

Advanced Infection Prevention and Control Training

May 2018 version

Prevention of catheter-associated urinary tract infection (CAUTI): student handbook

Introduction

Welcome to the “Prevention of catheter-associated urinary tract infections (CAUTI)” module. This advanced module is part of a broader infection prevention and control (IPC) training package targeting advanced IPC focal points working in low-resource settings. It is designed to support the implementation of the WHO *Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level*¹ as part of a multifaceted approach to capacity-building.

Target audience

This training module is designed for individuals and teams who are intending to occupy a senior leadership position in IPC at the national, subnational or health facility level. Trainees are expected to possess at least basic experience and competence in IPC. They could include IPC professionals, IPC hospital teams, facility administrators, hospital epidemiologists, microbiologists and other relevant health care professionals, among others. The package complements a basic training package intended for all front-line health care workers.

Learning objectives of the module

The module aims to equip the advanced IPC focal point to:

- explain the problem of CAUTI;
- explain catheter use, occurrence of CAUTI and related risk factors;
- recognize CAUTI and understand management principles;
- explain evidence-based (multimodal) implementation strategies for CAUTI prevention including appropriate catheter insertion, maintenance and removal.

Purpose and content of the student handbook

The module comprises a blend of PowerPoint presentations, videos and group work (including case studies and interactive question-and-answer sessions). The student handbook contains supplementary information to support learning, handouts that will be referred to during the training, reflective reading for homework and group work instructions. Together with the PowerPoint slides it will form a valuable resource for students.

The table below sets out the module’s sessions and lists the associated resources contained within the handbook.

¹ Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (<http://www.who.int/infection-prevention/publications/ipc-components-guidelines/en/>, accessed 23 January 2018).

Advanced Infection Prevention and Control Training

May 2018 version

Session	Resource	Page
1. The problem of CAUTI	• Handout 1. Key points to note	3
	• Handout 2. My 5 Moments for Hand Hygiene – Focus on caring for a patient with a urinary catheter	4
	• Handout 3. IFIC basic concepts of infection control, Chapter 18: Prevention of catheter-associated urinary tract infections	6
2. Catheter use, occurrence of CAUTI and related risk factors	• Handout 4. Quiz 1	14
	• Handout 5. Supplementary information related to quiz 1	15
	• Handout 6. Guide for Foley catheter use in hospitalized medical patients	16
	• Handout 7. Types of catheterization and catheters	18
	• Handout 8. Common microorganisms causing CAUTI	19
3. Recognizing CAUTI and understanding management principles	• Handout 9. Collecting a catheter specimen of urine from the sampling port	20
4. Implementing evidence-based (multimodal, quality improvement-informed) strategies for CAUTI prevention during catheter insertion, maintenance and removal	• Handout 10. Four key IPC principles and practices	21
	• Handout 11. Multimodal strategy trigger questions	23
	• Handout 12. Aseptic Non Touch Technique (ANTT) poster	25
	• Handout 13. Two case studies – Kenya and United States of America	27
	• Handout 14. Additional reading list	28

Advanced Infection Prevention and Control Training

May 2018 version

Handout 1. Key points to note

- Avoid urinary catheterization if possible!
- When feasible, use a two-person team to perform insertion.
- Use sterile equipment and aseptic technique during insertion and aftercare/maintenance.
- Review the need for the catheter daily and remove as soon as possible when no longer needed (ideally within 48 hours).
- Hand hygiene is critical (especially **moment 2** before an aseptic/clean procedure and **moment 3** after blood and body fluid exposure).
- Don't change the catheter routinely if it is functioning properly.
- Maintain closed drainage.
- Bladder irrigation/washout and use of antiseptics/antimicrobial agents does **not** prevent CAUTI: **do not use!**
- Empty drainage bag regularly into a clean receptacle used only on one patient.
- The clean receptacle should be changed daily.

