special sampling port designed to obtain urine specimens while maintaining a closed system. (Fig. 22) Some companies produce bags with a needle-free sampling port to avoid sharp injury.



*Fig. 22 Collection of a catheter specimen of urine - needle free (Source: T. Schwennesen)*

### 5.3.2 Leg bag / body worn bag

If the patient is mobile a leg bag can be preferable. The leg bags allow maximum freedom and movement and can be concealed beneath the clothes.

Leg bags are available in different sizes, designs and qualities and it is important to select a bag according to the patient's preference, patient mobility and the intended duration. (Fig. 23)



Fig. 23 Different types of leg bags (Source: T. Schwennesen)

**Capacity:** ranges from 120 to 800 ml and the size depends on how often the bag has to be emptied according to the patient's daily routines.

**Chamber:** the bags are available with a single or several chambers. Several chambers flatten the bags profile and are therefore more discreet.

**Materials:** bags are produced in different materials with different backings and comfort. Some of the bags are PVC-free as well.

**Tube:** ranges from about 4 cm to 45 cm and some can have an individual length by cutting the tube. In addition some tubes are kinking-free, which reduces the risk for obstruction.

**Suspension system:** leg bags can be attached to the leg with straps (elasticated), nets, bags/pocket of cotton, etc. (Fig. 24, 25, 26)

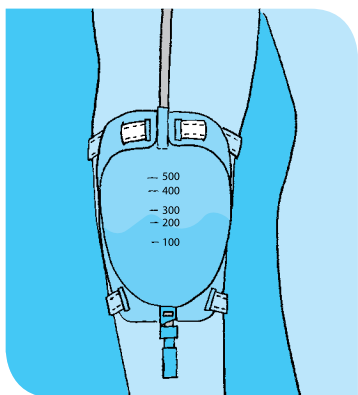


Fig. 24 Bag fixed at the leg

(Source: Rotherham District General Hospital, permission see page 65)

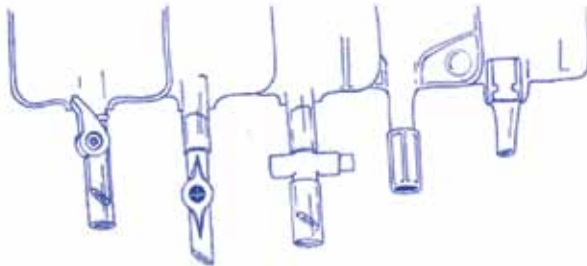


*Fig. 25 Special net for leg bag  
(Source: C. Vandewinkel)*



*Fig. 26 Cotton leg bag holder supported  
by wide elastic at the waist and on the  
pocket edge  
(Source: Netti A/S, Denmark, permission see page 65)*

**Outlet tap:** are available in different designs; barrel tap, lever tap and push-pull tap. [48] It is important to choose a bag with a tap the patient can manage especially in patients with reduced hand function. (Fig. 27, 28)



*Fig. 27 Examples of bag taps (Source: ICUD, permission see page 65)*



*Fig. 28 Quadriplegic patient with a poor manual dexterity.  
(Please note that the bag is being held above the level of the bladder for photographic purposes only)  
(Source: T. Schwennesen)*

Another discreet bag which allows mobility is the body-worn bag as for example the Belly bag® (Fig. 29). The bag can be used with either a suprapubic, a urethral or a nephrostomy catheter, but is not intended to be used with a male external catheter (condom or urosheath) in males. An anti-reflux valve behind the catheter port prevents reflux urine flow, which allows positioning this bag above the level of the bladder, contrary to other bags.



Fig. 29 Body worn bag (Source: Teleflex Europe Ltd., permission see page 65)

### 5.3.3 Large capacity bag

Large capacity bags (2-4 litres) can be used post-operatively, if the patient is confined to bed or if the use of a leg bag is not appropriate. Some of the bags with a large capacity are provided with an urimeter which allows accurate measurement of urine in the intensive care patient.

Different outlet taps and tube lengths are available as for leg bags (see 5.3.2).

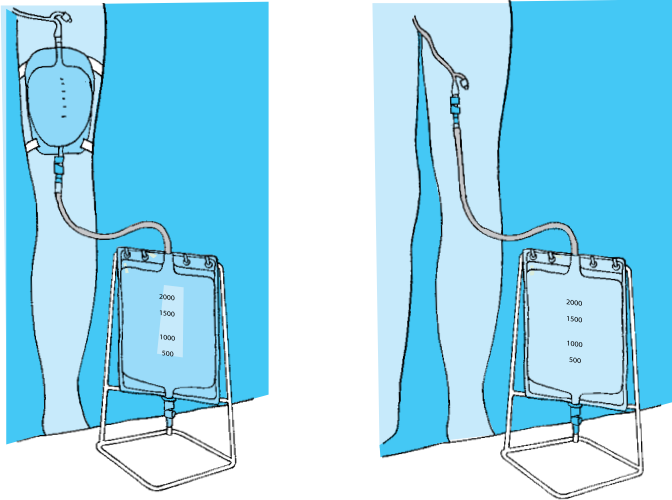
### Overnight / bedside bag

The large capacity bags can be used as a night bag as well. Patients normally require a 2 litre drainage bag that is connected to the leg bag at night or if they are immobile / bedbound. The outlet tap on the leg bag is left open so that the urine collects in the larger bag without breaking the closed drainage system. [56] (Fig. 30)

The night bag requires a stand for support, to reduce the risk of dislodging the link system and is available in different designs and materials. [48] (Fig. 31)



Fig. 30 Different types of night bags (Source: T. Schwennesen)



*Fig. 31 Overnight drainage system*

*(Source: Rotherham District General Hospital, permission see page 65)*

#### **5.3.4 Single use urinary bag**

Over the last few years, technique has changed from sterile to clean in home care setting. In some countries clean, single-use non-drainable night bags are used which means that when the bag is full it has to be changed since the bag cannot be emptied. In other countries, night bags are cleaned and reused for long-term catheters at home. More research is needed to ensure that guidelines and resultant care are based on existing evidence rather than on custom and common practice. [57]



Recommendations	LE	GR
<ul style="list-style-type: none"> <li>• A closed drainage system should be maintained to reduce risk of catheter-associated infection [16]</li> </ul>	1b	B
<ul style="list-style-type: none"> <li>• Unnecessary disconnection of a closed drainage system should be avoided, but if it occurs the catheter and collecting system have to be replaced using aseptic technique and sterile equipment [16]</li> </ul>	1b	B
<ul style="list-style-type: none"> <li>• Complex urinary drainage systems (utilising mechanisms for reducing bacterial entry such as antiseptic-release cartridges in the drain port) are not necessary for routine use [16]</li> </ul>	1b	B
<ul style="list-style-type: none"> <li>• In making urinary drainage bag selections particular attention should be focused on: the ability of the user to operate the tap, comfort; freedom from leakage and discretion [21]</li> </ul>	4	C
<ul style="list-style-type: none"> <li>• The patient's individual needs and personal preferences should determine the use of leg/suspension/attachments and position of where the bag is worn [21]</li> </ul>	4	C
<ul style="list-style-type: none"> <li>• Further research is needed on disinfection of the urinary bag and reusing the urinary bag</li> </ul>	Unresolved issue	
<ul style="list-style-type: none"> <li>• Consult national policies for working with medical devices – and reuse of single material</li> </ul>	4	C

## 5.4 Catheter valves

Valves are small devices connected to the catheter outlet instead of a bag and are available in a variety of designs. (Fig. 32)



Fig. 32 Different catheter valves (Source: T. Schwennesen)

The catheter valves are an alternative to leg bags/body-worn bags which give the patient more freedom to move and more discreet drainage. Most valves are designed to fit with linked systems so it is possible to connect to a drainage bag. For example in the night-time, for journeys, etc. [48]

The valves provide a well-accepted system of bladder emptying for suitable patients who are able to manipulate the valve mechanism and empty the bladder regularly to avoid overfilling. Another advantage is that the valve offers the potential for maintenance of bladder function, capacity and tone by allowing the filling and emptying of the bladder. [21] Furthermore, research has shown that using a catheter valve with a two to four-hourly release has been associated with reduced catheter blockage. [58] The valve is not an optimal solution for all patients and the nurse specialist has to assess the suitability for each patient. However, in some countries the use of catheter valves is not approved.

The catheter valve is contraindicated in a patient with:

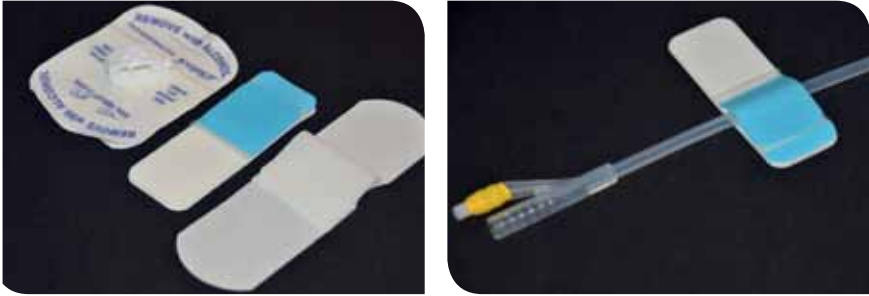
1. Severe cognitive impairment (the patient must be able to recognise the need to empty the bladder through sensation or on a timed schedule)
2. Overactive bladder syndrome; might cause urinary leakage
3. Urethral reflux or renal impairment
4. Small or limited bladder capacity; the valve would have to be opened very often
5. Urinary tract infection
6. Poor manual dexterity

[59]

Recommendations	LE	GR
<ul style="list-style-type: none"> <li>• Catheter valves provide a well-accepted system of bladder emptying for suitable patients who are able to manipulate the valve mechanism and empty the bladder regularly [21]</li> </ul>	4	C
<ul style="list-style-type: none"> <li>• A combination of a valve during the day and free drainage at night through an open valve connected to a drainage bag could be an appropriate management strategy [21]</li> </ul>	4	C
<ul style="list-style-type: none"> <li>• Suitability for catheter valves should be assessed by a health care professional</li> </ul>	4	C
<ul style="list-style-type: none"> <li>• When a catheter valve is used a two to four-hourly release is recommended [58]</li> </ul>	2a	B
<ul style="list-style-type: none"> <li>• Further research is needed about the use of catheter valves and urinary tract infection</li> </ul>	Unresolved issue	

## 5.5 Catheter securement devices

Catheter securement devices are designed to prevent excessive traction of the catheter against the bladder neck or inadvertent catheter removal. There are different kinds of securement devices such as tape, Velcro™. (Fig. 33, 34)



*Fig. 33 and Fig. 34 Different types of catheter securement devices (Source: T. Schwennesen)*

*For more information about catheter securement see 6.5.5 Stabilising of the urethral catheter.*

## 5.6 Lubricating gel

The lubricant dilates and lubricates the urethra. The lubricant does not need to be antiseptic [60] or anaesthetic.

Four types of lubricants can be distinguished:

1. Water soluble lubricants
2. Water soluble lubricants with chlorhexidine (antiseptic)
3. Water soluble lubricants with anaesthetic lignocaine/lidocaine
4. Water soluble lubricants with anaesthetic lignocaine/lidocaine and chlorhexidine

# 6. Principles of management of nursing intervention

## 6.1 Patient preparation

### Consent

Catheterisation is an invasive procedure that can cause embarrassment, physical and psychological discomfort and impact on the patient's self-image. To ensure the patient is fully prepared for catheterisation it is the responsibility of the health care professional to inform the patient of the reasons and necessity for the procedure, and obtain the patient's permission. [61] In many areas of medicine, patients are required to sign a consent form that indicates agreement for the practitioner to undertake a procedure. It also implies an understanding of the event and the associated potential complications/problems. At present it is not common practice within Europe for patients to provide written consent for catheterisation; it is however a necessity that verbal consent and agreement is reached and the relevant information is recorded in the patient's medical and/or nursing notes. [62]

### Information and support

Explaining the procedure and providing the reason for catheterisation to the patient will help reduce patient anxiety and embarrassment and help the patient to report any problems that may occur while the catheter is in-situ. [63] Relaxing the patient by offering reassurance and support will help for smoother insertion of the catheter and assist in avoiding unnecessary discomfort and the potential of urethral trauma during the insertion. [64, 65]

### Equipment and preparation

Even if catheterisation is a medical order, the health care professional should take a brief medical patient history, especially about urological conditions before the procedure.

Catheterisation is a sterile procedure as it involves instrumentation of a sterile tract. It is imperative that the health care professional has a good understanding of the principles of the aseptic procedure as this will help to reduce the risk of UTI. [66]

### Lubricating gel

Catheterisation can be painful in both males and females. The use of anaesthetic lubricating gels is well recognised for male catheterisation. An appropriate sterile single-use syringe with lubricant should be used before catheter insertion of a non-lubricated catheter to minimise urethral trauma, discomfort and infection. [8, 33] However, it is essential to ask the patient if they have any sensitivity to lignocaine/lidocaine, chlorhexidine or latex before commencing the procedure. There have been reported cases of anaphylaxis attributed to the chlorhexidine component in lubricating gel. [67] Ten to fifteen ml of the gel is instilled directly into the urethra until this volume reaches the sphincter/bladder neck region. Blandy [68] and Colley [69] recommend a 3 to 5 minute gap before starting the catheterisation after instilling the gel, but it is important to follow manufacturer's guidance. A maximised anaesthetic effect will help the patient to relax and the insertion of the catheter should be easier. [70]

If the lubricant contains lignocaine/lidocaine or chlorhexidine, care should be taken if the patient has an open wound or severe damaged mucous membranes and/or infections in the regions where the lubricant will be used. In patients with severe disorders of the impulse conduction system or epilepsy as well as women in the first three months of pregnancy or breast feeding (Package instruction leaflets Instillagel® and Xylocaine®), the urologist should be asked permission to use a lignocaine/lidocaine containing lubricant.

**Set for catheterisation**

Fixed catheter sets are widely used. Different hospitals use different sets for catheterisation (refer to local policy). There is no standard list of materials for a catheterisation set / pack. You should check individual packs for required contents, the catheter and drainage bag are usually separate from the catheterisation packs.

There is no literature on a scientific basis about the advantage or disadvantage of using such a catheter-set. Using a set could be an advantage in educational situations or in emergency situations because you only need to search for a set and the catheter with a bag and not for all single materials you need to insert a catheter. [33]

Recommendations	LE	GR
• Verbal consent should be obtained from the patient for indwelling catheterisation before starting the procedure	4	C
• It is imperative that the health care professional has a good understanding of the principles of the aseptic procedure as this will help to reduce the risk of UTI [16, 66]	1b	B
• It is essential to ask the patient if they have any sensitivity for chlorhexidine [67], lignocaine/lidocaine or latex before commencing the procedure	4	C

**6.2 Urethral catheter - female and male insertion procedure**

*For practical guidelines on how to insert a male or a female urethral catheter see Appendix B and C.*

The recommendations below are for catheterisation in males; recommendations with an \* are also relevant for females.

Recommendations	LE	GR
<ul style="list-style-type: none"> <li>If resistance is felt at the external sphincter, increase the traction on the penis slightly and apply steady, gentle pressure on the catheter. Ask the patient to strain gently as if passing urine</li> </ul>	4	C
<ul style="list-style-type: none"> <li>In case of inability to negotiate the catheter past the U-shaped bulbar urethra use a curved tip (Tiemann) catheter or hold the penis in an upright position to straighten out the curves</li> </ul>	4	C
<ul style="list-style-type: none"> <li>Special catheters like Tiemann e.g., need a special technique and should be attempted by those with experience and training [65, 71, 72, 73]</li> </ul>	4	C
<ul style="list-style-type: none"> <li>Inserting a Tiemann tip, the tip has to point upward in the 12 o'clock position to facilitate passage around the prostate gland [52]</li> </ul>	4	C
<ul style="list-style-type: none"> <li>When inserting the urethral catheter use a sterile single-use packet of lubricant jelly [16] *</li> </ul>	4	C
<ul style="list-style-type: none"> <li>Routine use of antiseptic lubricants for inserting the catheter is not necessary [16] *</li> </ul>	4	C
<ul style="list-style-type: none"> <li>A small lumen catheter can buckle/kink in the urethra; in some instance a slightly larger Ch size might help [73] *</li> </ul>	4	C
<ul style="list-style-type: none"> <li>Further research is needed for using the non-touch technique for indwelling urethral catheterisation *</li> </ul>	Unresolved issue	
<ul style="list-style-type: none"> <li>After the catheter has been inserted using aseptic technique, it should immediately be connected to the sterile bag, because an aseptic closed drainage system minimises the risk of catheter-associated urinary tract infections *</li> </ul>	1A	A

\* Recommendation also relevant for females

### 6.3 Suprapubic catheter insertion procedure

There are two techniques to insert a suprapubic catheter. The classic method is with the use of sterile gloves. The second method is the “no-touch technique” without sterile gloves. Instead, the sterile package of the catheter is used to touch the catheter. The no-touch technique is probably to be preferred, because there is less risk of contamination, but unfortunately there is no evidence in the literature available.

If the patient does not have a readily palpable bladder then ideally, the bladder should be filled with at least 300 ml prior to insertion of a suprapubic catheter (SPC). Ultrasonography may also be used as an adjunct to SPC insertion or with cystoscopy to ensure that the needle used to make the SPC tract can be visualised entering the bladder at an appropriate point on the anterior bladder wall.

In patients with a history of lower abdominal surgery or the bladder cannot be distended then an open procedure may have to be performed for insertion of the SPC. (LE 3) [74]

*For practical guidelines on how to insert a suprapubic balloon catheter see Appendix D.*

Recommendations	LE	GR
<ul style="list-style-type: none"> <li>Further research is needed for using the non-touch technique for suprapubic catheters</li> </ul>	Unresolved issue	

## 6.4 Difficulties that may occur during insertion

Difficulty in catheterising the patient can be caused by a variety of reasons. Medical advice and support should be sought if problems during or after the insertion occur. Complications associated with catheters include UTI, trauma and inflammatory reactions, urethral stricture, calculi, hypospadias, false route and possibly carcinoma of the bladder. [75] These can result in one or more of the following symptoms occurring: pain, bypassing, blockage, catheter expulsion and bleeding.

## 6.5 Catheter care / maintenance

### 6.5.1 Meatal cleansing

Routine daily personal hygiene is all that is needed to maintain meatal hygiene. [13, 76, 77, 78] Trials of various cleansing agents, e.g. chlorhexidine, saline etc., have failed to demonstrate a reduction in bacterial growth rate [79], meaning soap and water is sufficient to achieve effective meatal cleansing. [65, 80, 81] However attention must be given to educating non-circumcised patients to clean underneath their foreskin daily to remove smegma, as this may increase the patient’s risk of developing a UTI in addition to causing trauma and ulceration to the meatus and glans penis. [76, 82]

There is no evidence that routine application of antimicrobial preparations around the meatus will prevent infections. [65, 81, 83]

Recommendations	LE	GR
<ul style="list-style-type: none"> <li>Routine daily hygiene (water and soap) is appropriate for meatal cleansing</li> </ul>	1b	B
<ul style="list-style-type: none"> <li>Application of topical antibiotic cream to the meatus around the catheter does not reduce bacteriuria. [65, 81, 83]</li> </ul>	1b	B

### 6.5.2 Care of urethral catheters

Whichever bag is chosen, extensive measures should also be taken to maintain unobstructed flow. [16] To prevent obstruction, the catheter and collecting tube should be kept free from kinking and the collecting bag has to be kept below the level of the bladder at all times (to allow urine to drain by gravity) and must never be rested on the floor. [16]

When emptying the collecting bag regularly use a separate, clean collecting container for each patient; avoid splashing, and prevent contact of the drainage spigot with the non-sterile collecting container. [16]

Recommendations	LE	GR
• Perform hand hygiene immediately before and after any manipulation of the catheter and system. Wear disposable gloves when handling the system	1b	B
• Maintain unobstructed urine flow [16]	1b	B
• Keep the catheter and collecting tube free from kinking	1b	B
• Keep the collecting bag below the level of the bladder at all times. Do not rest the bag on the floor	1b	B
• Empty the collecting bag regularly using a separate container for each patient; avoid splashing, and prevent contact of the drainage spigot with the non-sterile collecting container	1b	B

### 6.5.3 Care of the suprapubic catheter site

Recommendations	LE	GR
• Always ensure good hand hygiene is performed prior to any intervention [85] and use protective equipment e.g. gloves	4	C
• Suprapubic catheter site should be cleaned daily with soap and water. Excess cleansing is not required [65, 81] and may increase the risk of infection	1b	B
• Observe the cystostomy site for signs of infection and over granulation	4	C
• Antimicrobial agents should not routinely or as prophylactic treatment be applied to the cystostomy site to prevent infection [81, 83]	1b	A
• Dressings are best avoided, if a dressing is used to contain a discharge this should be undertaken with strict aseptic technique to protect against infection	4	C
• Wherever possible, patients should be encouraged to change their own dressings [23]	4	C



#### 6.5.4 Observation and management of catheter drainage

The observations relate to the indication for catheterisation. Post-operatively catheterisation is often performed to monitor urine output. The monitoring of urine output is vital to ensure that the bladder continues to empty and that excessive diuresis does not occur. [84] In home settings observations relate to common complications to long-term catheters such as blockage and infections.

*For Common problems with indwelling catheter equipment, see Appendix E.*

*For Observation of urinary drainage, see Appendix F.*

Indwelling catheters with open-drainage systems result in bacteriuria in almost 100% of cases within 3-4 days. [20, 55] By using closed urinary drainage systems bacteriuria cannot be prevented, but it can be delayed. Almost all patients will develop bacteriuria within approximately 4 weeks. [20] Breaking a closed drainage system to obtain urine samples therefore increases the risk of CAUTI. [85]

Recommendations	LE	GR
• Maintain unobstructed urine flow [16]	1b	B
• Keep the catheter and collecting tube free from kinking	1b	B
• Keep the collecting bag below the level of the bladder at all times	1b	B
• When emptying the collecting bag regularly use a separate, clean collecting container for each patient; avoid splashing, and prevent contact of the drainage spigot with the non sterile collecting container	1b	B
• Unnecessary disconnection of a sealed (pre-connected) drainage system should be avoided but if it occurs the catheter and collecting system have to be replaced using aseptic technique and sterile equipment	1b	B
• Catheter and drainage tubes should never be disconnected unless for good clinical reason	2b	B
• Disinfect the catheter/collecting tube junction when connected	4	C
• Use of a urimeter which allows accurate measurement is recommended in intensive care patients [86]	2b	B
• Complex urinary drainage systems are not necessary for routine use	2b	B
• Extensive measures should also be taken to maintain unobstructed flow	1b	B
• Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Rather, catheters and drainage bags should be changed based on clinical indications such as infection, obstruction, or when the closed system is compromised [16]	1b	B

### 6.5.5 Stabilising of the urethral catheter

If the catheter is not secured properly, it may migrate from its intended point of stabilisation. Stabilising urethral catheters can reduce adverse events such as dislodgment, tissue trauma, inflammation and urinary tract infection. [87, 88, 89] Urethral trauma can be caused by any catheter size or by forced insertion of the catheter. Urethral trauma should be minimised by the use of adequate lubricant and the smallest possible catheter size. [20] (LE: 1b) Inflammation and trauma may also occur when the device is unsecured. Movement-induced trauma can lead to urinary tract infection and tissue necrosis. The use of a securement device reduces both the physical and psychological trauma to the patient by decreasing the need for reinsertion. If the catheter bag becomes too heavy with urine, and it is not supported properly, the bag can pull on the catheter. This, along with catheter movement at the site of insertion, can cause discomfort and irritation to the patient. [16, 90] To avoid necrosis at the urethral penile-scrotal junction caused by prolonged catheter pressure, it is recommended to secure urinary catheters to males' abdomen. [87] The catheter has to be positioned in a soft curve towards the femur (Fig. 35) and can be fixed with a securing device, tape, velcro™ or a pocket for the bag (Fig. 36, 37, 38). Although the references are only for urethral catheterisation the same principles of stabilisation apply to suprapubic catheters. [54]

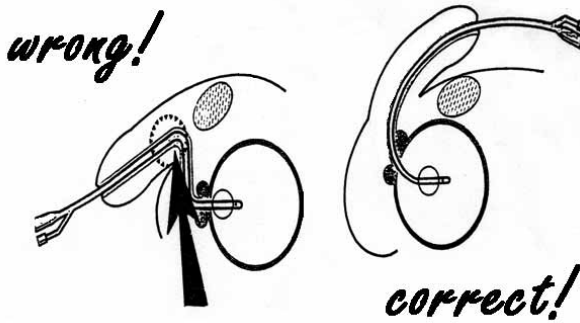


Fig. 35 Fixation of the catheter (Source: unknown)



Fig. 36 Fixation of a urethral catheter  
(Source: C. Vandewinkel)



Fig. 37 Fixation of the urethral catheter/leg bag  
(Source: C. Vandewinkel)



Fig. 38 Fixation of the catheter with a securement device

(Source: D.K. Newman, permission see page 65)

Recommendations	LE	GR
• It is important to secure the catheter after insertion to prevent movement and urethral traction [16]	1b	B
• It is important to stabilise the urinary catheter	1b	A
• In males secure urinary catheter to the abdomen and in females to the leg	4	C

### 6.5.6 Clamping or not

Bladder dysfunction and postoperative voiding impairment have been documented following catheterisation and these can lead to infections of the urinary tract. The intermittent clamping of the indwelling urethral catheter draining tube prior to withdrawal has been suggested on the basis that this simulates normal filling and emptying of the bladder. While clamping catheters might minimise postoperative neurogenic urinary dysfunction, it could also result in bladder infection or distension. A Cochrane review investigated the best strategies for the removal of catheters from patients with a short-term indwelling catheter. They compared clamping the indwelling urethral catheter prior to removal with free drainage. Because of poor methodological quality of the studies limited evidence is obtained from the review and it does not provide a robust base for the development of practice guidelines. [91]

A review addressing short-term urinary catheter policies following urogenital surgery in adults concludes the same. A small study compared clamp-and-release policies before catheter removal versus immediate removal and found urinary tract infections were more common in the clamp-and-release group and this group took longer to return to normal bladder function. The value of clamp-and-release before catheter removal could not be assessed reliably, because of the quality of the study. [92]

Recommendations	LE	GR
• Further research is needed on the value of clamp-and-release	Unsolved issue	

## 6.6 Changes of urine due to food and medication

The presence of an appliance for collecting urine increases patient's awareness of both odour and colour changes affecting the urine caused by some medications and food products. (Appendix G) The patient and caregiver should be told that these changes are not harmful and do not necessarily occur in all patients. Normal urine is clear, straw-coloured with almost no odour. [93]

See table *Possible colour and odour changes in urine due to food or medication, Appendix G.*

### Purple urine bag syndrome (PUBS)

Purple urine bag syndrome is a rare condition and is characterised by a purple discolouration of the urine bag, appliances and various catheter tubing. The urine itself may be dark in colour and not necessarily purple. The condition appears to have a significantly higher incidence in women and chronically debilitated patients with long-term indwelling urinary catheters. [94, 95, 96] The major risk factors for PUBS are female gender, severe constipation, chronic indwelling urinary catheterisation and increased tryptophan dietary content. [94, 95] The purple colour is caused by the metabolism of tryptophan by bacteria to indole and later converted to indican in the liver. Indican passes through the kidney giving urine a purple/blue/grey colour. [96, 97]

Although studies have shown certain factors may be present, these factors are not found consistently. [95, 98] PUBS is generally found to be harmless, but there have been case reports describing PUBS progressing to Fournier's gangrene. [99] The discolouration of the urine and the urine bag can be distressing for patient, family and healthcare workers, therefore they should be educated to manage this syndrome. [100] The incidence is reduced by avoiding constipation and proper care of the urinary catheter. [95, 98]

Recommendations	LE	GR
• If urine changes odour or colour, check what could be the reason for this change	4	C

## 6.7 Constipation

Constipation may cause pressure on the drainage lumen that prevents the catheter from draining adequately, which can cause ureteric reflux and back pressure on the kidneys. [101, 102, 103] Chronic constipation may also cause leaking just like bladder spasms have been attributed to constipation by a multiple sclerosis patient. [104] Maintaining regular bowel function with a high-fibre and high-fluid intake helps prevent constipation. [104, 105]

Recommendations	LE	GR
• In case of constipation a bowel assessment should be made	4	C
• Educating the patient regarding the link between constipation and bypassing urine	4	C

## 6.8 Suprapubic catheter change

### Change of the catheter

- The change of a catheter is a medical order.
- Long-term catheters can be changed on an individual basis to try to avoid/anticipate problems. However, the catheter must be changed within the timeframe as per manufacturer's instructions which may be up to a maximum of 12 weeks.
- The catheter must be changed at the time of any identified catheter-related problems e.g. catheter blockage, catheter damage.
- A catheter change depends of the material of the catheter. A latex catheter is changed after 2 weeks to a hydrogel or silicone catheter.
- Check the catheter for encrustation after removal. If there is encrustation than its better to change the catheter earlier or when there is no encrustation the catheter can be changed later.

There are different techniques to change a suprapubic catheter. If the catheter change is uneventful the classic catheter with open eyes at the side and a closed eye at the end of the catheter is preferred. In case of severe problems with changing the catheter a changing set with Seldinger™ and a catheter with an open end should be used.

Antibiotics are not routinely given prior to suprapubic catheter change but may be prescribed for patients deemed 'at risk' of infection at the physician's discretion.

Following initial insertion of a suprapubic catheter, the tract will take approximately between 10 days to 4 weeks to become established, after which time the catheter can be changed safely.

Comply with local protocols and procedures with regard to change of suprapubic catheter (male and female).

*For Preparation and procedure for changing a suprapubic catheter, see Appendix H.*

Recommendations	LE	GR
• A proper fixation for catheters is necessary to prevent tension and friction in urethra and bladder neck	4	C

## 6.9 Removal of urethral and suprapubic catheters

The nurse needs to monitor the need for a catheter carefully.

In case removal might be considered, it should be discussed with the medical team.

The removal of a catheter is a medical order.

Pain is frequently encountered during removal of both urethral and suprapubic catheters and is often a consequence of ridge formation on the catheter balloon. This can be minimised by allowing passive deflation of the balloon rather than applying active suction to the deflating channel. [106]

When the catheter has been removed, and advice on life style (e.g. drinking, etc.) has been given, make sure the patient understands he can contact you or your colleagues at any time if or when problems occur.

*See Appendix I Flow chart on Indwelling urethral catheter removal,*

*Appendix J Removal of the urethral catheter – procedure and*

*Appendix K Removal of the suprapubic catheter - procedure*

Recommendations	LE	GR
• Minimise pain by allowing passive deflation of the balloon rather than applying active suction to the deflating channel [106]	3	B

## 6.10 Potential problems during and following catheter removal

There are several problems that might arise during removal of a urethral catheter and it is vital that the health care professional is aware of the actions required to overcome them.

**Problems and management are listed in:**

*Appendix L Troubleshooting for indwelling catheters (Problem management),*

*Appendix M Potential problems during catheter removal and*

*Appendix N Potential problems following removal of the catheter.*

# 7. Catheter complications

## 7.1 Catheter Associated Urinary Tract Infection (CAUTI)

The urinary tract is the most common source of nosocomial infection, particularly when the bladder is catheterized [20], accounting for nearly 40% of all hospital acquired infections (HAI) [12, 107, 108, 109, 110] (LE: 1a) with the duration of catheterisation being a significant risk factor [107, 109, 110, 111, 112]. (LE: 1a)

Catheter Associated Urinary Tract Infection (CAUTI) is defined as bacteriuria or funguria with a count of more than 10<sup>3</sup> CFUs/mL. [113]

It is well accepted that bacterial colonisation with catheterisation is inevitable with some reports estimating the risk to be in the region of 5% per day with almost 100% colonisation risk at 7 to 10 days of catheterisation. The incidence of bacteriuria has been estimated to be about 3% to 10% higher each day after catheter insertion. [81, 114]

Prolonged urinary catheterisation is common amongst people in long-term care settings and this carries a high risk of developing a catheter-related urinary tract infection and associated problems. [51, 115]

Bacteruria is therefore an almost universal feature of urinalysis and does not require therapy in asymptomatic individuals.

Suprapubic catheters are less prone to cause symptomatic infection compared to urethral catheterisation and are preferable in appropriate patients. [20] (LE: 1b)

Urinary drainage systems are often reservoirs for multidrug-resistant bacteria and a source of transmission to other patients and also the main risk factor for nosocomial UTI, because they allow micro-organisms to by-pass host defences and reach the bladder. Extra-luminal contamination may occur when the catheter is inserted or later by micro-organisms ascending from the perineum. Intra luminal contamination occurs by reflux, which is prevented when closed urinary systems are used. [12, 55, 114, 117, 116]

The following have been shown to reduce the risk of CAUTI:

Recommendations	LE	GR
• Use of closed urinary drainage systems [55, 79, 118, 119]	1a	A
• Use of silver coated catheters [53, 108, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129] (Decrease by between 17 and 85%) only for less than a week	1b	A

• Use of a combination of a silver coated all silicone catheter and an antiseptic drainage system [130, 131] (Decrease by between 47% and 61%)	2a	A
• Use of stop orders and daily assessment of the need for urethral catheterisation [132] (Decrease by 52%)	1a	A
• Avoid drainage tube occlusion [133]	3	A
• Adhere to commonplace hand washing policy [133]	3	B
• Use small lumen catheters [54]	4	C
• Avoid unnecessary catheterisation	1b	A
• Remove the catheter as soon as possible	1b	B
• Use urinary catheters in operative patients only if necessary, not routinely	1b	B

There is now good evidence that the following **do not** reduce the risk of developing CAUTI and therefore such practices are **not recommended** but may be utilised according to local policy and protocol.

**Not recommended is:**

1. Cleansing with 0.05% chlorhexidine gluconate [79, 134, 135] (LE: 1a)
2. Addition of chlorhexidine to drainage bags [79, 136] (LE: 1a)
3. Utilising povidine iodine to wash the genital area [138] (LE: 3)
4. Regular bladder washouts [79, 137] (LE: 1a)
5. Regular catheter bag changing [79, 139] (LE: 1a)
6. Regular meatal cleansing beyond normal hygiene [140, 79] (LE: 1a)
7. Systemic antimicrobial prophylaxis. This should not be routinely used in patients with short-term or long-term catheterisation to reduce catheter associated bacteriuria or UTI because of concern about selection of antimicrobial resistance. [45] Antibiotic prophylaxis when changing catheters should only be used for patients with a history of catheter-associated urinary tract infection following catheter change. [8] There is weak evidence that prophylactic antibiotics reduce CAUTI in female post abdominal surgical patients.[114] (LE: 3)

Infection may also occur at the site of an SPC insertion which may present as cellulites, requiring oral or intravenous antimicrobial pharmacotherapy depending upon severity or a subcutaneous abscess requiring formal incision and drainage.

Such infections are more common in patients who are immunocompromised.



### **Prevention**

Replacing chronic catheters prior to commencement of antibiotics for symptomatic UTI yields greater and faster clinical improvement. [141] (LE: 2b)

### **Treatment**

Only patients with symptomatic positive urinalysis should receive treatment. This should be a pure isolated organism with greater than  $10^3$  organisms per hpf.

## **7.2 Epididymitis**

Epididymitis is an inflammation of the epididymis. The condition causes pain and swelling and is almost always unilateral and relatively acute in onset. In elderly patients, epididymitis is usually due to common urinary pathogens. [20] Epididymitis as a complication to urethral catheterisation is seen significantly more often in patients with indwelling catheters compared to intermittent catheterisation. One study observed epididymitis in almost 5% of spinal cord injury patients with long-term indwelling catheters. The author of the study points out that patient-related factors such as personal hygiene, fluid intake and catheter care should be remembered, too. [142] (LE: 2a)

## **7.3 Catheter blockage**

40 - 50% of patients with indwelling catheters experience problems with lumen blockage [143, 144, 145, 146] (LE: 2b) as a consequence of either debris or encrustation. Studies have shown that over 70% of blocked catheters are encrusted and of these, over 60% are associated with bladder stones. [144, 147, 148]

Blockage can also occur as a result of kinking of the catheter, catheter against bladder wall or constipation. Urinary leakage can occur as a symptom of catheter blockage.

### **Catheter encrustation**

Encrustation is a result of bacteria in the urine, most commonly 'Proteus' (*P. mirabilis*), that produce an enzyme called urease, which splits urinary urea into ammonia and carbon dioxide. This results in an increase in alkalinity, providing ideal conditions for the development of crystals, e.g. struvite (magnesium ammonium phosphate) and calcium phosphate. The crystals develop around the eyelets, balloon and internal lumen of the catheter. [137]

### **Debris**

Debris is caused by urothelial cells from the bladder or tumours shedding cells, blood from infection, disease, urological surgery or trauma or from mucus.

### **Biofilm**

A thin layer of micro-organism adhering to the surface of a structure, which may be organic or inorganic, together with the polymers that they secrete. [149, 150, 151]

## Prevention and treatment

The evidence base for prevention is weak with some series suggesting that potassium citrate supplementation, increased fluid intake and lemon juice supplements all reduce the incidence and severity of catheter encrustation [143, 152] (LE: 2a) The Cochrane review based on suggests there are no high level evidence studies on prevention. [137] (LE: 1b)

In vitro studies suggest that daily bladder washouts (BWO) with EDTA solution may prolong the time to blockage by almost 50% [153] (LE: 2b), although this has not yet been translated into clinical practice and as such cannot be recommended at this stage.

Bladder washouts and bladder instillations seem to be more extended in clinical practice than other solutions despite the limited evidence of their effectiveness. (See Chapter 8: Bladder Washout) [85]

Further studies have shown that intermittent drainage every 2-4 hours reduces the rate of catheter blockage compared to continuous flow. [58] (LE: 2b)

A dependent free draining catheter bag may exert significant syphoning pressure resulting in severe catheter reaction within the bladder urothelium. This polypoidal inflammation in turn may block the catheter holes and result in blockage. (LE: 4) Elevation of the catheter bag to eliminate such pressure may alleviate this risk.

Larger catheter lumens also reduce blockage. Silicone catheters appear to be affected by blockage less often than other catheters, which may be explained by the larger lumen, but the material may also be a contributing factor. [144, 145] (LE: 3)

*For Bladder washout - Procedure and troubleshooting, see Appendix O*

Recommendations	LE	GR
• Patients with regular catheter blockage should be investigated for possible bladder stones	2b	B
• Intermittent drainage every 2-4 hours reduces the rate of catheter blockage compared to continuous flow	2b	B
• Optimise fluid intake and use lemon juice supplements to reduce the incidence and severity of catheter encrustation	2a	B
• Elevation of the catheter bag to eliminate pressure within the bladder urothelium may alleviate the risk of polypoidal inflammation with blockage as a result	4	C

## 7.4 Catheter bypassing

Catheter bypassing, occurs in up to 40% of patients with indwelling catheters [146], and may occur as a consequence of various aetiologies including catheter blockage (see section 7.3 above), bladder spasm (see point 7.6 below), constipation, pulling on the catheter or a too large diameter of the catheter. In itself, catheter bypassing is not a diagnosis but rather a symptom, treatment of which should be aimed at the underlying cause.

## 7.5 Iatrogenic trauma

Iatrogenic trauma during urethral catheterisation may result in either the formation of a false passage, usually at the level of the prostate or bladder neck, urethral stricture disease or traumatic cleaving in the male [154], with sphincteric disruption in the female. (LE: 3) Such trauma is rare, with an overall incidence of 0.3%, decreased by medical and nursing personnel education by up to 78%. [155] (LE: 3)

Traumatic cleaving and sphincteric disruption can be avoided by preventing catheter traction or preferably conversion to SPC. (LE: 4) Paraphimosis may occur when an uncircumcised male is catheterised and the prepuce is not replaced. Care and continued patient and carer education will reduce the incidence of such a complication. (LE: 4)

11% of urethral strictures requiring urethroplasty arise following urethral catheterisation. [156] (LE: 3)

Suprapubic catheterisation is associated with a potential for visceral injury which although difficult to reliably quantify due to under-reporting, is in the region of 2 - 3% for bowel perforation, carrying a 30-day mortality rate in the region of 2%. [157, 158, 159] (LE: 3) Visceral trauma is more common amongst patients with previous lower abdominal surgery and in those with neurological disease. [158] (LE: 3)

### Prevention

The incidence of visceral trauma during SPC insertion may be reduced by the utilisation of ultrasound to ensure an unhindered route from the skin into the bladder. With training it is possible to detect bowel interposed in the intended path of insertion. (LE: 4) Trauma is also prevented by ensuring there is some urine (300 ml) in the bladder. If there is not sufficient urine in the bladder try to enlarge the volume via the transurethral or oral route. (LE: 4)

Recommendations	LE	GR
• Traumatic cleaving and sphincteric disruption can be avoided by preventing catheter traction or preferably conversion to SPC	4	C
• Training could make it possible to detect bowel interposed in the intended path of insertion	4	C
• To prevent trauma it is essential to ensure that there is some urine (preferably 300 ml) in the bladder	4	C

## 7.6 Bladder spasm

Bladder spasm is very common in patients with indwelling catheters and is best managed with anticholinergic medication which may be given orally, transdermally or intravesically. Chronic constipation may also cause bladder spasm. Maintaining regular bowel function with a high-fibre and high-fluid intake helps prevent constipation. [104, 105] Sometimes a different catheter (smaller lumen and balloon size) can reduce the spasm caused by constipation. (LE: 4)

Should this fail, intra-detrusor injections of botulinum toxin A may be administered. [160] (LE: 3)

Recommendations	LE	GR
• Educate the patient regarding the link between constipation and bladder spasm	4	C
• Bladder spasm are best managed with anticholinergic medication	3	B
• Intra-detrusor injections of botulinum toxin A may be administered if anticholinergic medications should fail	3	B

## 7.7 Bladder pain

Bladder pain may be an extreme form of urgency experienced as a consequence of detrusor spasm or may exist as a distinct entity without an associated urge to void.

Catheter associated bladder pain is exacerbated by constipation which therefore should be treated as a priority in affected individuals. [161] (LE: 3). Catheter-associated bladder pain is mentioned here as possible complication of catheterisation. Other aspects of bladder pain and painful bladder syndrome fall outside the remit of this guideline.

Recommendations	LE	GR
• Various studies have shown success in treating catheter associated bladder pain with anticholinergic medications, which reduce both the incidence and severity of such pain [161, 162]	1b	A
• Ketamine has also been shown to significantly reduce the incidence of catheter related bladder pain at a dose of 250 mcg/kg [163]	2a	B
• It would appear that the incidence of bladder pain is less for suprapubic catheters than for urethral catheters but the explanation for this is currently unclear, although may be related to its more apical position which may minimise or avoid trigonal stimulation [42]	1a	A

## 7.8 Haematuria

Haematuria may occur following catheterisation and is usually self limiting. During urethral catheterisation, prostatic trauma may be the underlying cause, although decompression of high pressure chronic retention may also result in haematuria.