Advanced Infection Prevention and Control Training

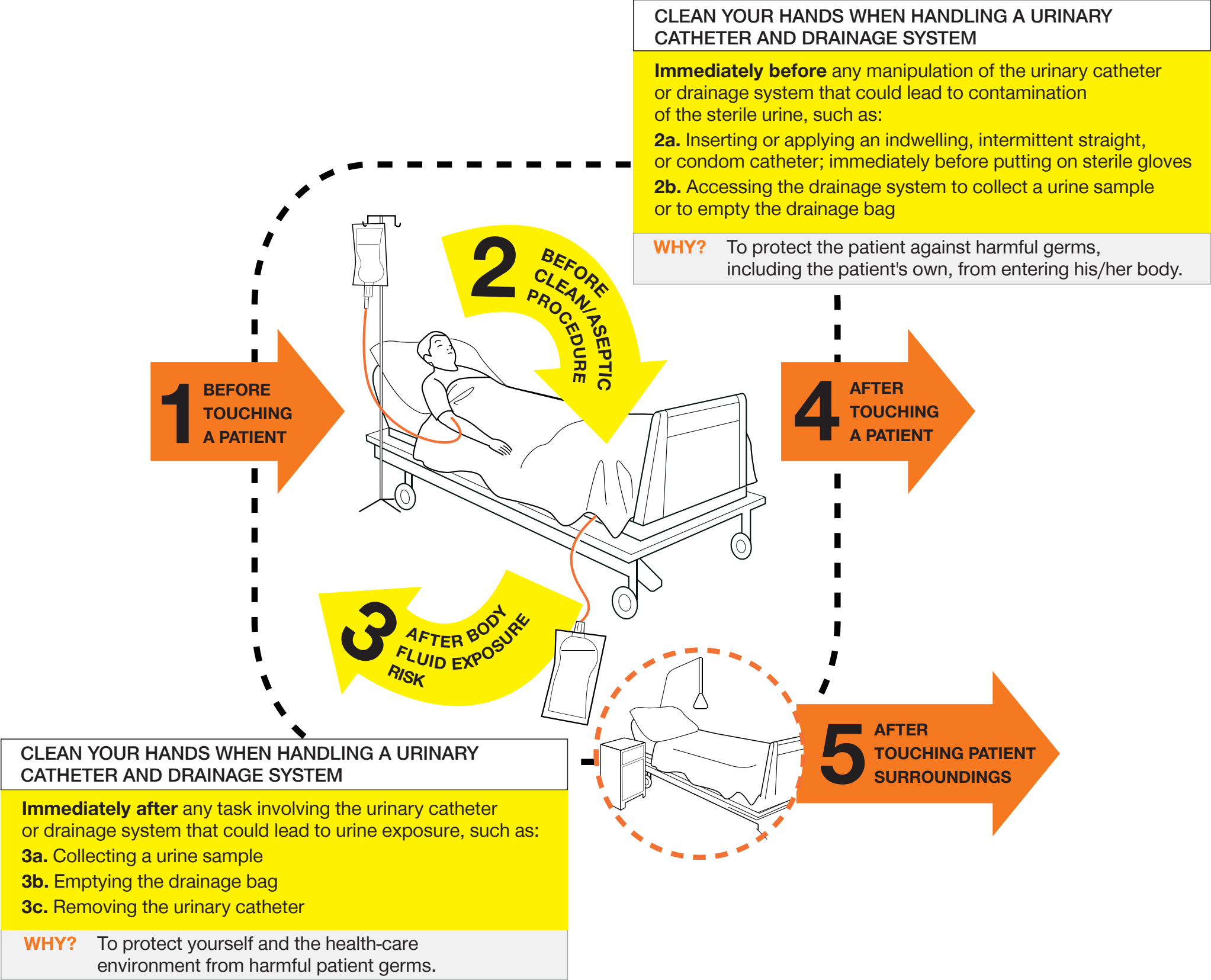
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Handout 2. My 5 Moments for Hand Hygiene – Focus on caring for a patient with a urinary catheter

The hand hygiene poster is available to download from: http://www.who.int/infection-prevention/tools/hand-hygiene/workplace_reminders/en/

My 5 Moments for Hand Hygiene

Focus on caring for a patient with a Urinary Catheter



- ### 5 KEY ADDITIONAL CONSIDERATIONS FOR A PATIENT WITH A URINARY CATHETER
- Make sure that there is an appropriate indication for the indwelling urinary catheter.
 - Use a closed urinary drainage system, and keep it closed.
 - Insert the catheter aseptically using sterile gloves.
 - Assess the patient at least daily to determine whether the catheter is still necessary.
 - Patients with indwelling urinary catheters do not need antibiotics (including for asymptomatic bacteriuria), unless they have a documented infection.