If such haematuria fails to settle, irrigation through a 3-way catheter may be required or in more severe cases, formal bladder washout under general anaesthesia may be necessary. (LE: 4)

Haematuria following supra-pubic catheterisation may be resolved by irrigation through the SPC or via an additional urethral catheter. (LE: 4)

Recommendations	LE	GR
<ul style="list-style-type: none"><li>• If haematuria fails to settle, irrigation through a 3-way catheter may be required or in more severe cases, formal bladder washout under general anaesthesia may be necessary</li></ul>	4	C
<ul style="list-style-type: none"><li>• Haematuria following suprapubic catheterisation may be resolved by irrigation through the SPC or via an additional urethral catheter</li></ul>	4	C

## 7.9 Granuloma formation

This complication is limited to suprapubic catheterisation and merely requires application of silver nitrate in the vast majority of cases. Rarely, if this is ineffective, surgical excision of the granuloma may be required with or without re-siting the SPC. (LE: 4)

## 7.10 Urinary extravasation

Although almost exclusively related to suprapubic catheterisation, it is possible to cause bladder rupture with resultant urinary extravasation when catheterising with the aid of a catheter introducer. A free draining catheter and antibiotic therapy will usually resolve the situation but occasionally a radiological inserted drain may be required, or even, in the case of bladder rupture as a consequence of an introducer, laparotomy and primary bladder repair will be necessary. (LE: 4)

## 7.11 Inability to remove catheter

Catheters may occasionally prove impossible to remove via balloon deflation. This may be as a consequence of balloon calcific encrustation or a faulty deflation mechanism.

Cutting the catheter below the bifurcation may result in deflation and allow catheter removal but if this fails, ultrasound guided transabdominal balloon puncture may be required. (LE: 4)

Please be aware that cutting the catheter will invalidate product liability. Should this method be employed, it is important to cystoscope the patient to ensure all balloon fragments are removed in order to avoid the potential consequence of calcification around the remaining foreign body with resultant bladder calculus formation. (LE: 3)

An alternative method in the event of being unable to remove an SPC is to utilise a flexible cystoscope and attempt balloon perforation with a metal guide wire of fine gauge needle. Again evacuation of all catheter matter is essential. (LE: 4)

Transrectal perforation of catheter balloons should be avoided for fear of sepsis. (LE: 4)  
Formation of a catheter knot in the bladder is a rare cause of catheter-retention, and usually requires endoscopic removal. [164]

Recommendations	LE	GR
<ul style="list-style-type: none"> <li>• In case of inability to remove catheter ultrasound guided transabdominal balloon puncture may be required</li> </ul>	4	C
<ul style="list-style-type: none"> <li>• In case of inability to remove catheter utilise of a flexible cystoscope and attempt balloon perforation with a metal guide wire of fine gauge needle may be required</li> </ul>	4	C
<ul style="list-style-type: none"> <li>• Transrectal perforation of catheter balloons should be avoided for fear of sepsis</li> </ul>	4	C

## 7.12 Squamous Cell Carcinoma (SCC)

Chronic catheterisation, in common with other forms of chronic urothelial irritation, may increase the risk of SCC formation.

Chronic catheterisation in spinal cord injury patients is the greatest pre-disposing factor for the development of non schistosomiasis induced SCC of the bladder [165], with the only potential way of reducing this risk being to avoid catheterisation in such patients if at all possible. (LE: 3)

# 8. Bladder washout, irrigation and instillation

In clinical practice the most extendedly used terms are “manual washout or bladder lavage” defined as the washing out of the bladder with sterile fluid and “bladder irrigation” as the continuous washing out of the bladder with sterile fluid. [166, 167, 168] Bladder instillations appear to have several indications, one of them is to prevent or treat catheter blockages. Furthermore, instillation treatments are not limited to saline or citric acid solutions; there are some others such as chemotherapy drugs (i.e. mitomycin-C or epirubicin) or anti-inflammatory drugs (i.e. hyaluronic acid), to reduce toxicity of brachytherapy [169] or vesicoureteral reflux. [170]

## 8.1 Washout policies/catheter maintenance in long-term urethral catheterisation

People requiring long-term bladder draining with an indwelling catheter can experience catheter blockage. As there are quite a few causes of catheter blockage (e.g. kinks in a tube, constipation, catheter against bladder wall, encrustation, debris) it is important to diagnose the exact reason for the blockage in order to decide the correct course of treatment.

Regiments involving different solutions are being used to wash out catheters with the aim of preventing blockage. Hagen et al, 2010 [137] conducted a Cochrane review comparing washout versus no washout, different washout solutions, frequency, duration, volume, concentration, method of administration in any setting with an indwelling urethral or suprapubic catheter for more than 28 days.

Hagen et al, 2010 found only 5 relevant articles; all these concluded that there was no evidence that washouts were helpful. It was stated that trials were sparse and generally of poor quality or poorly reported, and that the evidence was too scanty to conclude whether or not washouts were beneficial.

Despite this conclusion, in daily practice bladder washouts are still often recommended in special circumstances, such as removal of encrustation in certain long-term indwelling catheters or removal of blood clots after urological surgery or in palliative treatment of intractable haematuria. [171 in 137, 172] As stated in the Cochrane review [45, 137] there is no evidence how long, and what kind of solutions should be given.

So, bladder washout / catheter maintenance is an option to be discussed with the patient and the clinical team on an individual patient basis. [173] Based on the evidence the working group only recommends bladder washout in bleeding and certain urological surgical procedures.

Recommendations	LE	GR
<ul style="list-style-type: none"> <li>• Routinely bladder washouts are not beneficial [45, 137]</li> </ul>	1a	A
<ul style="list-style-type: none"> <li>• Bladder Irrigation and instillation of maintenance solutions do not prevent catheter associated infections. However they may be recommended in special circumstances e.g. management of blood clots [45, 137]</li> </ul>	1b	A



# 9. Urinalysis

Urinalysis should not be routinely performed on all long-term catheterised patients, as virtually all patients will have bacteria present in their urine. [174]

## Indications

Urinalysis / catheter specimen of urine (CSU) should be undertaken when:

1. Patient is systemically unwell
2. Patient has a high temperature
3. Following lack of response to treatment
4. Admitted/transferred to hospital to ascertain the presence of HAI or CAI (hospital or community acquired infection). [23]

## Technique

Urine samples from a catheter must be obtained under aseptic technique from the needle free sampling port by syringe aspiration. [16]

The sampling port has been specially designed to re-seal after aspiration of the urine sample. [175]

Obtain large volumes of urine for special analyses (not culture) aseptically from the drainage bag. [16] (LE: 1b)

If the indwelling catheter has been in place for more than 7 days, the catheter should be changed, and the urine should be collected from the new catheter so the sample is representative of the microorganisms really present in the bladder and not the microorganisms that have adhered to the interior wall of the catheter. [45]

*For the procedure of Obtaining a urine sample from an indwelling catheter, see Appendix P.*

## Dipstick

Bacterial colonisation with catheterisation is inevitable with almost 100% colonisation risk at 7-10 days [42] and does not require therapy in asymptomatic individuals, the use of dipstick to detect UTI is not recommended. If dipstick is used to detect glucose in the urine, attention should be paid that uric acid and vitamin C can cause a false-negative result. [176]

Recommendations	LE	GR
• For urine analyses; aspirate the urine from the needleless sampling port with a sterile syringe/cannula adapter after cleansing the port with a disinfectant [16]	1b	B
• Obtain large volumes of urine for special analyses (not culture) aseptically from the drainage bag [16]	1b	B

# 10. Infection prevention

## 10.1 Fluid intake

Drinking sufficient fluid dilutes the urine and helps reduce the risk of catheter encrustation and blockage. A good fluid intake also ensures a constant downward drainage and flushing effect. There is no standard amount of advised fluid intake and the type of fluid consumed appears to be insignificant as long as the volume is sufficient to prevent concentration of urine. The amount of fluid needed varies and depends on patient's size (25-35 ml/kg/day), amount of fluid loss, patient's food intake and patients circulatory and renal status. Regular fluid intake maintains the urinary flow and reduces the risk of infection and catheter blockage. The patient should be given sufficiently fluid to maintain an output of 50-100 ml/h. [12, 102, 103, 177]

Recommendations	LE	GR
• The patient should be given sufficient fluid to maintain an output of 50-100 ml/h	2b	B
• To promote "Good fluid intake" should be advised to all catheter users to promote the flow of urine and prevent blockage	4	C

## 10.2 Cranberries

Cranberries have been used for several decades for the prevention and treatment of UTI. Cranberries comprise nearly 90% water and also contain various organic substances such as quinic acid, malic acid and citric acid as well as glucose and fructose. No definite mechanism of action has been established for cranberry in the prevention or treatment of UTIs. The main suggestion is that cranberries prevent bacteria from sticking to uroepithelial cells that line the wall of the bladder. [116] A Cochrane review identified 10 studies comparing cranberry products with placebo, juice or water and found that cranberries can prevent recurrent infection in women, but there is no evidence that cranberries are effective in people who need catheterisation. [116] Another study tested the effect of cranberry juice on encrustation and blockage by biofilms, which also may cause UTI because bacteriuria is inevitably associated with encrustation. This study found that drinking cranberry juice did not produce urine that was inhibitory to the development of biofilms.

Beside the ineffectiveness of preventing UTI, attention should be paid to the interaction between cranberry and warfarin. Studies indicate that cranberry may potentiate the effect of warfarin. [178]

Recommendations	LE	GR
• Cranberry products are not effective in preventing UTI in people with indwelling catheters	1b	B

### 10.3 Hand hygiene

Hand-mediated transmission is a major factor in increasing the risk of infections to patients, which emphasises the vital importance of hand hygiene and use of personal protective equipment such as aprons and gloves. [85] It is important to maintain unobstructed urine flow. [16]

Recommendations	LE	GR
• Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site [16]	1b	A
• Carers and patients managing their own catheters must wash their hands before and after manipulation of the catheter [8]	1b	A
• Healthcare professionals should observe protocols on hand washing and the need to use disposable gloves between catheterised patients [12, 20]	1b	B

# 11. Patient Quality of Life (QoL)

## 11.1 Impact of a catheter on the patient

An indwelling urinary catheter often will be placed, at the outpatient's clinic or emergency room, in for the patient a stress situation; the patient is referred because of urinary retention. Or an indwelling catheter is the last alternative, after all other treatments have failed, for example clean intermittent catheterisation, medication, use of pads or male external catheters. The catheter can be a relieve at that moment, but as Wilde, WCON, 2003 [179] discussed, urinary catheters may be commonplace to health care professionals; wearing one may not be that easy. A patient can be faced with different kinds of problems, such as urinary catheter equipment, how to deal with sexual activities, UTI or even sepsis, emptying bags problems, catheter changes, clothing adjustments, positioning of tubing, (hand) hygiene, meatal cleansing, falling out of the catheter, odour, kinking of catheter. [48, 54, 179, 180]

The process of learning to accept the catheter was reported to take about 1 year's time in one study. [181 in 179] Also Wilde [179] discovered in her study that participants who wore the catheter longer were most accepting.

Most participants viewed their catheter in a balanced way, minimising the negative and emphasising the positive. It is a necessity to treat a medical problem related to underlying disease or injury.

Statements of participants about their catheter are: 'a necessary evil', 'a part of me', 'it makes life easier for me now', 'becomes second nature'. [179, page 34-35]

## 11.2 Sexuality and body-image

There is a lack of research how sexual intercourse is affected by catheter use. Patients with indwelling catheters can experience not only physical problems but also emotional problems. Several constraints may impair teaching/counseling about sexuality, including lack of privacy because of several caregivers in the home, insufficient information about patient's neurological status, cultural taboos, or views that chronically ill people do not have sexual needs and desires. Making adjustments in sexual activities can be a challenge for patients, require support, open communication, and sensitivity of nurses. But by not bringing up this sensitive subject, nurses put their patients in the uncomfortable position of having to introduce the topic themselves. It should be a part of the routine teaching. [179]

Advice which can be given:

- Discuss with patient that sexual behaviour encompasses a range of activities from caressing, kissing and masturbation to penetration of the vagina by the penis.
- Patients (or partner) can be taught to remove the catheter and replace it after intercourse.
- Women can tape the catheter on to the abdomen.
- Men can tape the catheter along the erect penis and secure it under a male external catheter [148]
- The drainage bag, once emptied, can be positioned out of the way in the bed.

- Alternatively, the drainage bag can be disconnected from the catheter and a valve attached during intercourse.
- A water-based lubrication can be used to facilitate insertion (oil-based lubrication can damage the catheter and rot the male external catheter).
- A suprapubic catheter, whenever possible, rather than a urethral catheter should be used.
- Different position during intercourse can be discussed. Of course the position should be comfortable for the patient, so he/she can relax. Some positions can cause increased traction on the catheter in females, such as a face-to-face position with the partner on top. Traction can be reduced by placing a pillow under the woman's bottom to raise the pelvis.

Recommendations	LE	GR
• It is recommended that these sexual issues should be discussed in an early stage of catheterisation before relationship problems may have occurred	4	C
• If possible, sometimes a sexual counsellor is an option to give advice and practical suggestions [48]	4	C

### 11.3 Social support

Wearing a catheter is often not a choice, and the experience leads to a time of embodied change, altering one's view of self within the world. [180] A lot of urological patients live with chronic illness and require ongoing care. It is generally argued that those with low levels of social support experience poorer quality of life and adjustment to illness.

In some countries there are foundations for patients, such as the Bladder and Bowel Foundation in the United Kingdom or the Pelvic Floor Foundation in The Netherlands. And also on the internet there are possibilities to meet other patients.

Recommendations	LE	GR
• Inform patients that joining a support organisation could be helpful	4	C

### 11.4 Patient and caregiver instruction on dismissal:

#### Advice and information

Many patients develop special skills in observing their bodies in relation to the catheter, such as the use of their hands to check periodically for the leg bag filling, or they feel the weight on his/her leg increasing. But most participants empty the bag on a schedule very similar to most people's daily pattern. Other skills are: awareness of changes of urine flow through the catheter, checking the tube for kinks, and especially for SCI-patients: symptoms of trigger autonomic dysreflexia. [104, 179]

As Wilde, 2003 [179] state: living with a long-term indwelling catheter can be a challenge, but with support and information about the best practice, individuals can adapt to this change.

Patients and care-givers should be provided with written and verbal information to support the following:

- Simple anatomy of the urinary tract
- What is a catheter, position of the catheter in the bladder in relation to function
- Hygiene and hand washing
- Care of the drainage system and obtaining further supplies
- How to set up a link system and care for a free-standing bag
- Frequency of catheter and bag changes
- Information on who will change their catheter
- Avoiding constipation, fluid intake advice
- How to recognise the onset of problems such as blockage and infection
- How to deal with specific problems, where and when to seek further advice (NS, the urologist or the urology department), date of re-catheterisation and who will do this
- Contact numbers to access advice and support

[37, 48]

Recommendations	LE	GR
• Patients should receive, written and oral, information about living with an indwelling catheter and its possible problems	4	C
• Patients should be informed about reimbursement for catheter equipment	4	C

## 11.5 Supply and reimbursement of catheter equipment

It is recommended that patients receive catheter packs from the hospital pharmacy or other medical suppliers, to ensure that the patient can start at home immediately. Equipment may vary, but consists mostly of a new catheter, leg bags, night bags, straps/stockinet holder, bed holder and/or a catheter valve. In case of a suprapubic catheter sometimes also a dressing may be required if secretions soil clothing, but this is not essential. [48]

Reimbursement differs in European countries as each country has its own healthcare insurance system and the personal insurance schemes also vary.

# 12. Documentation

Evidence-based guidelines such as this one are useful. Caregivers can convert these guidelines into local policies and procedures.

As Foulkes, 2008 [182] describes, there are still a lot of problems which patients with long-term indwelling catheters can experience. Without an ongoing catheter care protocol for patients with indwelling urinary catheters, important issues are likely to be neglected. [183]

There are different rules and experiences [184] of documentation in different countries. Written catheter care protocols are necessary to secure details of the procedure in the appropriate place. [12, 24, 65] The following issues should be recorded:

1. Catheter type/balloon/Ch/length
2. Batch number / Lot number
3. Expiry date
4. Date of insertion
5. Reason for catheterisation or changing catheter
6. Patients reaction to catheterisation and any complaints due to catheter in situ
7. Problems with catheter insertion and type of problem
8. Description of urine, colour and volume drained
9. Specimen collected
10. Identity of catheteriser

Some catheter manufacturers have printed booklets for this purpose that accompany their catheters.

Rew, 2005 [101] developed a form (catheter change record) in which the above issues are represented. Patients with long-term indwelling urethral catheters may profit from such a change record, because this may help detect and thus prevent potential problems such as encrustation.

*Example Catheter change record (adapted from Rew 2005), see Appendix Q*

In case of problems Mitchell, 2008 [173] developed an evidence-based long-term urinary catheter management flow chart. She reviewed the literature on evidence. As a result, for example, in this chart there is no recommendation about catheter maintenance solutions, because there is no evidence for this. It is a tool to be discussed with the patient and the clinical team on an individual patient basis. In case of blockage the literature advises to look back over at least the last 3 catheter changes (the catheter change record can be used for this).

*Decision flow chart on Draining of the catheter (adapted from Mitchell 2008) [173], see Appendix R*

<b>Recommendations</b>	<b>LE</b>	<b>GR</b>
<ul style="list-style-type: none"> <li>• Implement care plans for all patients with indwelling catheters</li> </ul>	4	C
<ul style="list-style-type: none"> <li>• In case of blocking problems a catheter change record of at least 3 catheter changes should be performed</li> </ul>	4	C



# 13. Abbreviations

- BOO Bladder outlet obstruction
- BWO Bladder washout
- CABF Catheter-associated bacteriuria
- CAI Community acquired infection
- CAUTI Catheter associated urinary tract infection
- CBI Continuous Bladder Irrigation
- CSU Catheter specimen of urine
- EDTA Ethylenediaminetetraacetic acid
- GA General anaesthetic
- HAI Hospital acquired infection
- IUC Indwelling urethral catheter
- NS Nurse specialist
- NUTI Nosocomial urinary tract infections
- PUBS Purple urine bag syndrome
- PVC Polyvinylchloride
- SCC Squamous cell carcinoma
- SPC Suprapubic catheterisation
- TCC Transitional cell carcinoma
- TURP Transurethral resection of the prostate
- UTI Urinary tract infection

# 14. Figure reference list

**Cover pictures:** Left and right picture: Source unknown

**Fig. 1 Female:** See cover picture

**Fig. 2 Male:** Provided by the American Urological Association Foundation, <http://www.urologyhealth.org/>

**Fig. 3 Without balloon:** Reproduced with kind permission of Hospital Santa Maria Lleida, Spain

**Fig. 4 With balloon:** See cover picture

**Fig. 5 Female urethral catheter:** See cover picture

**Fig. 6 Male suprapubic catheter:** See cover picture

**Fig. 7 One-way catheters for various uses as mentioned in the listing above this figure.**  
Courtesy T. Schwennesen, Denmark

**Fig. 8 2-way catheter and**

**Fig. 9 3-way catheter:** These illustrations were published in Essential Clinical Procedures, Richard W. Dehn, David P. Asprey, Vol. 1, 2nd ed., 2007: 205, Chapter 16, Urinary Bladder Catheterization by Dan Vetrosky. Copyright Saunders Elsevier (2011).

**Fig. 10 Catheter with a temperature sensor:** Courtesy C. Vandewinkel, Belgium

**Fig. 11 Suprapubic catheter with a balloon:** See cover picture

**Fig. 12 Suprapubic catheter without a balloon:** See Fig. 3

**Fig: 13a Open end catheter with a guide wire and**

**Fig. 13b a close-up picture where the guide wire enters the catheter:**  
Courtesy T. Schwennesen, Denmark

**Fig. 14 Catheter set:** Courtesy T. Schwennesen, Denmark

**Fig. 15 International colours of catheter size and 16. Examples of silicon and latex catheter lumen:** Reproduced with kind permission of Coloplast Denmark A/S

**Fig. 17 From top to bottom: Nelaton (latex), Nelaton (silicone) and Tiemann (silicone):**  
Courtesy T. Schwennesen, Denmark

**Fig. 18 Tiemann indwelling catheter (hard latex):** Courtesy C. Vandewinkel, Belgium

**Fig. 19 Inflated balloon in the bladder:** Reproduced with kind permission of the Rotherham District General Hospital, Rotherham, United Kingdom

**Fig. 20 Silicone Tiemann catheter with deflated and inflated balloon:**  
Courtesy T. Schwennesen, Denmark

- Fig. 21 Pre-connected drainage system:** Courtesy C. Vandewinkel, Belgium
- Fig. 22 Different types of leg bags:** Courtesy T. Schwennesen, Denmark
- Fig. 23 Collection of a catheter specimen of urine – needle free:** Courtesy T. Schwennesen, Denmark
- Fig. 24 The bag fixed at the leg:** Reproduced with kind permission of the Rotherham District General Hospital, Rotherham, United Kingdom
- Fig. 25 Special net for leg bag:** Courtesy C. Vandewinkel, Belgium
- Fig. 26 Leg bag of cotton and extra fixation on the abdomen:** Reproduced with kind permission of Netti A/S, Denmark
- Fig. 27 Examples of bag taps:** Reproduced with kind permission of the International Consultation on Urological Diseases (ICUD), Bristol, United Kingdom
- Fig. 28 A quadriplegic patient with a poor manual dexterity:** Courtesy T. Schwennesen, Denmark
- Fig. 29 Body worn bag:** Reproduced with kind permission of Teleflex Headquarters EMEA, Ireland, Teleflex Medical Europe Ltd., IDA Business Park, Athlone, Co. Westmeath, [www.teleflex.com](http://www.teleflex.com).
- Fig. 30 Different types of night bags:** Courtesy T. Schwennesen, Denmark
- Fig. 31 Overnight drainage system:** Reproduced with kind permission of the Rotherham District General Hospital, Rotherham, United Kingdom
- Fig. 32 Different catheter valves:** Courtesy T. Schwennesen, Denmark
- Fig. 33 and**  
**Fig. 34 Different types of catheter securement devices:** Courtesy T. Schwennesen, Denmark
- Fig. 35 Fixation of the catheter:** Source: unknown
- Fig. 36 Fixation of a urethral catheter**
- Fig. 37 Fixation of the urethral catheter/leg bag:** Courtesy C. Vandewinkel, Belgium
- Fig. 38 Fixation of the catheter with a securement device:** Courtesy D.K. Newman, United States of America
- Fig. 39 No touch technique:** Courtesy C. Vandewinkel, Belgium
- Fig. 40 Three lumen catheter for Continuous Bladder Irrigation:** Courtesy M. Gea-Sánchez, Spain
- Fig. 41 Syringe (60 ml) and sterile saline to remove clots:** Courtesy M. Gea-Sánchez, Spain

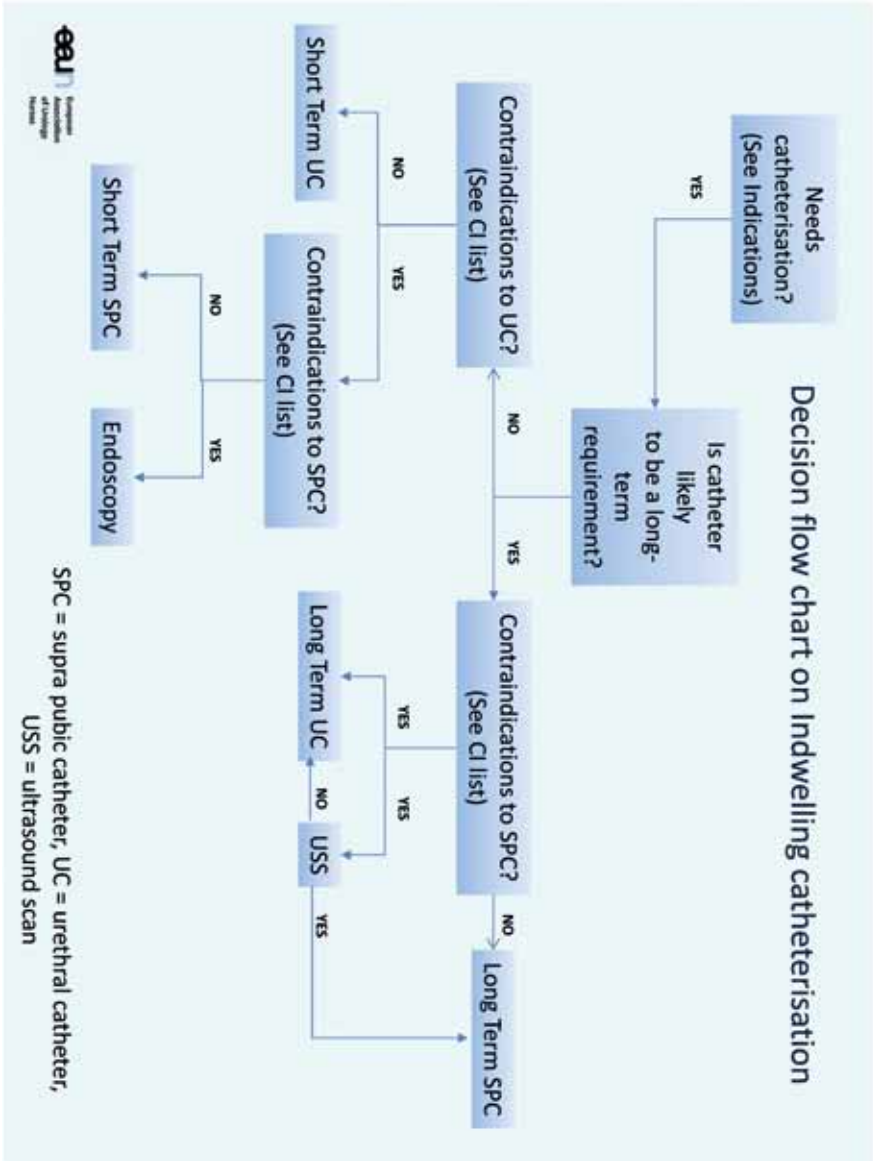
# 15. Appendices

Below a number of procedures are described. These procedures do not have a high level of evidence, but they are based on the experience of the working group as well from protocols, care standards of various hospitals. Subsequently the evidence level for these documents is 4 C.

- Appendix A Decision flow chart on Indwelling catheterisation
- Appendix B Male urethral catheterisation – insertion procedure
- Appendix C Female urethral catheterisation – insertion procedure
- Appendix D Insertion of a suprapubic balloon catheter
- Appendix E Patient information about common problems with indwelling catheter equipment
- Appendix F Observation of the urinary drainage
- Appendix G Possible colour and odour changes in urine due to food or medication
- Appendix H Preparation and procedure for changing a suprapubic catheter
- Appendix I Flow chart on Indwelling urethral catheter removal
- Appendix J Removal of the urethral catheter - procedure
- Appendix K Removal of the suprapubic catheter - procedure
- Appendix L Troubleshooting for indwelling catheters (Problem management)
- Appendix M Potential problems during catheter removal
- Appendix N Potential problems following removal of the catheter
- Appendix O Bladder washout – procedure and troubleshooting
- Appendix P Obtaining a urine sample from an indwelling catheter - procedure
- Appendix Q Example Catheter change record
- Appendix R Decision flow chart on Draining of the catheter

# Appendix A

## Decision flow chart on Indwelling catheterisation



# Appendix B

## Male urethral catheterisation – insertion procedure

### Checklist equipment:

1. Sterile catheterisation pack containing gallipots, receiver, low-linting swabs, disposable towels
2. Disposable pad for bed protection
3. 2 pairs of gloves, one of which must be sterile for handling catheter
4. Selection of appropriate catheters; it is advisable to take a spare catheter in addition to the one you want, and one of a different/smaller size
5. Sterile anaesthetic lubricating jelly (1- 2 tubes).
6. Universal specimen container, if required
7. Cleansing solution
8. Bactericidal alcohol hand disinfection.
9. 10 ml sterile water (inflation of balloon) or as recommended by manufacturer
10. Syringe and needle to draw up sterile water and inflate balloon
11. Disposable plastic apron/protective clothing
12. A closed urinary drainage system, e.g. a night bag, leg bag or catheter valve
13. A catheter drainage bag stand, if required

Action	Rationale
1. Check patient file for past problems, allergies etc.	To ensure the patient understands the procedure.
2. During the procedure explain the process to the patient.	Consent
3. a) Undertake procedure on the patient's bed or in clinical treatment area using screens/ curtains to promote and maintain dignity b) Assist the patient to get into the supine position to ensure the penis is accessible c) Do not expose the patient at this stage of the procedure.	To ensure patient's privacy.  To maintain patient's dignity procedure and comfort.
4. Wash hands using soap and water or bactericidal alcohol hand rub.	To reduce risk of infection.
5. Clean and prepare the trolley, placing all equipment required on the bottom shelf.	The top shelf acts as a clean working surface.
6. Take the trolley to the patient's bedside.	
7. Open the outer cover of the catheterisation pack and slide the pack onto the top shelf of the trolley.	To prepare equipment.

8. Using an aseptic technique, connect the bag to the catheter at this stage.	To reduce the risk of cross infection.
9. Remove cover that is maintaining the patient's privacy and position a disposable pad under the patient's buttocks and thighs.	To ensure urine does not leak onto bed.
10. Clean hands with a bactericidal alcohol hand rub.	Hands may have become contaminated by handling the outer packs.
11. Put on gloves.	To reduce risk of cross infection.
12. Place dressing / protective towel across the patient's thighs and under penis.	To create a protective field.
13. Lift the penis and retract the foreskin if present using a gauze swab and clean the glans penis with the solution. Beginning with the foreskin, the glans and urethral meatus at the end. Use a new swab for each part.	Lifting the penis straightens the penile urethra and facilitates catheterisation. To reduce the risk of introducing infection. [185]
14. Replace existing gloves with a sterile pair.	To prevent infection.
15. Slowly instill 10-15 ml of the (anaesthetic) lubricating gel into the urethra holding the penis firmly below the glans with thumb and fingers and the tip of the syringe firmly in the meatus to prevent the gel from leaking out.	Adequate lubrication helps to prevent urethral trauma. Use of a local anaesthetic minimises the discomfort experienced by the patient and can aid success of the procedure.
16. Remove the syringe tip from the urethra and keep the urethra closed. Alternatively, a penile clamp may be used.	To ensure that the gel stays in the urethra.
17. Wait as recommended on the product (3 to 5 min.)	To ensure a maximised anaesthetic effect. [65, 68, 69, 71, 186]
18. Advance the catheter gently to the bifurcation. Hold the penis all the time upright with traction of the other hand (if no urine drains gently apply pressure over the symphysis pubis area.	Advancing the catheter ensures that it is correctly positioned in the bladder. [75, 187, 188]
19. Slowly inflate the balloon according to the manufacturer's direction, having ensured that the catheter is draining urine beforehand.	Inadvertent inflation of the balloon in the urethra causes pain and urethral trauma. [63, 187]
20. Withdraw the catheter slightly.	Withdrawing the catheter ensures the balloon sits at the bladder base ensuring optimal urine drainage.

<p>21. Secure the catheter using a support strap. Ensure that the catheter does not become taut when patient is mobilising or when the penis becomes erect. (For Stabilisation of urethral catheter see 6.5.5)</p>	<p>To maintain patient comfort and to reduce the risk of urethral and bladder neck trauma.</p>
<p>22. Ensure that the glans penis is cleansed after the procedure and reposition the foreskin if present.</p>	<p>Retraction and constriction of the foreskin behind the glans penis resulting in paraphimosis may occur if this is not done. [65]</p>
<p>23. Help the patient into a comfortable position. Ensure that the patient's skin and the bed are both dry.</p>	<p>If the area is left wet or moist, secondary infection and skin irritation may occur.</p>
<p>24. Measure the amount of urine.</p>	<p>To be aware of bladder capacity for patients with previous occurrences of urinary retention. To monitor renal function and fluid balance. It is not necessary to measure the amount of urine if the patient is having the urinary catheter routinely changed.</p>
<p>25. Take a urine specimen for laboratory examination, if required.</p>	<p>To rule out urinary tract infection.</p>
<p>26. Dispose of equipment in a plastic clinical waste bag and seal the bag before moving the trolley.</p>	<p>To prevent environmental contamination.</p>
<p>27. Record information in relevant documents, this should include:</p> <ul style="list-style-type: none"> <li>• reasons for catheterisation</li> <li>• date and time of catheterisation</li> <li>• catheter type, length and size.</li> <li>• amount of water instilled into the balloon</li> <li>• batch number and manufacturer</li> <li>• drainage system used</li> <li>• problems negotiated during the procedure</li> <li>• review date to assess the need for continued catheterisation or date of change of catheter.</li> </ul>	<p>To provide a point of reference or comparison in the event of later queries.</p>
<p>28. Record patient experience and any problems. See Chapter 12</p>	<p>To provide a point of reference or comparison in the event of later queries.</p>



# Appendix C

## Female urethral catheterisation – insertion procedure

The needed equipment is the same as in male catheterisation (Appendix A)

Action	Rationale
Until point 12 the procedure is the same as for male catheterisation.	
13. Place dressing / protective towel under the patient.	To create a protective field.
14. Put on gloves	To reduce risk of cross infection.
15. Clean the meatus: labia majora, then the labia minor and finally the urethral meatus. One swab – one wipe anterior to posterior.	To avoid wiping any bacteria from the perineum and anus forwards towards the urethra.
16. Put on sterile gloves.	To prevent infection.
17. Separate the labia with one hand and give traction upwards.	To have a good view on the meatus and to minimise the risk of contamination of the urethra.
18. Apply a little lubrication to the meatus and then insert the conus of the syringe with (anaesthetic) lubrication in the meatus and slowly instill 6 ml of the gel into the urethra. Then remove the nozzle from the urethra.	Adequate lubrication helps to prevent urethral trauma. Use of a local anaesthetic minimises the discomfort experienced by the patient and can add to the success of the procedure.
19. Pick up the catheter with the hand with the sterile glove. Insert the catheter in the meatus and gently advance the catheter along the urethra until it reaches the bladder and urine flows out. Then insert the catheter 2 cm deeper.	Inadvertent inflation of the balloon in the urethra causes pain and urethral trauma [63, 187]  To be sure that the balloon is in the bladder.
20. Withdraw the catheter slightly.	Withdrawing the catheter ensures the balloon sits at the bladder base ensuring optimal urine drainage.
21. If the patient desires secure the catheter using a support strap. Ensure that the catheter does not become taut when patient is mobilising.	To maintain patient comfort and to reduce the risk of urethral and bladder neck trauma.
22. Ensure that the labia are cleaned after the procedure.	To avoid skin irritation.
23. Help the patient into a comfortable position. Ensure that the patient's skin and the bed are both dry.	If the area is left wet or moist, secondary infection and skin irritation may occur.
24. The same procedure as in men from point 27 et seq.	

# Appendix D

## Insertion of a suprapubic balloon catheter

Action	Rationale
1. Any practitioner (medical or nursing) who undertakes initial suprapubic catheter insertion or suprapubic re-catheterisation should have undergone a programme of training and clinical supervision and be assessed as competent to undertake this procedure. [23]	To comply with the correct protocols and procedures. To minimise risk.
2. Patients should have the procedure performed in a controlled environment.	To minimise short- and long-term risks of complications of suprapubic catheterisation.
3. An indwelling catheter is inserted into the bladder midline above the symphysis pubis.	Correct anatomical position.
4. An aseptic technique should be used to minimise the risk of infection at the time of initial insertion.	To minimise short- and long-term risk.
5. Insertion can be performed by using local anaesthetic injected into the subcutaneous tissue at the site of anatomical entry, followed by either a Seldinger technique or traditional trocar technique.	Use of local anaesthetic minimises the discomfort experienced by the patient.
6. Insertion of a suprapubic catheter may also be performed under general anaesthesia or under cystoscopic view.	Use of general anaesthetic minimises the discomfort experienced by the patient and will aid insertion of the suprapubic catheter.
7. Once a tract into the bladder has been made then ideally a catheter no smaller than size 12-14 Ch (in adults) should be used to drain the bladder.	To maintain a patent tract, to aid drainage and aid future catheter changes.
8. Using a size 12-14 Ch or above catheter with a 10 ml balloon allows for a patent and maintained tract to form between the bladder and the skin. [85]	To maintain a patent tract, to aid drainage and to aid future catheter changes.

[34]

# Appendix E

## Patient information about common problems with indwelling catheter equipment

Observation	Management
1. Emptying bag problem	Check whether there are other systems with different taps.
2. Incorrect position of the drainage bag above the level of the bladder	Teach patient to check regularly position of drainage bag.
3. Over full drainage bag	Clockwise emptying of drainage bag or write a protocol to see over time, when over filling of the bag occurs. Cell phone or alarm watch can be used. Ensure drainage bag is supported /stabilised correctly, advise patient / carer regarding catheter stabilisation devices.
4. Clothing problem	There are different clothes on the market such as underwear for catheterised people. Website keywords to find the products: "Bathing suits with bags for a drainage bag"
5. Occlusion of catheter lumen by tight clothing	Teach patients about occlusion by tight clothing. Teach patient to check if necessary.
6. Catheter straps occluding the non return valve of the drainage bag	Try different straps or catheter bag support products e.g. leg pockets / sporrans to support drainage bag.
7. Incorrect position of tubing	Should be correctly positioned and secured to allow free drainage and patient mobility.
8. Change in odour or colour of urine	See Appendix F: Possible colour and odour changes in urine. Inform patient about possible reasons for odour/colour change. Change in odour may be caused by urinary tract infection but this is not a reliable indicator of bacteriuria or infection. [189]
9. Kinking of catheter	Try non kinking catheter tubes. Check the positioning of the drainage bag. Tube can be stabilised with tape.
10. No flow of urine	Check whether the drainage bag is full, whether there is a kink in the catheter or drainage conduit, whether the catheter is still in the bladder and whether there was sufficient fluid intake.

[48, 54, 173, 179, 180]

# Appendix F

## Observation of the urinary drainage

Observation	Management
1. Is the drainage bag full?	Empty the drainage bag.
2. Is there a bend in the catheter or drainage conduit?	Make sure that the catheter and drainage tubing are not kinked or trapped.
3. Is the catheter blocked?	Lower the drainage system to aid gravity to see if urine then flows.
4. Is the catheter still in the bladder?	Check position of catheter, is the balloon visible?
5. Is the catheter balloon in the urethra?	Check if the patient experiences any pain, check if the balloon is visible. If so, remove the catheter after deflating the balloon.

# Appendix G

## Possible colour and odour changes in urine due to food or medication

Medication	Colour or odour of urine
Amitriptyline	Blue-green
Anthraquinones	Red-brown (in alkaline urine)
Antibiotics (not all)	Offensive smell
Chloroquine	Rusty brown, yellow
Danthron	Orange
Ferrous salts	Black
Ibuprofen	Red
Indomethacin	Green
Levodopa	Darkens
Methyldopa	Darkens (red-black on standing)
Metronidazole	Red to brown
Nitrofurantoin	Pink (alkaline)
Phenothiazines	Pink to red-brown
Rifampicin	Red to brown
Senna	Yellow-brown (acid urine); yellow-pink (alkaline urine) darkens on standing
Sulphonamides	Greenish blue
Triamterene	Blue
Uropyrine	Orange
Vitamin B complex	Dark yellow
Warfarin	Orange
<b>Caused by food and drink</b>	
Asparagus	Green colour and offensive smell (not in all patients)
Beetroot	Pink to dark red
Red fruit drinks	Pink to dark red
• Oily fish	Fishy
Total parenteral nutrition	Offensive
Certain food smells appear to pass through into the urine, e.g. onions, garlic, some spices	

Adapted from Landowski (2008) [190], Mason (2004) [93], Wallach (1992) [191] and Watson (1987) [192], EAUN guideline "Incontinent Urostomy" 2009, p37.

# Appendix H

## Preparation and procedure for changing a suprapubic catheter

Comply with local protocols and procedures with regard to change of suprapubic catheter (male and female).

### Checklist equipment:

1. Sterile catheterisation pack containing gallipots, receiver, low-linting swabs, disposable towels
2. Disposable pad for bed protection
3. 2 pairs of gloves, one of which must be sterile for handling catheter
4. Selection of appropriate catheters; it is advisable to take a spare catheter in addition to the one you want, and one of a different/smaller size
5. Sterile anaesthetic lubricating jelly (1- 2 tubes)
6. Universal specimen container, if required
7. Cleansing solution
8. Bactericidal alcohol hand disinfection
9. 10 ml sterile water (inflation of balloon) or as recommended by manufacturer
10. Syringe and needle to draw up sterile water and inflate balloon
11. Disposable plastic apron/protective clothing
12. A closed urinary drainage system, e.g. a night bag, leg bag or catheter valve
13. A catheter drainage bag stand, if required
14. Dressing and wound care set (supplementary pack)

Action	Rationale
1. Check patient file for past problems, allergies etc. During the procedure explain the process to the patient.	To ensure the patient understands the procedure.
2. Undertake procedure on the patient's bed or in clinical treatment area using screens/ curtains to promote and maintain dignity Assist the patient to get into a comfortable supine position to ensure the suprapubic tract is accessible. Do not expose the patient at this stage of the procedure.	To ensure patient's privacy.  To maintain patient's dignity procedure and comfort.
3. Wash hands using soap and water or bactericidal alcohol hand rub.	To reduce risk of infection.
4. Put on a disposable plastic apron or protective clothing.	To reduce risk of cross infection from microorganisms on uniform.

5. Clean and prepare the trolley, placing all equipment required on the bottom shelf. Assemble all of the necessary equipment. The catheter size and amount of water instilled in the balloon should be the same as the existing suprapubic catheter.	The top shelf acts as a clean working surface. To ensure you have all required equipment.
6. Take the trolley to the patient's bedside.	Equipment easily to hand to perform procedure.
7. Open the outer cover of the catheterisation pack and slide the pack onto the top shelf of the trolley.	To prepare equipment.
8. Using an aseptic technique, connect the bag to the catheter at this stage.	To reduce the risk of cross infection.
9. Using an aseptic technique, open the supplementary packs.	To reduce the risk of cross infection.
10. Remove cover that is maintaining the patient's privacy and position a disposable pad under the patient's buttocks and thighs.	To ensure urine does not leak onto bed.
11. Clean hands with a bactericidal alcohol hand rub.	Hands may have become contaminated by handling the outer packs.
12. Put on gloves.	To reduce risk of cross infection.
13. Observe the current suprapubic site for the lie of the catheter, angle of insertion and how much of the catheter length is visible outside the body as this information will be a useful guide for the insertion technique for the new catheter. [193]	To aid removal and re-insertion of suprapubic catheter
14. Place dressing / protective towel across the patient's abdomen.	To create a protective field.
15. Lift the present using a gauze swab and clean the cystostomy site with the solution.	To reduce the risk of introducing infection.
16. Replace existing gloves with a sterile pair and place new sterile towel at the cystostomy site.	It is too early for the sterile gloves when preparing for an aseptic catheterisation procedure. They must be put on just before placing the new catheter.
17. Deflate balloon without suction of existing catheter and remove catheter. Ensure you have sterile gauze at hand, to put on SPC insertion to prevent leakage. After this has been carried out it is advisable to put on sterile gloves and insert the new catheter immediately.	To prevent a cuff or wrinkles at the balloon; it will aid success of the procedure. A 2 person technique can be used, one person removes the catheter whilst the 'aseptic' person inserts the new catheter.