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No Cure Tomorrow

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Handout 3. IFIC basic concepts of infection control, Chapter 18: Prevention of catheter-associated urinary tract infections

The chapter is available to download from: http://theific.org/wp-content/uploads/2016/04/18-UTI_2016.pdf

Chapter 18

Prevention of Catheter-Associated Urinary Tract Infections

Nizam Damani

Key Points

- Urinary catheterisation should be avoided if possible. If needed, then catheter should be reviewed on a daily basis and removed as soon as clinically possible, preferably within 5 days.
- Urinary catheterisation should be performed using sterile equipment and aseptic technique should always be maintained during insertion and aftercare procedures.
- Hands must be properly washed before and after procedure and during daily management.
- Catheters should not be changed routinely as this exposes the patient to increased risk of bladder and urethral trauma.
- Maintain a closed drainage system; open systems should be avoided if at all possible.
- Bladder irrigation or washout and instillation of antiseptics or antimicrobial agents does not prevent catheter-associated urinary tract infection and should not be used.
- The drainage bag should be emptied at least once per nursing session into a clean receptacle used only on one patient.

Introduction¹⁻⁴

Urinary tract infections (UTI) are the commonest healthcare-associated infections (HAI), accounting for up to 40% of all HAIs. Most involve urinary drainage devices, such as bladder catheters. The risk of a catheterised patient acquiring bacteriuria increases with the duration of catheterisation, the daily rate is 5% so that by 4 weeks almost 100% of patients are bacteriuric. One to four percent of patients with bacteriuria will ultimately develop clinically significant infection, e.g., cystitis, pyelonephritis, and septicaemia.

Therefore, urinary catheters must only be inserted when there are clear medical indications (See Table 18.1). They should be removed as soon as no longer needed. In suitable patients, clean intermittent urinary catheterisation or external condom catheters should be considered, as these have a lower risk of infection. Urinary incontinence is not an indication for urinary catheterisation; use napkins or absorbent pads instead.

Table 18.1. Indications for the use of indwelling urinary catheters

<p>Examples of <i>appropriate</i> uses of indwelling catheters</p> <p>Patient with acute and/or chronic urinary retention or bladder outlet obstruction</p> <p>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)</p> <p>Need for accurate measurements of urinary output in critically ill patients</p> <p>Perioperative use for selected surgical procedures, e.g., patients undergoing urological surgery or other surgery on contiguous structures of the genitourinary tract</p> <p>Anticipated prolonged duration of surgery – catheters inserted for this reason should be removed in theatre recovery unit</p> <p>Patients anticipated to receive large-volume infusions or diuretics during surgery or need for intraoperative monitoring of urinary output</p> <p>To assist in healing of open sacral or perineal wounds in selected incontinent patients</p> <p>Patient requiring prolonged immobilisation, e.g., potentially unstable thoracic or lumbar spine or multiple traumatic injuries such as pelvic fractures</p> <p>To improve comfort for end of life care if needed</p>
<p>Examples of <i>inappropriate</i> uses</p> <p><i>Don't use</i> indwelling catheters as a substitute for nursing care of the patient or resident with incontinence</p> <p><i>Don't use</i> as a means of obtaining urine for culture or other diagnostic tests when the patient can voluntarily void</p> <p><i>Don't use</i> for prolonged postoperative duration without appropriate indications</p>

Pathogenesis

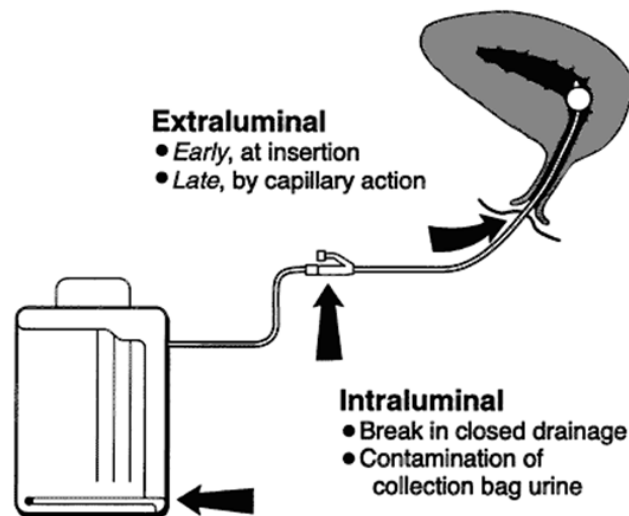
Under normal circumstances urethral flora, which tends to migrate into the bladder, is constantly flushed out during urination. When a catheter is inserted, this flushing mechanism is circumvented and peri-neal and urethral flora can pass up into the bladder in the fluid layer between the outside of the catheter and the urethral mucosa or in the urine in the catheter lumen (i.e., endogenous). Because of this, bladder colonisation is inevitable if catheters are left in place for prolonged periods.

In addition, bladder infection can be caused by bacterial reflux from contaminated urine in the drainage bag. Closed drainage systems reduce onset of infection by limiting access of bacteria to the urine. Hands of personnel may also contaminate the urinary catheter system during insertion or management (i.e., exogenous). See Figure 18.1.

Microbiology

A UTI is usually caused by endogenous microorganisms from the patient's own bowel. In community-acquired infections, the commonest microorganisms are *E. coli* and *Proteus* spp.

Fig 18.1. Main sites through which bacteria may reach the bladder of a patient with an indwelling urethral catheter.



Source: Maki DG, Tambyah PA. *Emerg Infect Dis* 2001;7:1-6.

Healthcare-associated UTIs are more resistant to antibiotics. This is because hospitalised patients become colonised with resistant microorganisms, a process encouraged by an increased length of stay and exposure to antibiotics. In communities where indiscriminate antimicrobial use is common, multi-resistant Gram-negative bacteria (e.g., extended spectrum beta-lactamase producers [ESBL] and *carbapenem-resistant Enterobacteriaceae* [CRE]) are also common colonisers of the human bowel.

E. coli is the most frequent cause of catheter-associated UTI (CAUTI). However, increasingly, CAUTIs are caused by more resistant Gram-negative species, including *Klebsiella* and *Pseudomonas*, as well as resistant *E. coli*. Similarly, ampicillin-resistant *Enterococcus* and vancomycin-resistant *E. faecium* (VRE) are becoming common. With additional antibiotic exposure, infections occur with multiply drug resistant bacteria (e.g., ESBL, CRE, VRE).

Resistant microorganisms may also be acquired by transfer from other patients, most commonly via contaminated staff hands, but sometimes from environmental sources. Urine and urinary catheter systems should be carefully disposed of, bottles and jugs cleaned and disinfected, and hands properly washed and decontaminated during insertion and management.

Definitions and Surveillance

Surveillance of CAUTI can be performed in selected groups of patients, e.g., patients in intensive care units or specific types of surgical patients. A definition for CAUTI may be obtained from the USA Centers for Disease Control and Prevention/National Healthcare Safety Network web site (<http://www.cdc.gov/nhsn/>) or European Centre for Disease Prevention and Control (<http://ecdc.europa.eu/>).

Strategies to Prevent Infection

Care bundle approach

Current strategies to prevent CAUTIs are based on the implementation of a 'care bundle'. A care bundle is a package of interventions that, when implemented together for all patients with urinary catheters, has resulted in substantial and sustained reductions in CAUTIs. The catheter care bundle for the prevention of CAUTIs developed by the USA Institute of Healthcare Improvement and the United Kingdom Department of Health are summarised in Table 18.3 with further strategies to prevent CAUTIs outlined in Table 18.2.

Table 18.2: Prevention of bacterial colonisation/infection of the bladder in patients with indwelling urethral catheters