<p>18. Insert 5 ml to 10 ml of water-soluble lubricant or local anaesthetic gel into the suprapubic tract. Advance the catheter into the tract 3 cm or 1 inch deeper than it was before and not more to prevent the catheter tip irritating the bladder wall and to prevent that the catheter passes the urethra. If no urine drains gently apply pressure over the symphysis pubis area. Once urine drains, insert the catheter approximately 2 inches or 5 cm further to ensure the catheter is in the bladder and not the suprapubic tract.</p>	<p>Adequate lubrication helps to prevent trauma. Use of a local anaesthetic minimises the discomfort.</p>
<p>19. Slowly inflate the balloon according to the manufacturer's direction, having ensured that the catheter is draining urine beforehand.</p>	<p>Inadvertent inflation of the balloon in the suprapubic tract causes pain and trauma.</p>
<p>20. Withdraw the catheter slightly and attach the drainage bag/system if this has not already been done.</p>	<p>Withdrawing the catheter ensures the balloon sits in the bladder, ensuring optimal urine drainage.</p>
<p>21. Secure the catheter using a support strap. Ensure that the catheter does not become taut when patient is mobilising.</p>	<p>To maintain patient comfort and to reduce trauma/traction being applied to the stoma.</p>
<p>22. Help the patient into a comfortable position. Ensure that the patient's skin and the bed are both dry. Assist the patient with dressing into own clothing.</p>	<p>If the area is left wet or moist, secondary infection and skin irritation may occur. Maintain privacy and dignity.</p>
<p>23. Measure the amount of urine.</p>	<p>To be aware of bladder capacity for patients with previous occurrences of urinary retention. To monitor renal function and fluid balance. It is not necessary to measure the amount of urine if the patient is having the urinary catheter routinely changed.</p>
<p>24. Take a urine specimen for laboratory examination, if required.</p>	<p>To rule out urinary tract infection.</p>
<p>25. Dispose of equipment in a plastic clinical waste bag and seal the bag before moving the trolley.</p>	<p>To prevent environmental contamination.</p>




<p>26. Record information in relevant documents, this should include:</p> <ul style="list-style-type: none"> <li>• reasons for catheterisation</li> <li>• residual volume</li> <li>• date and time of catheterisation</li> <li>• catheter type, length and size.</li> <li>• amount of water instilled into the balloon</li> <li>• batch number and manufacturer</li> <li>• drainage system used</li> <li>• problems negotiated during the procedure</li> <li>• review date to assess the need for continued</li> <li>• catheterisation or date of change of catheter.</li> <li>• observation of cystostomy site</li> </ul> <p>See Chapter 12.</p>	<p>To provide a point of reference or comparison in the event of later queries.</p>
<p>27. Record patient experience and any problems. See Catheter change record (Chapter 12).</p>	<p>To provide a point of reference or comparison in the event of later queries.</p>

### No touch technique for changing suprapubic catheter

Use the internal package of the indwelling catheter to place the catheter in the bladder.  
Do not touch the catheter itself.

1 – 14. The same as above	
<p>15. Place the receiver containing the catheter on the sterile field. Remove the exterior package of the indwelling catheter. Open the package of the urinary bag and remove the preperforated part of the interior package at the end of the indwelling catheter and connect the urinary bag.</p>	<p>To prevent contamination of the catheter.</p>
<p>16. Deflate balloon (without suction) of existing catheter and remove catheter.</p>	<p>To prevent a cuff or wrinkles at the balloon.</p>
<p>17. Insert 5 to 10 ml of water-soluble lubricant or local anaesthetic gel into the suprapubic tract.</p>	<p>Adequate lubrication helps to prevent trauma. Use of a local anaesthetic minimises the discomfort experienced by the patient and can aid success of the procedure.</p>

<p>18. Remove the preperforated front part of the intern package so that the first 5 cm or 2 inch of the catheter is free. Advance the catheter into the tract 3 cm or 1 inch deeper than it was before and not more to prevent that the catheter tip irritates the bladder wall and to prevent that the catheter passes the urethra. When no urine drains gently apply pressure over the symphysis pubis area. Once urine returns, insert the catheter approximately 5 cm or 2 inches further to ensure the catheter is in the bladder and not the suprapubic tract.</p>	<p>Advancing the catheter ensures that it is correctly positioned in the bladder.</p>  <p><i>Fig. 39 No touch technique</i> (Source: C. Vandewinkel)</p>
<p>19. Slowly inflate the balloon according to the manufacturer's direction, having ensured that the catheter is draining urine beforehand.</p>	<p>Inadvertent inflation of the balloon in the suprapubic tract causes pain and trauma.</p>
<p>20. Open the rest of the package by the preperforated part and remove the package.</p>	
<p>21. Withdraw the catheter slightly.</p>	<p>Withdrawing the catheter ensures the balloon sits in the bladder, ensuring optimal urine drainage.</p>
<p>22. Secure the catheter using a support strap. Ensure that the catheter does not become taut when patient is mobilising.</p>	<p>To maintain patient comfort and to reduce trauma/traction being applied to the stoma.</p>
<p>23. Help the patient into a comfortable position. Ensure that the patient's skin and the bed are both dry. Assist the patient with dressing into own clothing.</p>	<p>If the area is left wet or moist, secondary infection and skin irritation may occur. Maintain privacy and dignity.</p>
<p>24. Measure the amount of urine.</p>	<p>To be aware of bladder capacity for patients with previous occurrences of urinary retention. To monitor renal function and fluid balance. It is not necessary to measure the amount of urine if the patient is having the urinary catheter routinely changed.</p>
<p>25. Take a urine specimen for laboratory examination, if required.</p>	<p>To rule out urinary tract infection.</p>
<p>26. Dispose of equipment in a plastic clinical waste bag and seal the bag before moving the trolley.</p>	<p>To prevent environmental contamination.</p>

<p>27. Record information in relevant documents, this should include:</p> <ol style="list-style-type: none"> <li>reasons for catheterisation</li> <li>residual volume</li> <li>date and time of catheterisation</li> <li>catheter type, length and size.</li> <li>amount of water instilled into the balloon</li> <li>batch number and manufacturer</li> <li>drainage system used</li> <li>problems negotiated during the procedure</li> <li>review date to assess the need for continued catheterisation or date of change of catheter.</li> <li>observation of cystostomy site.</li> </ol> <p>See Chapter 12.</p>	<p>To provide a point of reference or comparison in the event of later queries.</p>
<p>Record patient experience and any problems. See Catheter change record (Chapter 12).</p>	<p>To provide a point of reference or comparison in the event of later queries.</p>

### Changing a Suprapubic catheter with a Seldinger technique

An open-end catheter is used. Special changing sets are available. (see section 5.1.5)

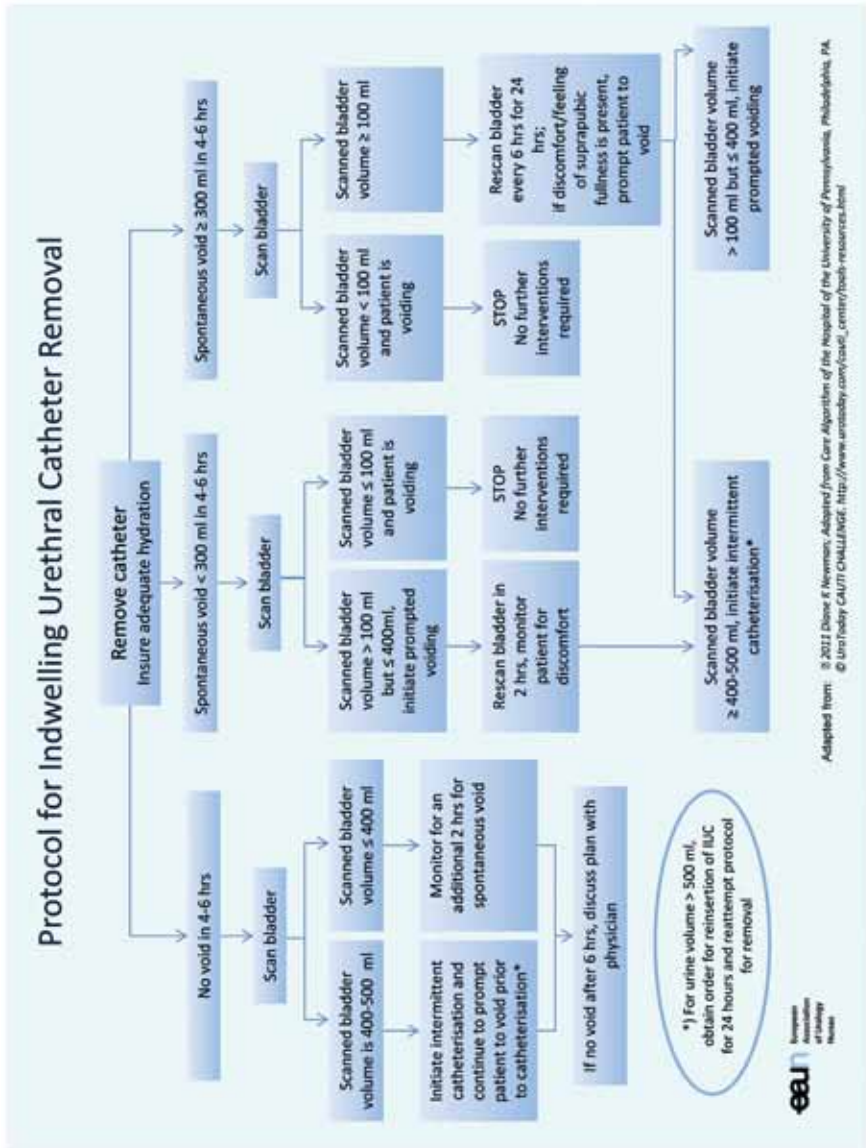
1 – 14. The same as above	
<p>15. Place the receiver containing the catheter on the sterile field. Connect the collecting bag/the catheter system. Disconnect the catheter.</p>	<p>To prevent contamination of the catheter.</p>
<p>16. Pull the catheter straight upwards and keep it in this position. Insert the mandrain through the catheter 3 cm or 1 inch further than the length of the catheter. Deflate balloon (without suction) of existing catheter and remove catheter. Remove the old catheter over the mandrain and keep the mandrain in the same position. After this has been carried out it is advisable to put on sterile gloves and insert the new catheter immediately.</p>	<p>To prevent a cuff or wrinkles at the balloon.</p> <p>A two-person technique can be used: one person removes the catheter whilst the 'aseptic' person inserts the new catheter.</p>

<p>17. Insert 5 ml to 10 ml of water-soluble lubricant or local anaesthetic gel into the suprapubic tract. Bring the new catheter over the mandrain Advance the new catheter into the tract 3 cm or 1 inch deeper than it was before and not more.</p> <p>When no urine drains gently apply pressure over the symphysis pubis area. Once urine returns, insert the catheter approximately 5 cm or 2 inches further to ensure the catheter is in the bladder and not the suprapubic tract.</p> <p>Remove the mandrain.</p>	<p>Adequate lubrication helps to prevent trauma. Use of a local anaesthetic minimises the discomfort.</p> <p>Advancing the catheter ensures that it is correctly positioned in the bladder to prevent that the catheter tip irritates the bladder wall and to prevent that the catheter passes the urethra.</p>
<p>18. Slowly inflate the balloon according to the manufacturer's direction, having ensured that the catheter is draining urine beforehand.</p>	<p>Inadvertent inflation of the balloon in the suprapubic tract causes pain and trauma.</p>
<p>19. Withdraw the catheter slightly and attach the drainage bag/system if this has not already been done.</p>	<p>Withdrawing the catheter ensures the balloon sits in the bladder, ensuring optimal urine drainage.</p>
<p>20. Secure the catheter using a support strap. Ensure that the catheter does not become taut when patient is mobilising.</p>	<p>To maintain patient comfort and to reduce trauma/traction being applied to the stoma.</p>
<p>21. Help the patient into a comfortable position. Ensure that the patient's skin and the bed are both dry. Assist the patient with dressing into own clothing.</p>	<p>If the area is left wet or moist, secondary infection and skin irritation may occur. Maintain privacy and dignity.</p>
<p>22. Measure the amount of urine.</p>	<p>To be aware of bladder capacity for patients with previous occurrences of urinary retention. To monitor renal function and fluid balance. It is not necessary to measure the amount of urine if the patient is having the urinary catheter routinely changed.</p>
<p>23. Take a urine specimen for laboratory examination, if required.</p>	<p>To rule out urinary tract infection.</p>
<p>24. Dispose of equipment in a plastic clinical waste bag and seal the bag before moving the trolley.</p>	<p>To prevent environmental contamination.</p>

<p>25. Record information in relevant documents, this should include:</p> <ul style="list-style-type: none"> <li>• reasons for catheterisation</li> <li>• residual volume</li> <li>• date and time of catheterisation</li> <li>• catheter type, length and size.</li> <li>• amount of water instilled into the balloon</li> <li>• batch number and manufacturer</li> <li>• drainage system used</li> <li>• problems negotiated during the procedure</li> <li>• review date to assess the need for continued catheterisation or date of change of catheter.</li> <li>• observation of cystostomy site.</li> </ul> <p>See Chapter 12.</p>	<p>To provide a point of reference or comparison in the event of later queries.</p>
<p>26. Record patient experience and any problems. See Catheter change record (Chapter 12).</p>	<p>To provide a point of reference or comparison in the event of later queries.</p>

# Appendix I

## Flow chart on Indwelling urethral catheter removal



# Appendix J

## Removal of the urethral catheter - procedure

### Checklist equipment:

1. Disposable gloves
2. Syringe for deflating balloon
3. Disposable pad (to protect bed)
4. Plastic disposable apron or protective clothing
5. Gauze swabs / disposable wipes

Action	Rationale
1. a) Catheters can be removed at night before 24h b) Catheters are often removed early in the morning (refer to local policy).	Shorter hospital stay. So that any retention problems can be dealt with during the day. [91]
2. Explain procedure to patient and inform him of the potential symptoms that may occur following removal, i.e., incontinence, urgency, frequency, dysuria, discomfort and retention.  Symptoms should resolve over the following 24-48 hours. If not, further investigation may be needed e.g., mid-stream urine specimen taken for culture.  Discuss the need for an adequate oral fluid intake of approximately 2-3 litres of fluid per day (30 ml/kg/day).	For adequate flushing of the bladder, and to help dilute and expel debris or infected urine, if present.
3. Check volume of water in balloon (refer to patient documentation), then use syringe to deflate balloon.	To confirm how much water is in the balloon. To ensure balloon is completely deflated before removing catheter. [106, 194, 195]
4. Attach the syringe to catheter valve to deflate the balloon. Do not use suction on the syringe but allow the solution to come back spontaneously. [106]	
5. Ask patient to breathe in and then out: as patient exhales, gently remove the catheter. Male patients should be warned of discomfort as the deflated balloon passes through the prostatic urethra.	To relax pelvic floor muscles.
6. Clean meatus using gauze / disposable wipe, clear away equipment, and make the patient comfortable.	
7. Used equipment should be placed in clinical waste bag and disposed of in line with local policy.	To reduce risk of cross infection to others.

# Appendix K

## Removal of the suprapubic catheter - procedure

### Checklist equipment:

1. Disposable gloves
2. Syringe for deflating balloon
3. Disposable pad (to protect bed)
4. Plastic disposable apron or protective clothing
5. Gauze swabs / disposable wipes
6. Sterile absorbing dressing and tape

Action	Rationale
1. Patient dignity	
<p>2. Explain procedure to patient and inform him of the potential symptoms that may occur following removal, i.e. incontinence, urgency, frequency, dysuria, discomfort and retention. Possibly also loss of urine through the suprapubic fistula.</p> <p>Symptoms should resolve over the following 24-48 hours. If not, further investigation may be needed e.g. mid-stream urine specimen taken for culture.</p> <p>Discuss the need for an adequate oral fluid intake of approximately 2-3 litres of fluid per day (30 ml/kg/day).</p>	For adequate flushing of the bladder, and to help dilute and expel debris or infected urine, if present.
3. Check volume of water in balloon (refer to patient documentation), then use syringe to deflate balloon.	To confirm how much water is in the balloon. To ensure balloon is completely deflated before removing catheter. [106, 194, 195]
4. Attach the syringe to catheter valve to deflate the balloon. Do not use suction on the syringe but allow the solution to come back spontaneously. [106]	To prevent cuff and wrinkles at the balloon
5. Ask patient to breathe in and then out: as patient exhales, gently remove the catheter.	To relax pelvic floor muscles.
<p>6. Clean suprapubic fistula using gauze / disposable wipe, clear away equipment, put on an occlusive absorbent dressing and make the patient comfortable.</p> <p>Ask the patient to sit or walk and not lie down.</p> <p>Check whether the dressing is dry after 1 hour. If not, check regularly until it is dry.</p>	<p>Big absorb dressing is for the loss of urine that can be voluminous in the beginning.</p> <p>To prevent a voluminous loose of urine.</p> <p>Sometimes it takes 1 day before the fistula is dry.</p>



<p>7. Used equipment should be placed in clinical waste bag and disposed of in line with local policy.</p>	<p>To reduce risk of cross infection to others.</p>
<p>8. Document procedure and note any difficulties / problems experienced.</p> <p>Commence fluid balance chart for monitoring patient's ability to void urine following removal of the catheter.</p>	<p>To ensure any problems are documented for future reference.</p> <p>To monitor for potential problems following removal of catheter i.e. retention of urine; if patient does not void in the first four to six hours, or if they are experiencing suprapubic pain then a bladder scan and discussion with medical team is indicated. Re-catheterisation could be indicated in this event.</p>

# Appendix L

## Troubleshooting for indwelling catheters (Problem management)

Problem	Cause	Suggested action
1. Urinary tract infection introduced during catheterisation.	Inadequate aseptic technique and / or urethral cleansing. Contamination of catheter tip.	Manage and treat immediate symptoms, inform medical staff. Obtain a catheter specimen of urine.
2. Urinary tract infection introduced via the drainage system.	Inappropriate handling of equipment. Breaking the closed system.	As above.
3. Urethral mucosal trauma.	Incorrect size or positioning of catheter. Poor insertion technique.	Check the catheter support and apply or reapply as necessary. Re-catheterise the patient using the correct size catheter.
	Creation of false passage as a result of catheter insertion technique.	Remove catheter if not draining urine. Seek medical advice.
4. Inability to tolerate indwelling catheter.	Urethral and / or bladder mucosal irritation.	Use catheter support strap to prevent unnecessary pulling. Discuss use of anti-cholinergic medication with medical staff. Consider use of 100% silicone catheter in cases of suspected latex hypersensitivity. [76, 82, 197]
	Impacting on patient's self-image.	Explain the need for and function of the catheter. Offer reassurance and support. Discuss alternative management options with the multi-disciplinary healthcare team.
5. Inadequate drainage of urine.	Kinked drainage tubing.	Ensure free flow of urine.
	Blocked tubing, e.g., blood clots, debris.	If a three-way catheter is in place commence irrigation. If a standard indwelling catheter is in use, see bladder washout, chapter 8.
	Incorrect placement of a catheter. e.g. in bladder neck.	Re-site the catheter.

6. Leakage of urine around catheter (bypassing).	Bladder irritation.	Ensure the catheter / drainage system is well supported. Discuss use of anticholinergic therapy with medical staff.
	Irritation from the catheter balloon.	Ensure a 10 ml balloon catheter has been used for standard drainage.
	Incorrect size of catheter.	Replace with the correct size, usually 2 Ch smaller.
7. Catheter falls out.	Incorrect filling of the balloon.	Check whether the amount of water in the balloon was sufficient.
	Incorrect fixation of a balloon free catheter.	Check fixation of the catheter.
	Catheter balloon may have deflated, accidental trauma.	Catheter needs to be replaced as soon as possible as the suprapubic tract may close. Contact catheter nurse specialist or health care professional immediately for re-insertion of new catheter.

# Appendix M

## Potential problems during catheter removal

Problem	Cause	Suggested action
1. Unable to deflate balloon.	Damaged or faulty valve on the inflation / deflation arm of the catheter.	Check the valve for evidence of damage. Try adding 2-3 ml of sterile water into inflation channel to dislodge blockage. If unsuccessful use a syringe and needle to aspirate the fluid from the inflation arm (above the valve). [196]
	Channel obstruction.	Attach syringe to the inflation arm and leave in place for 20-40 minutes. The effect of gravity will help with the deflation process. [196]
		Squeeze the visible tubing to try and displace crystal formation in inflation channel. [196] Snip the balloon tube and insert a small mandrain and perforate the balloon. It is necessary that the bladder is full and the balloon is retracted to the bladder neck.
		If the above are unsuccessful refer to medical staff as the balloon will need to be punctured suprapubically using a needle under ultrasound visualisation. [196, 198]
		Following catheter removal the balloon should be inspected to ensure it is intact and that there are no fragments left in the bladder. [196, 198]
2. Wrinkling of balloon following deflation resulting in formation of a 'cuff'.	Balloon unable to return to pre-inflation shape resulting in formation of a ridge.	Withdraw catheter gently on deflation of balloon, but if resistance experienced stop the procedure. Using a syringe re-insert 1-2 ml of saline (NaCl) back into the balloon; this action will prevent formation of a 'cuff'. Withdrawal of the catheter should now be easier and patient discomfort and potential urethral trauma will be reduced.
3. Pain	Balloon cuffing (as above) or sensitivity experienced at the bladder neck or within the urethra from the catheter.	Good patient preparation and support throughout the procedure is essential so that the patient is relaxed and fully aware of what to expect. Inserting anaesthetic (lignocaine/lidocaine) gel into the drainage port of the catheter 3-5 minutes prior to removal can reduce sensitivity at the bladder neck. It should be noted that more than 2-3 ml will need to be used as this volume will remain within the catheter. [198]

Note: If you experience any product failure or difficulties it is important that the manufacturer is contacted and informed of the problem.