1. EXTERNAL URETHRA MEATUS AND URETHRA	
Bacteria carried into bladder during insertion of catheter	<ul style="list-style-type: none"> • Use aseptic non-touch technique (ANTT) for insertion. • Pass catheter when bladder is full (preferably) for wash-out effect. • Use bladder ultrasound, if available
	<ul style="list-style-type: none"> • Before catheterisation, clean the urinary meatus using single-use sterile water/saline or antiseptic solution.
	<ul style="list-style-type: none"> • Use single-use sterile gel. If 2% lignocaine anaesthetic (single-use sterile) gel is used, then inject gel into urethra and hold it for 3-5 min before inserting catheter.
	<ul style="list-style-type: none"> • Use sterile items /equipment (sterile catheter, sterile gloves, single-use sterile solution etc.). • Use Urinary Catheter Pack (contains sterile items required for insertion of catheter in a
Ascending colonisation up urethra	<ul style="list-style-type: none"> • Keep peri-urethral area clean and dry. • <i>Don't use</i> catheter maintenance solution or ointments.
	<ul style="list-style-type: none"> • Secure catheter appropriately to prevent movement in urethra.
	<ul style="list-style-type: none"> • After faecal incontinence, clean perineum as soon as possible.
	<ul style="list-style-type: none"> • Maintain unobstructed urine flow; ensure that the catheter and drainage bag tubing are free of kinks.
2. JUNCTION BETWEEN CATHETER AND DRAINAGE TUBE	
	<ul style="list-style-type: none"> • Break in the closed drainage must be avoided unless absolutely necessary.
	<ul style="list-style-type: none"> • Closed drainage bag should <i>not</i> be disconnected. If a sample of urine is required for bacteriological examination, it should be obtained from a sampling port using aseptic
3. TAP AT BOTTOM OF COLLECTION BAG	
Reflux from bag into catheter	<ul style="list-style-type: none"> • Ensure the drainage bag is <i>never</i> raised above the height of the bladder. • Keep the catheter and collecting tube free from kinking.
	<ul style="list-style-type: none"> • <i>Do not</i> hold the bag upside down when emptying. • The drainage bag <i>must never</i> touch the floor.
Emptying of bag	<ul style="list-style-type: none"> • Empty the bag every 8 hours or when 2/3 full. • Use a separate disinfected jug to collect urine from each bag; prevent contact of the drainage spigot with the non-sterile collecting jug/container.
	<ul style="list-style-type: none"> • <i>Don't</i> instil antiseptic into urinary bag after emptying.
	<ul style="list-style-type: none"> • Always wash or disinfect physically clean hands with an alcoholic hand rub before and after opening tap.

Staff training

Healthcare personnel performing urinary catheterisation should receive training on correct procedures for insertion and maintenance of urinary catheters based on local written protocols.

Catheter size

Catheters are available in different sizes. The smallest diameter catheter that allows free flow of urine should be used. Larger diameter catheters are more likely to cause unnecessary pressure on the urethral mucosa, leading to trauma and ischaemic necrosis. Urological patients and some other patient groups may require larger sized catheters; these should only be used on the advice of specialists.

Table 18.3. Care bundle to prevent catheter-associated urinary tract infections*

Insertion Care Bundle
Avoid unnecessary catheterisation Chose catheters of appropriate size Use sterile items/equipment Insert catheter using strict aseptic non-touch technique Use closed drainage system
Maintenance Care Bundle
Review the need for the catheter on a daily basis and remove catheter promptly when no longer necessary Use aseptic technique for daily catheter care (e.g., hand hygiene, sterile items/equipment) Don't break the closed drainage system. If urine specimen required, take specimen aseptically via the sampling port (see Fig. 18.1)

*Adapted with modification from references 6 and 7. Note: The Care Bundle can be adapted or expanded to cover more issues according to local needs.

Antimicrobial coated catheters

Silver alloy catheters may reduce the incidence of asymptomatic bacteriuria in patients on short-term catheterization (2–10 days). There is no evidence that they decrease symptomatic infections and therefore they should not be used routinely. They should not be used for patients with chronic catheters.

Catheter insertion

Urinary catheterisation should always be performed using sterile or high-level disinfected equipment and aseptic technique. To minimise trauma to the urethra and discomfort to the patient, a sterile lubricant or local anaesthetic gel should be used.

Meatal cleansing

Meatal cleansing should be performed regularly to ensure that the meatus is free from encrustations. Cleansing with soap and water is sufficient; application of antimicrobial ointment or disinfectant to the urethral meatus is harmful and should be avoided.

Drainage bag

To help prevent trauma to the urethra, the urinary drainage tubing should be secured to the patient's thigh with straps and adjusted to a comfortable fit. The catheter drainage bag must always be placed below the level of the bladder to promote good drainage. If a catheter stand is used, the drainage bag and drainage tap must not come in contact with the floor. During patient movement, the drainage tube should be temporarily clamped to prevent back-flow of urine. Do not disconnect the drainage bag unnecessarily; maintain the closed drainage system.

Emptying the drainage bag

The drainage bag should be emptied regularly via the drainage tap at the bottom of the bag (i.e., when 3/4 full or sooner if it fills rapidly). If the bag does not have a tap, it must be replaced when 3/4 full using aseptic technique.

Extreme care must be taken when emptying a drainage bag to prevent cross-infection between patients. Hands must be washed or disinfected with an alcohol-based hand rub and non-sterile/clean disposable gloves should be worn when emptying the bag. Alcohol impregnated swabs should be used to decontaminate the outlet of the drainage tap (inside and outside). After emptying the bag, gloves must be removed and hands must be washed.

When emptying the drainage bag, use a separate container for each patient's urine and avoid contact between the urinary drainage tap and the container. The urine container must be rinsed and disinfected (preferably in a washer disinfectant) after each use, dried, and stored inverted in a clean place before further use.

Bladder irrigation

Bladder irrigation or washout and instillation of antiseptics or antimicrobial agents does not prevent CAUTI and therefore should not be used for this purpose. The use of these agents may damage the bladder mucosa or catheter and promote the development of resistant bacteria which are difficult to treat.

Specimen collection

Samples of urine for bacteriological examination should be obtained from the sampling port using aseptic technique. The sampling port should be disinfected by wiping with a 70% isopropyl alcohol impregnated swab. The sample may then be aspirated using a sterile needle and syringe and transferred into a sterile container.

If the urinary catheter has no sampling port, then the sample can be obtained from the urinary catheter by wiping the tube with 70% isopropyl alcohol. Allow to dry and then aspirate the urine sample using a sterile small bore needle and syringe. Transfer into a sterile urine container and send it to the microbiology laboratory as soon as possible. Never obtain a sample from the drainage bag. In asymptomatic patients, routine bacteriological testing is of no clinical benefit and not recommended.

Use of antimicrobial agents

The routine administration of systemic antibiotics at the time of catheter insertion/removal is not recommended. Routine prophylactic antibiotics while the catheter is in situ must not be used as this does not prevent CAUTI; it leads to resistant bacteria. The antibiotic treatment of CAUTIs in the presence of long-term indwelling catheters may not be successful because the causative bacteria are often embedded in biofilm on the surface of the catheter and protected from the action of antibiotics.

Condom catheters

There may be a place for the use of condom catheters for short-term drainage in cooperative male patients. Frequent changes, e.g., daily, may avoid complications, together with penile care. It should be removed at the first sign of penile irritation or skin breakdown. Condom use for 24 hour periods should also be avoided and other methods, such as napkins or absorbent pads, used at night.

Diagnosing UTI

The diagnosis of a UTI depends on laboratory support. When either 1) a carefully collected mid-stream specimen is obtained or, 2) the specimen is obtained aseptically by needle aspirate of the proximal drainage tube in a patient with an indwelling catheter, finding $\geq 10^5$ bacterial colony forming units (CFU)/ml is diagnostic of UTI. Bacterial concentrations $>10^2$ CFU/ml suggest infection if the specimen is obtained aseptically or in women with acute, uncomplicated cystitis.

Although UTIs in non-catheterised patients are usually caused by a single microorganism, in patients with chronic catheters, infections can be polymicrobial. The presence of multiple microorganisms does not necessarily indicate contamination.

Urine must be processed promptly, since even with good technique urine samples may contain small numbers of contaminants. These bacteria can multiply at room temperature (especially in hot climates) and result in falsely high colony counts. If delay is expected, the specimen should be transported to the laboratory in an ice box and refrigerated on arrival. Alternatively, boric acid (1% W/V or 1 g/10 ml of urine) should be added to the urine. Specimens containing boric acid need not be refrigerated.

Where microbiological support is limited, clinical symptoms (e.g., fever, supra-pubic tenderness, frequency, and dysuria) may be useful in diagnosis, principally in non-catheterised patients. The presence of pyuria on either microscopic examination or by dip-stick (leukocyte esterase) is consistent with UTI, however it is not specific. If dip-sticks are available, a positive nitrite reaction in combination with a positive leu-

kocyte esterase reaction is supportive in a symptomatic patient. In catheterised patients, a positive urine culture or dip-stick is not sufficient for diagnosis of infection. In such patients, fever and leukocytosis or leucopenia are additional diagnostic criteria.