# Appendix N

## Potential problems following removal of the catheter

Problem	Cause	Suggested action
1. Frequency and dysuria.	Inflammation of the urethral mucosa.	Ensure a fluid intake of 2-3 litres per day (30 ml/kg/day) Advise the patient that frequency and dysuria is common but will usually be resolved once micturition has occurred at least three times. Inform medical staff if the problem persists.
2. Retention of urine.	Inability of the bladder to empty. Patient anxiety.	Encourage the patient to increase fluid intake. Offer the patient a warm bath to promote relaxation. If unsuccessful perform manual palpation of the bladder or a bladder scan (if the equipment is available) and inform medical staff if the problem persists as the patient may require re-catheterisation.
3. Bacteriuria / urinary tract infection.	Resulting in frequency and dysuria.	Encourage a fluid intake of 2-3 litres a day to promote flushing of the bladder. Collect a specimen of urine if symptoms persist and inform medical staff. Administer prescribed antibiotics.
4. Small amounts of blood at the start, throughout or at the end of the patient's urine stream.	Minor damage of tissue in urethra.	Encourage the patient to increase fluid intake. Reassure patient that the condition is harmless. Inform patient of signs of UTI.
5. The urge to urinate and not get to the container or bathroom in time.		Explain to the patient this resolves mostly within the first 24-48 hours If not: urinary culture to exclude UTI.
6. Dribbling. This problem should subside within several days.		Give patient pads. Teach patient pelvic floor exercises. Explain that this is mostly a short-term complication as result of the catheter.

[79]

# Appendix O

## Bladder washout – procedure and troubleshooting

### Before starting the procedure you have to consider:

- Management and maintenance of three-way Foley catheter (Fig. 40) involves a closed drainage system and sterile technique;
- Saline solution for infusion should be stored and infused at room temperature to avoid bladder spasms;
- Strict “Intake and Output” is recommended for all patients receiving Continuous Bladder Irrigation (CBI). Special attention to frail elderly and/or history of pelvic floor or bladder radiation should be paid. These patients are at high risk for bladder perforation.

### Equipment

- Sterile 0.9% sodium chloride irrigation bags (3000 ml)\*
- Irrigation tubing
- Foley (3-way)
- Large Foley drainage bag
- 60 ml syringe
- Sterile saline (50 ml)

### Implementation process

- Foley (3-way) insertion (see section 5.1.3. and 6.2).
- Connect the middle lumen to drainage bag (2000 ml)
- Connect the third lumen to sodium chloride irrigation bags. The speed of irrigation depends on haematuria and bladder characteristics.
- Use strict aseptic technique when handling any of the equipment to prevent introduction of microorganisms into the urinary tract.



*Fig. 40 Three lumen catheter for Continuous Bladder Irrigation*

*(Source: M. Gea-Sánchez)*

## Troubleshooting

### 1. Drainage out is less than irrigation infused

- Stop the irrigation. (Recalculate “Intake and Output”);
- Ensure that tubing is not kinked or looped below bladder level;
- Palpate bladder for distention. (Use bladder scanner if available, to facilitate genitourinary assessment as per unit’s routine);
- If obstruction is suspected, gentle manual irrigation may be required as per physician’s orders;
- Cleanse the catheter opening. Use nothing smaller than a 60 ml syringe and sterile saline (Fig. 41);
- Use slow, even pressure to avoid damaging the bladder wall. Do not force if resistance is met;
- Allow irrigation to flow back freely.



*Fig. 41 Syringe (60 ml) and sterile saline to remove clots*

*(Source: M. Gea-Sánchez)*

### 2. Increased bloody drainage or presence of clots.

- Increase rate of irrigation infusion as per physician’s orders;
- Irrigation of catheter as outlined in 1 to aid in clot removal may be indicated;
- If large amount blood or clots persists, notify physician.

### 3. Patient complains of pain: (Complete pain assessment using the 0-10 or visual analogue scale)

- Palpate bladder to determine presence of distention;
- Check drainage tubing for kinks;
- Observe drainage for adequate amount, presence of clots that might be blocking drainage tube. Evaluate “Intake and Output;”
- Avoid cold irrigation solution as it may cause bladder spasm.

### 4. The patient is confused/agitated

- Assess if patient is orientated to time, place, person;
- Have relevant information ready to share (i.e. amount of opioids received, amount of CBI received, true urine output, time of onset of alteration in orientation, sodium level; in TURP syndrome an overload of fluid through the prostatic sinuses can lead to dilutional hyponatremia, confusion and hypertension).

### 5. Solution leaks around the Foley catheter

- Assess for bladder spasms;
- Refer to #1 – assessing for obstruction;
- Consider administering antispasmodic i.e. Buscopan.

## Documentation

Documentation includes:

- Patient's comfort/pain level (how procedure is being tolerated)
- Colour and type of drainage, presence of clots/fragments
- Intake and output; use following calculation:  
**CBI infused- Foley output = True urine output**
- Interventions required (manual irrigation, use of bladder scanner)
- Health teaching done with patient and family
- Patient concerns/adverse reactions (i.e. continued bladder spasms, decreased total urine output), the nursing actions taken and patient outcomes

\*A Cochrane systematic review (2010) concluded that there are no differences between saline, acid or antibiotic solutions. [137]

Adapted from: Grey Bruce Health Network. Continuous Bladder Irrigation Clinical Protocol. 2007. [167]



# Appendix P

## Obtaining a urine sample from an indwelling catheter - procedure

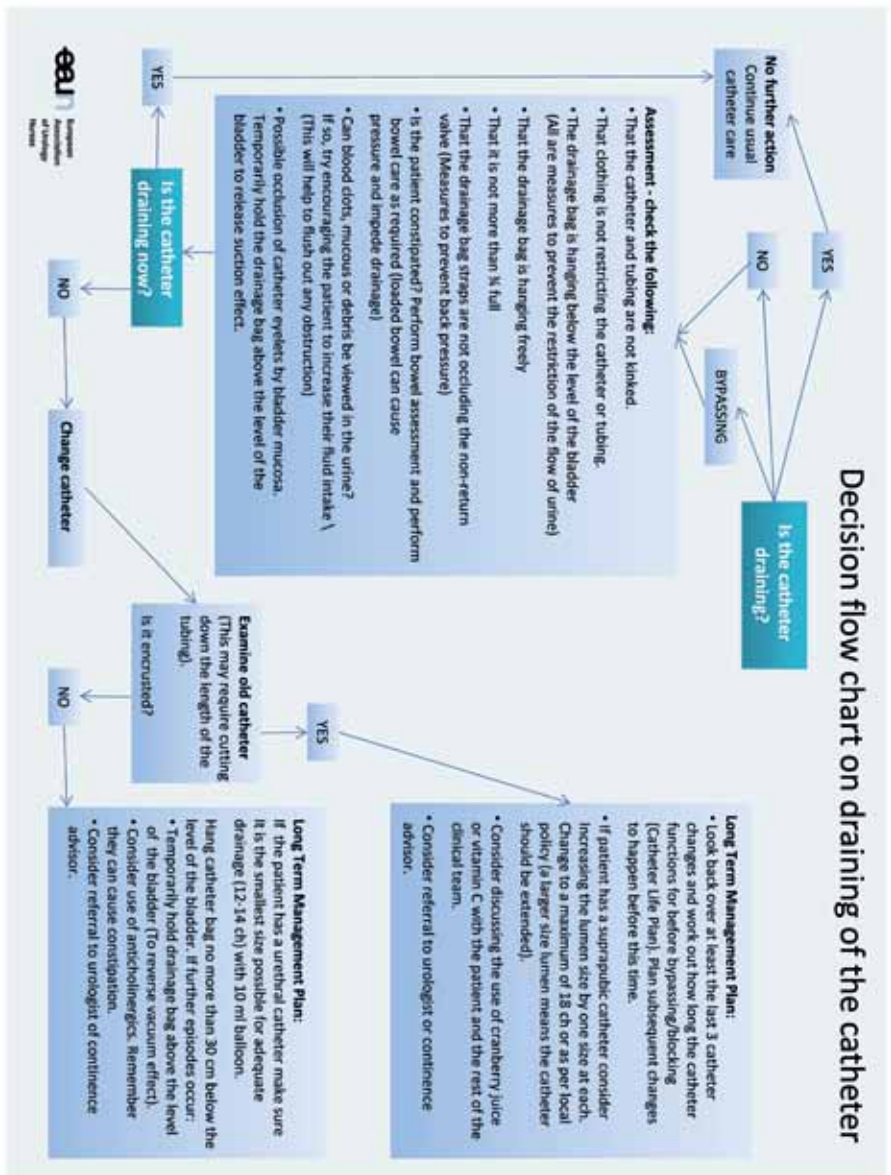
1. Obtain consent and ensure the procedure is performed maintaining patient dignity
2. Wash your hands and put on an apron. Clean hands with alcohol hand rub.
3. If there is no urine visible in the catheter tubing then a clamp may be placed a few centimetres distal to the sampling port.
4. Once there is sufficient urine visible in the drainage tube above the clamp, then wipe the sampling port with an alcohol swab and allow to dry.
5. Insert a sterile syringe into the needle-free sampling port. Aspirate the required amount of urine.
6. Remove the syringe and transfer specimen into sterile specimen pot.
7. Wipe the sampling port with an alcohol swab and allow to dry.
8. Unclamp the drainage tubing.
9. Dispose of all waste materials.
10. Wash hands.
11. Complete documentation according to the organisational guidelines.
12. Dispatch the specimen to the laboratory.



# Appendix R

## Decision flow chart on Draining of the catheter

(Adapted from Mitchell 2008) [173]



# 16. About the authors

## **Veronika Geng (DE)**

Registered Nurse, Infection Control Practitioner, Coach for Quality in Health Care, MSc in health science specialisation in nursing.

Veronika Geng currently works as a project leader for the Manfred-Sauer-Foundation in Lobbach, Germany. She has performed clinical studies on the incidence of hospital-acquired UTIs. Veronika previously contributed, as a panel member, to guidelines on male external catheters and also produced an instructional videotape on this topic.

Special interests: nutrition, bladder and bowel management in people with spinal cord injury.

## **Hanny Cobussen-Boekhorst (NL)**

Registered Nurse and Nurse Practitioner in continence and urostomy care for adults and children at the Department of Urology of the University Medical Centre St. Radboud, Nijmegen, The Netherlands. Hanny is a frequent speaker at national and international conferences and is involved in the national continence course for nurses in The Netherlands. In 2007, Hanny developed a patient information booklet about clean intermittent catheterisation, including a protocol for nurses, in collaboration with the National Continence Nursing Society of The Netherlands.

Hanny is a member of the National Continence Nursing Society and a member of their conference board. She is also a member of the National Stoma Nursing Society, a member of the ESPU-N (European Society for Paediatric Urology Nurses Group), and a member of the EAUN.

Special interests: urological problems in patients with multiple sclerosis and (children with) spina bifida and extrophia vesicae, as well as urotherapy in children.

## **Jan Farrell (UK)**

Registered General Nurse, qualified in 1977. Jan has had a varied nursing career working in Cardiology, ITU, Accident and Emergency Department and Urology.

Jan currently is a Nurse Consultant for Urological Services at Rotherham General Hospital, UK Whilst working in Urology she has developed various nurse-led services e.g. ISC, Prostate Cancer Follow-up, Lower Urinary Tract assessment clinics and Andrology.

Jan has developed patient information booklets and guidelines for principles of effective practice with regard to catheterisation.

Special interest: ISC.

### **Montserrat Gea-Sánchez (ES)**

Registered Nurse. Clinical Nurse at the Urology Department of Hospital Santa Maria (GSS), Lleida, Spain from 1999 to 2010. Currently, Montserrat is a professor of the Faculty of Nursing at the University of Lleida and involved in developing several research projects in Urology related to prostate and bladder cancer in collaboration with clinicians.

Montserrat is a member of the Spanish Association of Urology Nurses and a member of the board. She is also the Secretary of the College of Nurses in Lleida where she is responsible for the development of ongoing learning and research programmes. She is also part of the board of the Consell d'Infermeres i Infermers de Catalunya (College of Nurses of Catalonia) and represents this institution in the Research Committee of the Health Department.

Special interest: prostate and bladder cancer in adults

### **Ian Pearce (UK)**

Ian has been a Consultant Urological Surgeon at Manchester Royal Infirmary, UK since 2002 having trained in Nottingham, Stoke and Greater Manchester.

He is currently on the executive committee of the BAUS Section of Female Neurological and Urodynamic Urology.

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Susanne is the Course Manager for local urology courses. She is responsible for introducing new staff within the department and to help and support nurses writing nursing projects.

Susanne is a member of the Danish Association of Urology Nurses.

She has worked in the field of urology since 1992. Her primary focus has been competence development to secure updated and qualified care for the urological patient.

Special interests: adult urology, development of documentation tools for the elective urological patient regarding the patient perspective

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# 17. References

1. OCEBM Table of Evidence Working Group. The Oxford 2011 Table of Evidence. <http://www.cebm.net/index.aspx?o=1025> [access date 22 January 2012]
2. Behrens J, Langer G. Evidence-based Nursing - Vertrauensbildende Entzauberung der Wissenschaft. Bern, Göttingen, Toronto, Seattle: Verlag Hans Huber, 2004.
3. DiCenso A, Cullum N, Ciliska D. Implementing evidence-based nursing: some misconceptions. *Evid Based Nurs* 1998;1(2):38-40. <http://ebn.bmj.com/content/1/2/38.extract?sid=27504c6d-c12f-4dd6-9577-d539f93d7a9b>
4. Pubmed.gov: US National Library of Medicine National Institutes of Health <http://www.ncbi.nlm.nih.gov/sites/entrez>
5. Niël-Weise BS, van den Broek PJ. Urinary catheter policies for long-term bladder drainage. *Cochrane Database Syst Rev* 2005(1):CD004201. Assessed as up to date: August 5, 2008. New search for studies and content updated (no change to conclusions), published in Issue 4, 2009. <http://www.ncbi.nlm.nih.gov/pubmed/15674931>. <http://summaries.cochrane.org/CD004201/urinary-catheter-policies-for-long-term-bladder-drainage>
6. Al-Juburi AZ, Cicanec J. New apparatus to reduce urinary drainage associated with urinary tract infections. *Urology* 1989;33(2):97-101. <http://www.ncbi.nlm.nih.gov/pubmed/2916297>
7. Robinson J. Contingence sizing and fitting a penile sheath. *Br J Community Nurs* 2006;11(10):420-427. <http://www.internurse.com/cgi-bin/go.pl/library/abstract.html?uid=21963>
8. Richard Wells Research Centre at Thames Valley University. Infection Control. Prevention of Healthcare-associated Infections in Primary and Community Care. NICE Clinical Guidelines, No. 2. National Collaborating Centre for Nursing and Supportive Care (UK). London: Thames Valley University; June 2003. <http://www.ncbi.nlm.nih.gov/pubmed/21155214> <http://www.ncbi.nlm.nih.gov/books/NBK49292/>
9. Cravens DD, Zweig S. Urinary catheter management. *Am Fam Physician* 2000;61:369-76. <http://www.aafp.org/afp/20000115/369.html>
10. Gammack K. Use and management of chronic urinary catheters in long-term care: much controversy, little consensus. *J Am Med Dir Assoc* 2002;3(3):162-8. <http://www.ncbi.nlm.nih.gov/pubmed/12807660>
11. Saint S, Kaufman SR, Rogers MAM, et al. Condom versus indwelling urinary catheters: a randomized trial. *J Am Geriatr Soc* 2006;54:1055-1061. <http://onlinelibrary.wiley.com/doi/10.1111/j.1532-5415.2006.00785.x/full>
12. Tenke P, Kovacs B, Bjerklund Johansen TE, et al. European and Asian guidelines on management and prevention of catheter-associated urinary tract infections. *Int J Antimicrob Agents* 2008;31 Suppl 1:S68-78. Epub 2007 Nov 14. <http://www.ncbi.nlm.nih.gov/pubmed/18006279>
13. Lo E, Nicolle L, Classen D, et al. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals. *Infect Control Hosp Epidemiol* 2008; 29 suppl. 1:S41-50. <http://www.ncbi.nlm.nih.gov/pubmed/18840088>
14. APIC Guide 2008. Guide to the elimination of catheter-associated urinary tract infections (CAUTIs). Washington: APIC, 2008, p33. [http://www.apic.org/Content/NavigationMenu/PracticeGuidance/APICEliminationGuides/CAUTI\\_Guide\\_0609.pdf](http://www.apic.org/Content/NavigationMenu/PracticeGuidance/APICEliminationGuides/CAUTI_Guide_0609.pdf)
15. Marklew A. Urinary catheter care in the intensive care unit. *British Association of Critical Care Nurses, Nursing in Critical Care* 2004;9(1). <http://onlinelibrary.wiley.com/doi/10.1111/j.1362-1017.2004.00448.x/full>
16. Gould CV, Umscheid CA, Agarwal RK, et al; HICPAC. Guideline for prevention of catheter-associated urinary tract infections 2009. Atlanta, GA: Centers for Disease Control and Prevention, 2009. p.34 and 47. <http://www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf>
17. Newman DK. Internal and External Urinary Catheters: A Primer for Clinical Practice 2008;54(12). <http://www.o-wm.com/content/internal-and-external-urinary-catheters-a-primer-clinical-practice?page=0,2>
18. Warren JW. Catheter-associated urinary tract infections. *Int J Antimicrob Agents* 2001;17(4):299-303 <http://www.ncbi.nlm.nih.gov/pubmed/11295412>
19. Maki DG, Tambyah PA. Consider alternatives to urethral catheterization engineering out the risk for infection with urinary catheters. *Emerg Infect Dis* 2001;7(2):342-7. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2631699/pdf/11294737.pdf>

20. Grabe M, Bjerklund-Johansen TE, Botto H, et al. Guidelines on Urological Infections. European Association of Urology 2010. <http://www.uroweb.org/gls/pdf/Urological%20Infections%202010.pdf>
21. Cottenden A, Bliss DZ, Buckley B, et al. Management using continence products. In: Abrams P, et al. eds. Incontinence. 4th ed. Paris: 2009:1519-642. [http://www.icsoffice.org/Publications/ICI\\_4/files-book/comite-20.pdf](http://www.icsoffice.org/Publications/ICI_4/files-book/comite-20.pdf)
22. Hart S. Urinary catheterisation. *Nurs Stand* 2008;22(27):44-8. <http://www.ncbi.nlm.nih.gov/pubmed/18405016>
23. Addison R, et al. Catheter Care: RCN guidance for nurses. Royal College of Nursing. March 2008. [http://www.rcn.org.uk/\\_data/assets/pdf\\_file/0018/157410/003237.pdf](http://www.rcn.org.uk/_data/assets/pdf_file/0018/157410/003237.pdf)
24. Talbot K, AUNS Catheter Care SIG. Catheter Care Guidelines 2006. The Australian and New Zealand Urological Nurses Society Inc. (ANZUNS) (Draft Reviewed Jan/Feb 2009. Next revision due in 2011.) [http://www.anzuns.org/ANZUNS\\_catheterisation\\_document.pdf](http://www.anzuns.org/ANZUNS_catheterisation_document.pdf)
25. Segers H. Nosocomial, catheter-associated urinary tract infections: need for an adequate urinary catheter policy. Ghent University Hospital. 2009-2010:12.
26. Highton P, Wren H. Urethral catheterisation (male and female). *The Foundation Years* 2008;4(5):214-216.
27. South Gloucestershire NHS. Clinical guidelines for bladder catheterisation. Review date January 2007. <http://www.sglos-pct.nhs.uk/clinical/continence-guidelines-guidelines-for-bladder-catheterisation.pdf>
28. Torres-Salazar JJ, Ricardez-Espinosa AA. Suprapubic cystostomy: indications for and against its implementation. *Rev Mex Urol* 2008;683:170-173.
29. Djakovic N, Plas E, Martínez-Piñero L, et al. members of the European Association of Urology (EAU) Guidelines Office. Guidelines on Urological Trauma. In: EAU Guidelines 2009, edition presented at the 25th EAU Annual Congress, Barcelona 2010. ISBN 978-90-79754-70-0. Page 46. [http://www.uroweb.org/gls/pdf/20\\_Urological\\_Trauma%202009.pdf](http://www.uroweb.org/gls/pdf/20_Urological_Trauma%202009.pdf)
30. NICE Urinary incontinence – the management of urinary incontinence in women. CG40 Full guideline. 2006;(4,5):16. [www.nice.org.uk/nicemedia/pdf/CG40fullguideline.pdf](http://www.nice.org.uk/nicemedia/pdf/CG40fullguideline.pdf)
31. Doherty W, Winder A. Indwelling catheters: practical guidelines for catheter blockage. *Br J Nurs* 2000;9(18):2006-8, 2010, 2012 passim. <http://www.ncbi.nlm.nih.gov/pubmed/11868207>
32. NHS Birmingham East and North: Primary Care Trust. Suprapubic Catheterisation Policy. Review 2007. [www.bpcssa.nhs.uk/policies/\\_ben%5Cpolicies%5C593.pdf](http://www.bpcssa.nhs.uk/policies/_ben%5Cpolicies%5C593.pdf)
33. GYWPCT. NHS Infection Control team. Policy for catheter management. NHS: 2006-2009. [www.gywpct.nhs.uk/\\_store/documents/catheterpolicy.pdf](http://www.gywpct.nhs.uk/_store/documents/catheterpolicy.pdf)
34. Rosh AJ. Suprapubic aspiration; Updated April 2009. <http://emedicine.medscape.com/article/82964-overview>
35. Schlamovitz GZ. Suprapubic catheterisation Jan. 2010. *Emedicine Specialities, Clinical Procedures, Genitourinary Procedures*. <http://emedicine.medscape.com/article/145909-overview>
36. Piechota H, Brühl P, Hertle L, et al. Katheterdrainage der harnblase heute. *Deutsches Ärzteblatt* 2000;4(5):168-174. [www.aerzteblatt.de/v4/archiv/artikel.asp?id=20959](http://www.aerzteblatt.de/v4/archiv/artikel.asp?id=20959)
37. Addison R, Mould C. Risk assessment in suprapubic catheterisation. *Royal College of Nursing (Great Britain). Nurs Stand* 2000;14(36):43-6. <http://www.ncbi.nlm.nih.gov/pubmed/11974265>
38. Kalbheim-Gapp E. Suprapubische harnableitung muss methode der wahl warden. *Krankenhaus arzt* 1997;70(1-2):48-51.
39. Piechota H, Brühl P, Meessen S, et al. Kann die technik der suprapubischen harnblasendrainage zu einer limitierung der transurethralen, kathetervermittelten harnweginfektionen und komplikationen beitragen? *Hygiene & Medizin* 1998;23:389-396.
40. Piechota HJ, Hertle L. Urindrainage: wann immer möglich suprapubisch. *Internationales Symposium über aktuelle Probleme der Notfallmedizin und Intensivtherapie, Münster*. 1995.
41. Lamont T, Harrison S, Panesar S, et al. Safer insertion of suprapubic catheters: summary of a safety report from the National Patient Safety Agency. *BMJ* 2011;342:d924. <http://www.bmj.com/content/342/bmj.d924.extract>



42. Niël-Weise BS, van den Broek PJ. Urinary catheter policies for short-term bladder drainage in adults. *Cochrane Database Syst Rev* 2005(3):CD004203. pub2. Assessed as up to date: May 29, 2006 Publication status and date: Edited (no change to conclusions), published in Issue 1, 2009. <http://www2.cochrane.org/reviews/en/ab004203.html>
43. Schwarz E. Suprapubische drainage. Nosokomiale harnwegsinfektionen vermeiden. *Klinikarzt. Medizin im Krankenhaus* 2000;7(29).
44. Sethia KK, Selkon JB, Berry AR. Prospective randomized controlled trial of urethral versus suprapubic catheterisation. *Br J Surg* 1987;74:624-625. [onlinelibrary.wiley.com/doi/10.1002/bjbs.1800740731/abstract](http://onlinelibrary.wiley.com/doi/10.1002/bjbs.1800740731/abstract)  
<http://www.ncbi.nlm.nih.gov/pubmed/3304522>
45. Hooton TM, Bradley SF, Cardenas DD, et al. Diagnosis, prevention, and treatment of catheter-associated urinary tract infection in adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. *Clin Infect Dis* 2010;50(5):625-63. <http://www.ncbi.nlm.nih.gov/pubmed/20175247>.
46. Herter R, Kazer MW. Best practice in urinary catheter care. *Home Healthc Nurse* 2010;28(6):342-9. <http://www.ncbi.nlm.nih.gov/pubmed/20539136>
47. Robinson J. Selecting a urinary catheter and drainage system, *Br J Community Nurs* 2006;1(19):1046-1050. <http://www.ncbi.nlm.nih.gov/pubmed/17167364>
48. Colpman D, Welford K. Urinary drainage systems. In: Fillingham S, Douglas J, eds. *Urological Nursing*. 3rd ed. London: Bailliere Tindall, 2004;5:67-93.
49. Downey P. *Introduction to Urological Nursing*. Whurr Publishers, 2000:150-173.
50. Newman DK. The indwelling urinary catheter: Principles for best practice. [Review] *J Wound Ostomy Continence Nurs* 2007;34(6):655-663. <http://www.ncbi.nlm.nih.gov/pubmed/18030105>
51. Jahn P, Preuss M, Kernig A, et al. Types of indwelling urinary catheters for long-term bladder drainage in adults. *Cochrane Database Syst Rev* 2007;(3):CD004997. <http://www.ncbi.nlm.nih.gov/pubmed/17636782>
52. Smith JAM. Indwelling Catheter management: From habit-based to evidence-based practice. *Ostomy Wound Manage* 2003;49(12). <http://www.o-wm.com/content/indwelling-catheter-management-from-habit-based-evidence-based-practice?page=0,2>
53. Schumm K, Lam TBL. Types of urethral catheters for management of short-term voiding problems in hospitalised adults. *Cochrane Database Syst Rev* 2008, Issue 2. Art. No.: CD004013. DOI: 10.1002/14651858.CD004013.pub3. <http://www2.cochrane.org/reviews/en/ab004013.html>
54. Cochran S. Care of the indwelling urinary catheter is it evidence based? *J Wound Ostomy Continence Nurs* 2007;34(3):282-8. <http://www.ncbi.nlm.nih.gov/pubmed/17505248>
55. Allepuz-Palau A, Rosselló-Urgell J, Vagué-Rafart J, et al. Evolution of closed urinary drainage systems use and associated factors in Spanish hospitals. *J Hosp Infect* 2004;57(4):332-8. <http://www.ncbi.nlm.nih.gov/pubmed/15262395>
56. Yates A. Urinary catheters. Part 5 Catheter drainage and support systems. *Nurs Times* 2008;104(43):22-3. [http://www1.lfl.cuni.cz/utp01/mater\\_EN/PC/RR/Urinary\\_catheters\\_5.pdf](http://www1.lfl.cuni.cz/utp01/mater_EN/PC/RR/Urinary_catheters_5.pdf)
57. Jones S, Foxley S, Dunkin J. Care of urinary catheters and drainage systems. *Nursing Times* 2007;103(42):48-50. <http://www.nursingtimes.net/nursing-practice-clinical-research/evidence-care-of-urinary-catheters-and-drainage-systems/439075.article>
58. Sabbuba NA, Stickler DJ, et al. Does the valve regulated release of urine from the bladder decrease encrustation and blockage of indwelling catheters by crystalline proteus mirabilis biofilms? *J Urol* 2005;173 (1):262-6. [http://www.hopkinsguides.com/hopkins/ub/citation/15592093/Does\\_the\\_valve\\_regulated\\_release\\_of\\_urine\\_from\\_the\\_bladder\\_decrease\\_encrustation\\_and\\_blockage\\_of\\_indwelling\\_catheters\\_by\\_crystalline\\_proteus\\_mirabilis\\_biofilms](http://www.hopkinsguides.com/hopkins/ub/citation/15592093/Does_the_valve_regulated_release_of_urine_from_the_bladder_decrease_encrustation_and_blockage_of_indwelling_catheters_by_crystalline_proteus_mirabilis_biofilms)  
<http://www.ncbi.nlm.nih.gov/pubmed/15592093>
59. Yates A. Urinary catheters. Part 6 Catheter valves. *Nurs Times* 2008;104(44):24-2. [http://www1.lfl.cuni.cz/utp01/mater\\_EN/PC/RR/Urinary\\_catheters\\_6.pdf](http://www1.lfl.cuni.cz/utp01/mater_EN/PC/RR/Urinary_catheters_6.pdf)

60. Schiotz HA. Antiseptic catheter gel and urinary tract infection after short-term postoperative catheterization in women. *Arch Gynecol Obstet* 1995;258(2):97-100. <https://springerlink3.metapress.com/content/u702771716077580/resource-secured/?target=fulltext.pdf&sid=1t5mtqr4yqq4j4rpfstxbqvb&sh=www.springerlink.com> <http://www.ncbi.nlm.nih.gov/pubmed/8779617>
61. Speechley V, Rosenfield M. *Cancer Information at Your Fingertips*. London. Class Publishing, 2001.
62. Kennedy I, Grubb A. *Implied Consent In: Medical Law: Text with Materials*. 2nd ed. London, Dublin and Edingburgh: Butterworths, 1994:101.
63. Robinson J. Urethral catheter selection. *Nurs Stand* 2001;15(25):39-42. <http://www.ncbi.nlm.nih.gov/pubmed/12211824>
64. Ballentine Carter H. Instrumentation and Endoscopy. In: *Campbell's Urology*. 7th ed. Philadelphia: WB Saunders, 1998:159-64.
65. Hadfield-Law L. Male catheterization. *Accid Emerg Nurs* 2001;9(4):257-63. <http://www.ncbi.nlm.nih.gov/pubmed/11855766>
66. Sedor J, Mulholland SG. Hospital-acquired urinary tract infections associated with the indwelling catheter. *Urol Clin North Am* 1999;26(4):821-8. [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=10584622&itool=iconabstr](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10584622&itool=iconabstr)
67. Parkes AW, Harper N, Herwadkar A, et al. Anaphylaxis to the chlorhexidine component of Instillagel®: a case series. *Br J Anaesth* 2009;102(1):65-68. Epub 2008 Nov 5. <http://bja.oxfordjournals.org/content/102/1/65.full.pdf> <http://www.ncbi.nlm.nih.gov/pubmed/18987055>
68. Blandy JP, Moors J. *Urology for nurses*. Oxford: Blackwell Scientific Publications, 1996:76.
69. Colley W. Male catheterization: 1. *Nurs Times Nurs Homes* 1999;1(1):31-2. <http://www.ncbi.nlm.nih.gov/pubmed/10795304>
70. Harmanli OH, Okafor O, Ayaz R, et al. Lidocaine jelly and plain aqueous gel for urethral straight catheterization and the Q-tip test: a randomized controlled trial. *Obstet Gynecol* 2009;114(3):547-50. [http://journals.lww.com/greenjournal/Fulltext/2009/09000/Evaluation\\_of\\_the\\_Fascial\\_Technique\\_for\\_Surgical.10.aspx](http://journals.lww.com/greenjournal/Fulltext/2009/09000/Evaluation_of_the_Fascial_Technique_for_Surgical.10.aspx) <http://www.ncbi.nlm.nih.gov/pubmed/19701033>
71. Doherty W. Instillagel: an anesthetic antiseptic gel for use in the catheterization. *Br J Nurs* 1999;8(2):109-12. <http://www.ncbi.nlm.nih.gov/pubmed/10214141>
72. Saint S, Lipsky BA. Preventing catheter-related bacteriuria: should we? Can we? How? *Arch Intern Med* 1999;159(8):800-8. [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=10219925&itool=iconabstr](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10219925&itool=iconabstr)
73. Eberle CM, Winsemius D, Garibaldi RA. Risk factors and consequences of bacteriuria in non-catheterized nursing home residents. *J Gerontol* 1993;48(6):M266-71. <http://www.ncbi.nlm.nih.gov/pubmed/8227997>
74. Harrison SC, Lawrence WT, Morley R, et al. British Association of Urological Surgeons' suprapubic catheter practice guidelines. *BJU Int* 2010;107(1):77-85. <http://www.ncbi.nlm.nih.gov/pubmed/21518233>
75. Lowthian P. The dangers of long-term catheter drainage. *Br J Nurs* 1998;7(7):366-8, 370, 372 *passim*. <http://www.ncbi.nlm.nih.gov/pubmed/9668751>
76. Ziylan HO, Ander AH, Alp T, et al. Latex allergy in patients with spinal dysraphism: the role of multiple surgery. *Br J Urol* 1996;78(5):777-9. <http://www.ncbi.nlm.nih.gov/8976778>
77. Rogers, J. Pass the cranberry juice. *Nurs Times* 1991;87(48):36-7. [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=1754454&itool=iconabstr](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1754454&itool=iconabstr)
78. Suvarna R, Pirmohamed M, Henderson L. Possible interaction between warfarin and cranberry juice. *BMJ* 2003;320(7429):1454. [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=14684645](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14684645)
79. Willson M, Wilde M, et al. Nursing interventions to reduce the risk of catheter-associated urinary tract infection: part 2: staff education, monitoring, and care techniques. *J Wound Ostomy Continence Nurs*;36(2):137-54. <http://www.ncbi.nlm.nih.gov/pubmed/19287262>

80. Pratt RJ, Pellowe CM, Wilson JA, et al. epic 2: National evidence-based guidelines for preventing healthcare-associated infection in NHS hospitals in England. *J Hosp Infect* 2007;65:51-564.  
<http://www.ncbi.nlm.nih.gov/pubmed/17307562>
81. Carstens J, Bus B. The Joanna Briggs Institute 2010. Evidence Summary: Urinary Retention: Catheter Clamping. [http://www.jbiconnect.org/connect/docs/cis/es\\_html\\_viewer.php?SID=5619&lang=en&region=AU](http://www.jbiconnect.org/connect/docs/cis/es_html_viewer.php?SID=5619&lang=en&region=AU)
82. Simpson L. Improving community catheter management. *Prof Nurse* 1999;14(12):831-4. [http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list\\_uids=10603892&itool=iconabstr](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10603892&itool=iconabstr)
83. Madigan E, Neff DF. Care of patients with long-term indwelling urinary catheters. *Online J Issues Nurs* 2003;8(3):7. [www.nursingworld.org](http://www.nursingworld.org)
84. Foxley S. Indwelling urinary catheters: accurate monitoring of urine output. *Br J Nurs* 2011;20(9). [www.ncbi.nlm.nih.gov/pubmed/21647018](http://www.ncbi.nlm.nih.gov/pubmed/21647018)
85. Bond P, Harris C. Best Practice in urinary catheterisation and catheter care. *Nurs Times* 2005;101(8):54,56,58. <http://www.ncbi.nlm.nih.gov/pubmed/15754946>
86. Robert Koch Institut - Kommission für Krankenhaushygiene. Empfehlungen zur Prävention und Kontrolle Katheter-assoziiertes Harnwegsinfektionen; Bundesgesundheitsbl.- Gesundheitsforsch-Gesundheitsschutz 1999;42:806-809. Springer Verlag. [http://www.rki.de/cln\\_153/nn\\_201414/DE/Content/Infekt/Krankenhaushygiene/Kommission/Downloads/Harnw\\_Rili,templateId=raw,property=publicationFile.pdf/Harnw\\_Rili.pdf](http://www.rki.de/cln_153/nn_201414/DE/Content/Infekt/Krankenhaushygiene/Kommission/Downloads/Harnw_Rili,templateId=raw,property=publicationFile.pdf/Harnw_Rili.pdf)
87. Hanchett M. Techniques for stabilizing urinary catheters. Tape may be the oldest method, but it's not the only one. *Am J Nurs* 2002;102(3):44-8. [no abstract available] <http://www.ncbi.nlm.nih.gov/pubmed/11976527>
88. Darouiche RO, Goetz L, Kaldis T, et al. Impact of StartLock securing device on symptomatic catheter-related urinary tract infections: a prospective randomized, multicenter clinical trial. *Am J Infect Control* 2006;34(9):555-60. <http://www.ncbi.nlm.nih.gov/pubmed/17097449>
89. Billington A, Crane C, Jownally S, et al. Minimizing the complications associated with migrating catheters. *Br J Community Nurs* 2008;13(11):502-6. <http://www.ncbi.nlm.nih.gov/pubmed/18981965>
90. Freeman C. Why more attention must be given to catheter stabilisation. *Nurs Times* 2009;105(29):35-6. <http://www.ncbi.nlm.nih.gov/pubmed/19715088>
91. Griffiths R, Fernandez R. Strategies for the removal of short-term indwelling catheters in adults. *Cochrane Database Syst Rev* 2007;18(2):CD004011. <http://www.ncbi.nlm.nih.gov/pubmed/17443536>
92. Phipps S, Lim YN, McClinton S, Barry C, Rane A, N'Dow JMO: Short term urinary catheter policies following urogenital surgery in adults (Review). *The Cochrane Library* 2009, Issue 1. [www2.cochrane.org/reviews/en/ab004374.html](http://www2.cochrane.org/reviews/en/ab004374.html)
93. Mason P. Test on specimens of urine and stools. *Pharm J* 2004;272:544-547. [www.pharmj.com/pdf/cpd/pj\\_20040501\\_clinicaltesting04.pdf](http://www.pharmj.com/pdf/cpd/pj_20040501_clinicaltesting04.pdf)
94. Shiao CC, Weng CY, Chuang JC, Huang MS, Chen ZY. Purple urine bag syndrome: a community-based study and literature review. *Nephrology (Carlton)* 2008;13(7):554-9. *Epub* 2008 Sep 1. <http://www.ncbi.nlm.nih.gov/pubmed/18771468>
95. Khan F, Chaudhry MA, Qureshi N, et al. Purple urine bag syndrome: an alarming hue? A brief review of the literature. *Int J Nephrol* 2011;2011:419213. *Epub* 2011 Oct 1. <http://www.ncbi.nlm.nih.gov/pubmed/21977321> <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3184437/>
96. Peters P, Merlo J, Beech N, et al. The purple urine bag syndrome: a visually striking side effect of a highly alkaline urinary tract infection. *Can Urol Assoc J* 2011;5(4):233-4. <http://www.ncbi.nlm.nih.gov/pubmed/21801678>
97. Su FH, Chung SY, Chen MH, Sheng ML, Chen CH, Chen YJ, Chang WC, Wang LY, Sung KY. Case analysis of purple urine bag syndrome at a long term care service in a community hospital. *Chang Gung Med J* 2005;28(9):636-42. <http://www.ncbi.nlm.nih.gov/pubmed/16323555>
98. Vallejo-Manzur F, Mireles-Cabodevila E, Varon J. Purple bag syndrome. *Am J Emerg Med* 2005;23(4):521-4. <http://www.ncbi.nlm.nih.gov/pubmed/16032624>
99. Tasi YM, Huang MS, Yang CJ, et al. Purple urine bag syndrome, not always a benign process. *Am J Emerg Med* 2009;27(7):895-7. [www.ncbi.nlm.nih.gov/pubmed/19683127](http://www.ncbi.nlm.nih.gov/pubmed/19683127)

100. Collins KK. Purple urine bag syndrome. *J World Council Enterostomal Therapists* 2002;22(1):10-14.
101. Rew M. Caring for catheterised patients: urinary catheter maintenance. *British J Nurs* 2005;14(2): 87-92. <http://www.ncbi.nlm.nih.gov/pubmed/15750508>
102. Clifford E. Urinary catheters: reducing the incidence of problems. *Community Nurse* 2000;6(4):35-6. <http://www.ncbi.nlm.nih.gov/pubmed/12778522>
103. Nazarko L. Providing effective evidence-based catheter management. *Br J Nurs* 2009 (Continence Supplement);18(7).
104. Wilde MH. Understanding Urinary Catheter Problems From the patient's point of view. *Home Healthcare Nurse* 2002;20(7). <http://www.ncbi.nlm.nih.gov/pubmed/12131623>
105. Emr K, Ryan R. Best practice for indwelling catheter in the home setting. *Home Healthc Nurse* 2004;22(12):820-8. <http://www.ncbi.nlm.nih.gov/pubmed/15597002>
106. Parkin J, Scanlan J, Woolley M, et al. Urinary catheter 'deflation cuff' formation: clinical audit and quantitative in vitro analysis. *BJU Int* 2002;90(7):666-71. <http://onlinelibrary.wiley.com/doi/10.1046/j.1464-410X.2002.03014.x/full>
107. Al-Asmary SM, Al-Helali NS, Abdel-Fattah MM, et al. Nosocomial urinary tract infection. Risk factors, rates and trends. *Saudi Med J* 2004;25(7):895-900. <http://www.ncbi.nlm.nih.gov/pubmed/15235696>
108. Dikon A, Olah R. Silver coated Foley catheters - initial cost is not the only thing to consider. *Am J Infect Control* 2006;34(5):e39-e40. [http://www.ajicjournal.org/article/S0196-6553\(06\)00727-9/abstract](http://www.ajicjournal.org/article/S0196-6553(06)00727-9/abstract)
109. Esposito S, Noviello S, Leone S. [Catheter-associated urinary tract infections: epidemiology and prevention]. *Infez Med* 2008;16(3):130-43. [article in Italian] <http://www.ncbi.nlm.nih.gov/pubmed/18843210>
110. Foxman, B. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. *Am J Med* 2002;113 Suppl 1A:5S-13S. <http://www.ncbi.nlm.nih.gov/pubmed/12113866>
111. Fernandez RS, Griffiths RD. Duration of short-term indwelling catheters--a systematic review of the evidence. *J Wound Ostomy Continence Nurs* 2006;33(2):145-53. <http://www.ncbi.nlm.nih.gov/pubmed/16572014>
112. Huang WC, Wann SR, Lin SL, et al. Catheter-associated urinary tract infections in intensive care units can be reduced by prompting physicians to remove unnecessary catheters. *Infect Control Hosp Epidemiol* 2004;25(11):974-8. <http://www.ncbi.nlm.nih.gov/pubmed/15566033>
113. Tambyah PA, Maki DG. Catheter-associated urinary tract infection is rarely symptomatic: a prospective study of 1,497 catheterized patients. *Arch Intern Med* 2000;160(5):678-82. <http://www.ncbi.nlm.nih.gov/pubmed/10724054>
114. Niel-Weise BS, van den Broek PJ. Antibiotic policies for short-term catheter bladder drainage in adults. *Cochrane Database Syst Rev* 2005(3): CD005428. Assessed as up to date: May 29, 2006. [www.cochrane.org/reviews/en/ab005428.html](http://www.cochrane.org/reviews/en/ab005428.html)
115. Biering-Sørensen F, Bagi P, Hoiby N. Urinary tract infections in patients with spinal cord lesions treatment and prevention. *Drugs* 2001;61(9):1275-87. [www.ncbi.nlm.nih.gov/pubmed/11511022](http://www.ncbi.nlm.nih.gov/pubmed/11511022)
116. Jepson RG, Craig JC. Cranberries for preventing urinary tract infections. *Cochrane Database Syst Rev* 2008;(1):CD001321. <http://www.ncbi.nlm.nih.gov/pubmed/18253990>
117. Agodi A, Barchitta M, Anzaldi A, et al. Active surveillance of nosocomial infections in urologic patients. *Eur Urol* 2007;51:247-254. [http://www.europanurology.com/article/S0302-2838\(06\)00635-X/fulltext](http://www.europanurology.com/article/S0302-2838(06)00635-X/fulltext)
118. Al-Habdan I, Sadat-Ali M, Corea JR, et al. Assessment of nosocomial urinary tract infections in orthopaedic patients: a prospective and comparative study using two different catheters. *Int Surg* 2003;88(3): 152-4. <http://www.ncbi.nlm.nih.gov/pubmed/14584770>
119. Johnson JR, Kuskowski MA, Wilt TJ. Systematic review: antimicrobial urinary catheters to prevent catheter-associated urinary tract infection in hospitalized patients. *Ann Intern Med* 2006;144(2):116-26. <http://www.ncbi.nlm.nih.gov/pubmed/16418411>
120. Caudill T. Reduction in catheter-associated urinary tract infection (CAUTI) using a silver-coated all-silicone Foley catheter versus a silver-impregnated latex Foley catheter in a Southeastern U.S. long-term acute care facility. *Am J Infect Control* 2005;33(5):e60. [http://www.ajicjournal.org/article/S0196-6553\(05\)00248-8/abstract](http://www.ajicjournal.org/article/S0196-6553(05)00248-8/abstract)
121. Davenport K, Keeley FX. Evidence for the use of silver-alloy-coated urethral catheters. *J Hosp Infect* 2005;60(4):298-303. <http://www.ncbi.nlm.nih.gov/pubmed/15936115>