Diagnosis of symptomatic infection can be difficult; you cannot rely on a positive culture result or dipstick as these are usually positive in most patients with a urinary catheter after a few days of insertion. Diagnosing CAUTI is based on clinical assessment as most patients are elderly and may not be able to communicate properly. A thorough examination of the patient is required; ruling out other sources of infection is essential before a diagnosis of CAUTI is made. As a guide, most patients with CAUTI may have bladder spasm, suprapubic tenderness, fever (>37.5 – 38.3 °C), and/or renal angle tenderness. Renal angle tenderness in the absence of any other underlying pathology suggests pyelonephritis.

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While the advice and information in this chapter is believed to be true and accurate, neither the authors nor the International Federation of Infection Control can accept any legal responsibility or liability for any loss or damage arising from actions or decisions based on this chapter.

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Handout 4. Quiz 1

- | | | | |
|----|--|--------------------------|--------------|
| 1. | The bladder is sterile (circle correct response) | True | False |
| 2. | The urethra is usually sterile in healthy non-catheterized people | True | False |
| 3. | In healthy non-catheterized people urine flow flushes out any invading bacteria | True | False |
| 4. | A urinary catheter is a foreign body | True | False |
| 5. | Reflux of contaminated urine from collecting bag is not an infection risk | True | False |
| 6. | A urinary catheter: (tick all correct responses) | | |
| | a. is a foreign body allowing potentially harmful uropathogens to enter the bladder | <input type="checkbox"/> | |
| | b. disrupts the protective mechanisms against infection – e.g. urine flow | <input type="checkbox"/> | |
| | c. causes damage during insertion that exposes the urinary tract to colonization and infection | <input type="checkbox"/> | |
| | d. can result in incomplete voiding of urine from the bladder because of retention of residual urine due to catheter balloon providing a medium for bacterial growth | <input type="checkbox"/> | |
| 7. | Bacteria can only ascend into the urinary tract on the outside of the catheter (i.e. extraluminal route) – between catheter and ureter epithelial surface | True | False |
| 8. | CAUTI can only be caused via contaminated equipment and/or the hands of health care workers (exogenous infection) | True | False |

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May 2018 version

Handout 5. Supplementary information related to quiz 1

CAUTI presents an infection risk.

The bladder is usually sterile. However, when a foreign body such as a urinary catheter is in place, local defences are bypassed and bacteria (i.e. uropathogens) can enter the bladder resulting in infection.

A urinary catheter can result in the following risks:

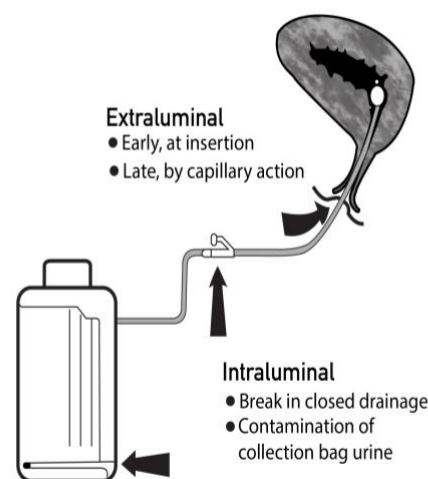
- disruption of protective mechanisms against infection e.g. urine flow;
- damage during insertion exposing the tract to colonization and infection;
- Damage to uroepithelial mucosa exposing binding sites to bacterial adhesins;
- incomplete voiding of urine from the bladder because of retention of residual urine due to catheter balloon providing a media for bacterial growth;
- reflux of contaminated urine from collecting bag.

Routes of entry of uropathogens

Bacteria ascend into the urinary tract via two possible routes: the **extraluminal** route between the catheter and ureter epithelial surface or the **intraluminal** route – this can occur during a break in the closed drainage system and/or defective asepsis, such as during specimen collection or if bag disconnected (see Fig. 1).

Infections can be either **endogenous** (self-infection): typically via meatal, rectal or vaginal colonization or **exogenous** (cross-infection): via contaminated equipment and/or hands of health care personnel.