122. Davis K. Reduction in catheter-associated urinary tract infections (CAUTIs) using a silver-coated 100% silicone Foley catheter versus a silver-coated latex Foley catheter in a Northeastern U.S. acute care hospital. *Am J Infect Control* 2005;33(5):e55-e56. [http://www.ajicjournal.org/article/S0196-6553\(05\)00241-5/abstract](http://www.ajicjournal.org/article/S0196-6553(05)00241-5/abstract)
123. Gentry H, Cope S. Using silver to reduce catheter-associated urinary tract infections. *Nurs Stand* 2005;19(50):51-4. <http://www.ncbi.nlm.nih.gov/pubmed/16138618>
124. Karchmer TB, Giannetta ET, Muto CA, et al. A randomized crossover study of silver-coated urinary catheters in hospitalized patients. *Arch Intern Med* 2000;160(21):3294-8. <http://www.ncbi.nlm.nih.gov/pubmed/11088092>
125. Kitchen, BJ. Reducing catheter-associated urinary tract infections through the use of silver-coated 100% silicone indwelling catheter system. *Am J Infect Control* 2006;34(5):e114. [http://www.ajicjournal.org/article/S0196-6553\(06\)00610-9/abstract](http://www.ajicjournal.org/article/S0196-6553(06)00610-9/abstract)
126. Lai KK, Fontecchio, SA. Use of silver-hydrogel urinary catheters on the incidence of catheter-associated urinary tract infections in hospitalized patients. *Am J Infect Control* 2002;30(4):221-5. <http://www.ncbi.nlm.nih.gov/pubmed/12032497>
127. Matsui Y, Yano K, et al. Silver urinary catheter system is key to significant reduction and postponement of urinary tract infections. *Am J Infect Control* 2004;32(3): E95-E96.
128. Rupp ME, Fitzgerald T, et al. Effect of silver-coated urinary catheters: efficacy, cost- effectiveness, and antimicrobial resistance. *Am J Infect Control* 2004;32(8):445-50.
129. Beattie M, Taylor J. Silver alloy vs. uncoated urinary catheters: a systematic review of the literature. *J Clin Nurs* 2011;20(15-16):2098-108. Epub 2011 Mar 21. <http://www.ncbi.nlm.nih.gov/pubmed/21418360>
130. Foster K, Smith G. Clinical effectiveness of the silver-impregnated Foley with bacteriostatic tubing/bag system compared with standard latex catheters and standard drain systems. *Am J Infect Control* 33(5):e133-e134. [http://www.ajicjournal.org/article/S0196-6553\(05\)00350-0/abstract](http://www.ajicjournal.org/article/S0196-6553(05)00350-0/abstract)
131. Hutchins A. Reducing the number one health care acquired infection utilizing a silver-impregnated foley with bacteriostatic tubing/bag system. *Am J Infect Control* 2006;34(5):e113. [http://www.ajicjournal.org/article/S0196-6553\(06\)00609-2/abstract](http://www.ajicjournal.org/article/S0196-6553(06)00609-2/abstract)
132. Meddings J, Rogers MAM, et al. Systematic review and meta-analysis: Reminder systems to reduce catheter-associated urinary tract infections and urinary catheter use in hospitalized patients. *Clin Infect Dis* 2010;51(5):550-560. <http://www.ncbi.nlm.nih.gov/pubmed/20673003>
133. Rosenthal VD, Guzman S, et al. Effect of education and performance feedback on rates of catheter-associated urinary tract infection in intensive care units in Argentina. *Infect Control Hosp Epidemiol* 2004;25(1):47-50. [https://www2.medicine.wisc.edu/home/files/domfiles/infectiousdisease/Effect%20of%20Education%20and%20Performance%20Feedback%20on%20Rates%20of%20CAUTI%20in%20ICU%20in%20Argentina%20\(Rosenthal...Safdar%20ICHE%20Vol%2025%20No%201\).pdf](https://www2.medicine.wisc.edu/home/files/domfiles/infectiousdisease/Effect%20of%20Education%20and%20Performance%20Feedback%20on%20Rates%20of%20CAUTI%20in%20ICU%20in%20Argentina%20(Rosenthal...Safdar%20ICHE%20Vol%2025%20No%201).pdf)
134. Cheung K, Leung P, Wong YC, et al. Water versus antiseptic periurethral cleansing before catheterization among home care patients: A randomized controlled trial. *Am J Infect Control* 2008;36(5):375-80. <http://www.ncbi.nlm.nih.gov/pubmed/18538705>
135. Webster J, Hood RH, et al. Water or antiseptic for periurethral cleaning before urinary catheterization: a randomized controlled trial. *Am J Infect Control* 2001;29(6):389-94.
136. Gillespie WA, Simpson RA, Jones JE, et al. Does the addition of disinfectant to urine drainage bags prevent infection in catheterised patients? *Lancet* 1983;1(8332):1037-9. <http://www.ncbi.nlm.nih.gov/pubmed/6133072>
137. Hagen S, Sinclair L, Cross S. Washout policies in long-term indwelling urinary catheterisation in adults. *Cochrane Database Syst Rev* 2010;(3):CD004012. <http://www.ncbi.nlm.nih.gov/pubmed/20238325>
138. Nasiriani K, Kalani Z, et al. Comparison of the effect of water vs povidone-iodine solution for periurethral cleaning in women requiring an indwelling catheter prior to gynecologic surgery. *Urol Nurs* 2009;9(2):118-21. <http://www.ncbi.nlm.nih.gov/pubmed/19507410>
139. Keerasuntonpong, A, Thearawiboon W, Panthawan A, et al. Incidence of urinary tract infections in patients with short-term indwelling urethral catheters: a comparison between a 3-day urinary drainage bag change and no change regimens. *Am J Infect Control* 2003;31(1):9-12. <http://www.ncbi.nlm.nih.gov/pubmed/12548251>

140. Koskeroglu N, Durmaz G, Bahar M, et al. The role of meatal disinfection in preventing catheter-related bacteriuria in an intensive care unit: a pilot study in Turkey. *J Hosp Infect* 2004;56(3):236-8. <http://www.ncbi.nlm.nih.gov/pubmed/15003674>
141. Raz R, Schiller D, Nicolle LE. Chronic indwelling catheter replacement before antimicrobial therapy for symptomatic urinary tract infection. *J Urol* 2000;164:1254-1258. <http://www.ncbi.nlm.nih.gov/pubmed/10992375>
142. Singh R, Rohilla RK, Sangwan K, et al. Bladder management methods and urological complications in spinal cord injury patients. *Indian J Orthop* 2011;45(2):141-147. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3051121/>  
<http://www.ijonline.com/article.asp?issn=0019-5413%3Byear%3D2011%3Bvolume%3D45%3Bissue%3D2%3Bspage%3D141%3Bepage%3D147%3Baulast%3DSingh>
143. Evans A, Godfrey A. Bladder washouts in the management of long-term catheters. *Br J Nurs* 2000;9(14): 900-2, 904, 906. <http://www.ncbi.nlm.nih.gov/pubmed/11261025>
144. Getliffe K. Managing recurrent urinary catheter encrustation. *Br J Community Nurs* 2002;7(11):574-80. <http://www.ncbi.nlm.nih.gov/pubmed/12447119>
145. Getliffe K. Managing recurrent urinary catheter blockage: problems, promises, and practicalities. *J Wound Ostomy Continence Nurs* 2003;30(3):146-51. <http://www.ncbi.nlm.nih.gov/pubmed/12761486>
146. Rew M, Woodward S. Troubleshooting common problems associated with long-term catheters. *Br J Nurs* 2001;10(12):764-74. <http://www.ncbi.nlm.nih.gov/pubmed/11972120>
147. Sabbuba, NA, Stickler DJ, et al. Genotyping demonstrates that the strains of *Proteus mirabilis* from bladder stones and catheter encrustations of patients undergoing long-term bladder catheterization are identical. *J Urol* 2004;171(5):1925-8. <http://www.ncbi.nlm.nih.gov/pubmed/15076313>
148. Pomfret I, Bayait F, Mackenzie R, Wells M, Winder A. Using bladder instillations to manage indwelling catheters. *Br J Nurs* 2004;13(5):261. <http://www.ncbi.nlm.nih.gov/pubmed/15028988>
149. Dorland's Illustrated Medical Dictionary. 31th ed. Philadelphia: WB Saunders, 2007:220.
150. Stickler DJ, Feneley RCL. The encrustation and blockage of long-term indwelling bladder catheters: a way forward in prevention and control. *Spinal Cord* 2010;48:784-790. <http://www.ncbi.nlm.nih.gov/pubmed/20368711>
151. Feneley RC, Kunin CM, Stickler DJ. An indwelling urinary catheter for the 21st century. *BJU Int* 2011 Nov 17. doi: 10.1111/j.1464-410X.2011.10753.x. [Epub ahead of print] <http://www.ncbi.nlm.nih.gov/pubmed/22094023>
152. Khan A, Housami F, Melotti R, et al. Strategy to control catheter encrustation with citrated drinks: a randomized crossover study. *J Urol* 2010;183(4):1390-4. <http://www.ncbi.nlm.nih.gov/pubmed/20171661>
153. Percival SL, Sabbuba NA, et al. The effect of EDTA instillations on the rate of development of encrustation and biofilms in Foley catheters. *Urol Res* 2009;37(4):205-9. <http://www.ncbi.nlm.nih.gov/pubmed/19468723>
154. Vaidyanathan S, Soni BM, Hughes PL, et al. Severe ventral erosion of penis caused by indwelling urethral catheter and inflation of foley balloon in urethra- need to create list of "Never events in spinal cord injury" in order to prevent these complications from happening in paraplegic and tetraplegic patients. *Adv Urol* 2010;46:1539. Epub 2010 Jun 27. <http://www.ncbi.nlm.nih.gov/pubmed/20671998>
155. Kashefi C, Messer K, Barden R, et al. Incidence and prevention of iatrogenic urethral injuries. *J Urol* 2008;179(6):2254-7. <http://www.ncbi.nlm.nih.gov/pubmed/18423712>
156. Lumen, N, Hoebeke P, Willemsen P, et al. Etiology of urethral stricture disease in the 21st century. *J Urol* 2009;182(3):983-7. <http://www.ncbi.nlm.nih.gov/pubmed/19616805>
157. Sheriff MK, Foley S, McFarlane J, et al. Long-term suprapubic catheterisation: clinical outcome and satisfaction survey. *Spinal cord* 1998;36(3):171-6. <http://www.ncbi.nlm.nih.gov/pubmed/9554016>
158. Ahluwalia RS, Johal N, Kouriefs C, et al. The surgical risk of suprapubic catheter insertion and long-term sequelae. *Ann R Coll Surg Engl* 2006;88(2):210-3. <http://www.ncbi.nlm.nih.gov/pubmed/16551422>
159. Noller KL, Pratt JH, Symmonds RE. Bowel perforation with suprapubic cystostomy Report of two cases. *Obstet Gynecol* 1976;48(1) Suppl:67S-69S. <http://www.ncbi.nlm.nih.gov/pubmed/945879>
160. Lekka E, Lee KL. Successful treatment with intradetrusor botulinum-A toxin for urethral urinary leakage (catheter bypassing) in patients with end-staged multiple sclerosis and indwelling suprapubic catheters. *Eur Urol* 2006;50(4):806-10. <http://www.ncbi.nlm.nih.gov/pubmed/16413661>

161. Nazarko L. Bladder pain from indwelling urinary catheterization: case study. *Br J Nurs* 2007;16(9):511-2. <http://www.ncbi.nlm.nih.gov/pubmed/17551439>
162. Agarwal A, Raza M, et al. The efficacy of tolterodine for prevention of catheter-related bladder discomfort: a prospective, randomized, placebo-controlled, double-blind study. *Anesth Analg* 2005;101(4):1065-7. <http://www.ncbi.nlm.nih.gov/pubmed/16192522>
163. Agarwal A, Gupta D, Kumar M, et al. Ketamine for treatment of catheter related bladder discomfort: A prospective, randomized, placebo controlled and double blind study. *Br J Anaesth* 2006;96(5):587-9. <http://www.ncbi.nlm.nih.gov/pubmed/16531445>
164. Villetta M, Vitagliano G, Castillo O. A rare complication associated to a suprapubic cystostomy: catheter knotting. *Arch Esp Urol* 2007;60(1):95-6. <http://www.ncbi.nlm.nih.gov/pubmed/17408184>
165. Shokeir AA. Squamous cell carcinoma of the bladder: pathology, diagnosis and treatment. *BJU Int* 2004;93(2):216-20. <http://www.ncbi.nlm.nih.gov/pubmed/14690486>
166. GMCT Urology Network – Nursing. Bladder Irrigation Guidelines. 2008. [http://www.health.nsw.gov.au/resources/gmct/urology/pdf/tk\\_bladder\\_irrigation.pdf](http://www.health.nsw.gov.au/resources/gmct/urology/pdf/tk_bladder_irrigation.pdf)
167. Grey Bruce Health Network. Continuous Bladder Irrigation Clinical Protocol. 2007. [http://www.gbhn.ca/ebc/documents/Continuous\\_Bladder\\_Irrigation\\_Protocol.pdf](http://www.gbhn.ca/ebc/documents/Continuous_Bladder_Irrigation_Protocol.pdf)
168. Dougherty L, Lister SE. *The Royal Marsden Hospital Manual of Clinical Nursing Procedures*. 7th ed. London: Wiley-Blackwell, 2008.
169. Samper Ots PM, Carrizosa CL, Rodríguez A, et al. Vesical instillations of hyaluronic acid to reduce the acute vesical toxicity caused by high-dose brachytherapy do not affect the survival: A five-year follow-up study. *Clin Transl Oncol* 2009;11(12):828-834. <http://www.ncbi.nlm.nih.gov/pubmed/20045789>
170. Ernst B. Dextranomer/hyaluronic acid copolymer for the treatment of vesicoureteral reflux. *Urol Nurs* 2008;28(4):299. <http://www.ncbi.nlm.nih.gov/pubmed/18771168>
171. Gray M; Center for Clinical Investigation. What nursing interventions reduce the risk of symptomatic urinary tract infection in the patient with an indwelling catheter? *J Wound Ostomy Continence Nurs* 2004;31(1):3-13. <http://www.ncbi.nlm.nih.gov/pubmed/15128089>
172. Ghahestani SM, Shakhssalim N. Palliative treatment of intractable hematuria in context of advanced bladder cancer: A systematic review. *Urol J* 2009;6(3):149-56. <http://www.ncbi.nlm.nih.gov/pubmed/19711266>
173. Mitchell N. Long term urinary catheter problems: a flow chart to aid management. *Br J Community Nurs* 2008;13(1):6. <http://www.ncbi.nlm.nih.gov/pubmed/18399365>
174. Elvy J, Colville A. Catheter associated urinary tract infection – what is it and how can we prevent it. *J Hosp Infect* 2009;10(2):36-41. <http://bjj.sagepub.com/content/10/2/36.abstract>
175. Higgins D. Specimen collection. Part 2 - Obtaining a catheter specimen of urine. *Nurs Times* 2008;104(18):26-7. <http://www.nursingtimes.net/nursing-practice/clinical-specialisms/continence/obtaining-a-catheter-specimen-of-urine/1314915.article>
176. Simerville JA, Maxted WC, Pahira JJ. Urinalysis: A Comprehensive Review. *Am Fam Physician* 2005;71(6):1153-62. <http://www.ncbi.nlm.nih.gov/pubmed/15791892>
177. Morris NS, Stickler DJ. Does drinking cranberry juice produce urine inhibitory to the development of crystalline, catheter-blocking *Proteus mirabilis* biofilms? *BJU Int* 2001;88(3):192-197. <http://www.ncbi.nlm.nih.gov/pubmed/11488728>
178. Hamann GL, Campbell JD, George CM. Warfarin-cranberry juice interaction. *Ann Pharmacother* 2011;45(3):e17. *Epub* 2011 Mar 1. <http://www.ncbi.nlm.nih.gov/pubmed/21364039>
179. Wilde MH. Meanings and practical knowledge of people with long-term urinary catheters. *J Wound Ostomy Continence Nurs* 2003;30:33-43. <http://www.ncbi.nlm.nih.gov/pubmed/12529592>
180. Wilde MH. Urine flowing: a phenomenological study of living with a urinary catheter. *Res Nurs Health* 2002;25:4-24. <http://www.ncbi.nlm.nih.gov/pubmed/11807916>

181. Roe B, Brocklehurst JC. Study of patients with indwelling catheters. *J Adv Nurs* 1987;12:713-9. <http://www.ncbi.nlm.nih.gov/pubmed/2179351>
182. Foulkes S. Reducing admissions for urinary catheterisation. *Nurs Times* 2008;104(5):49-51. <http://www.ncbi.nlm.nih.gov/pubmed/18323387>
183. Wilde MH, Brasch J. A pilot study of self-monitoring urine flow in people with long-term urinary catheters. *Res Nurs Health* 2008;31(5):490-500. <http://www.ncbi.nlm.nih.gov/pubmed/18418847>
184. O'Connell B, Myers H, Twigg D, et al. Documenting and communicating patient care: Are nursing care plans redundant? *Int J Nurs Pract* 2000;6(5):276-280. <http://onlinelibrary.wiley.com/doi/10.1046/j.1440-172x.2000.00249.x/full>
185. Baxter A. Urinary Catheterization In: Mallett and Dougherty (Eds), *Manual of Clinical Nursing Procedures* 5th Ed., Oxford; Blackwell, 2000, 600-12.
186. Doherty W. Instillagel: an anesthetic antiseptic gel for use in the catheterization. *Br J Nurs* 1999;8(2):109-12. <http://www.ncbi.nlm.nih.gov/pubmed/10214141>
187. Flynn JT, Blandly JP. Urethral catheterization. *Br Med J* 1980;281(6245):928-30. <http://www.ncbi.nlm.nih.gov/pubmed/7427511>
188. Winn C. Complications with urinary catheters. *Prof Nurse* 1998;13(5 Suppl):S7-10.
189. Trout S, Dattolo J, Hansbrough JF. Catheterization: how far should you go? *RN* 1993;56(8):52-4. <http://www.ncbi.nlm.nih.gov/pubmed/8362188>
190. Scottish Intercollegiate Guidelines Network (SIGN). Management of suspected bacterial urinary tract infection in adults. A national clinical guideline. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2006:19-21. (SIGN publication no. 88) <http://www.sign.ac.uk/guidelines/fulltext/88/index.html>
191. Landowski R. Senior pharmacists medical information. London: University College Hospitals, London, UK, 2008.
192. Wallach J. Interpretation of diagnostic tests: a synopsis of laboratory medicine. 5th ed. Philadelphia, PA: Lippincott Williams & Wilkins, US, 1992.
193. Watson D. Drug therapy – colour changes to faeces and urine. *Pharm J* 1987;236:68.
194. Patterson R, Little B, Tolan J, et al. How to manage a urinary catheter balloon that will not deflate. *Int Urol Nephrol* 2006;38(1):57-61. [www.ncbi.nlm.nih.gov/pubmed/16502053](http://www.ncbi.nlm.nih.gov/pubmed/16502053)
195. Gonzalzo ML, Walsh PC. Balloon cuffing and management of the entrapped Foley catheter. *Urology* 2003;61(4):825-7. <http://www.ncbi.nlm.nih.gov/pubmed/12670575>
196. Addison R, Rigby D. A guide for patients: at home with your flip-flop catheter valve. Crawly: BARD, 1999. (booklet)
197. Kunin CM. Nosocomial urinary tract infections and the indwelling catheter: what is new and what is true? *Chest* 2001;120(1):10-2. <http://chestjournal.chestpubs.org/content/120/1/10.long>  
<http://www.ncbi.nlm.nih.gov/pubmed/11451807>
198. Schonebeck J. Blåskatetern och dess bruk. Astra Teck AS. Växjö Proffset AB. 1997. [Swedish]



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