Fig. 1. Routes of entry of uropathogens



Source: Maki DG, Tambyah PA. Engineering out the risk for infection with urinary catheters. Emerg Infect Dis 2001;7(2): 342–7.

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May 2018 version

Handout 6. Guide for Foley catheter use in hospitalized medical patients

Appropriate indications

1. Acute urinary retention *without* bladder outlet obstruction (e.g. medication-related urinary retention)
2. Acute urinary retention *with* bladder outlet obstruction due to non-infectious, nontraumatic diagnosis (e.g. exacerbation of benign prostatic hyperplasia). *Note:* consider urology consultation for catheter type and/or placement for conditions, such as acute prostatitis and urethral trauma.
3. Chronic urinary retention with bladder outlet obstruction. *Note:* it is unclear whether a Foley catheter is appropriate for chronic urinary retention without bladder outlet obstruction (e.g. neurogenic bladder) when an intermittent straight catheter is feasible and adequate.
4. Severe pressure ulcers or similarly severe wounds of other types that cannot be kept clear of urinary incontinence despite wound care; other urinary management strategies (e.g. barrier creams, absorbent pads, prompted toileting and non-indwelling catheters) should be considered.
5. Urinary incontinence in patients for whom nurses find it difficult to provide skin care despite other urinary management strategies and available resources, such as lift teams and mechanical lift devices –e.g. if turning causes hemodynamic or respiratory instability, strict prolonged immobility (such as in unstable spine or pelvic fractures), strict temporary immobility after a procedure (such as after vascular catheterization) or excess weight (>300 lb) from severe oedema or obesity
6. Hourly measurement of urine volume required to provide treatment – e.g. for management of hemodynamic instability, hourly titration of fluids, drips (such as vasopressors or inotropes) or life-supportive therapy
7. Daily measurement of urine volume that is required to provide treatment and cannot be assessed by other volume and urine collection strategies (e.g. acute renal failure work-up, acute intravenous or oral diuretic management, intravenous fluid management in respiratory or heart failure)
8. Single 24-hour urine sample for diagnostic test that cannot be obtained by other urine collection strategies (e.g. urinal, bedside commode, bedpan, external catheter or intermittent straight catheter)
9. To reduce acute, severe pain with movement when other urine management strategies are difficult (e.g. acute unrepaired fracture). *Note:* consider other urine collection strategies (e.g. urinal, bedside commode, bedpan, external catheter or intermittent straight catheter).
10. Improvement in comfort when urine collection by catheter addresses patient and family goals in a dying patient

Advanced Infection Prevention and Control Training

May 2018 version

11. Management of gross haematuria with blood clots in urine
12. Clinical condition for which an intermittent straight catheter or external catheter would be appropriate but placement by experienced nurse or physician was difficult or for a patient for whom bladder emptying was inadequate with non-indwelling strategies during this admission

Inappropriate uses

1. Urinary incontinence when nurses can turn/provide skin care with available resources, including patients with intact skin, incontinence-associated dermatitis, stage I and II pressure ulcers and closed deep-tissue injury
2. Routine use of Foley catheter in intensive care unit without an appropriate indication
3. Foley placement to reduce risk of falls by minimizing the need to get up to urinate
4. Post-void residual urine volume assessment
5. Random or 24-hour urine sample collection for sterile or nonsterile specimens if possible by other collection strategies (e.g. barrier creams, absorbent pads, prompted toileting or non-indwelling catheters)
6. Patient or family request when no expected difficulties managing urine otherwise in non-dying patient, including during patient transport (for details see reference below)
7. Patient ordered for “bed rest” without strict immobility requirement (e.g. lower-extremity cellulitis)
8. Preventing urinary tract infection in patient with faecal incontinence or diarrhoea or management of frequent, painful urination in patients with urinary tract infection

Sources: Meddings J, Saint S, Fowler KE, Gaies E, Hickner A, Krein SL et al. The Ann Arbor criteria for appropriate urinary catheter use in hospitalized medical patients: results obtained by using the RAND/UCLA appropriateness method. *Ann Intern Med.* 2015;162(9 Suppl):S1–S34;

Guideline for prevention of catheter-associated urinary tract infections (2009). Atlanta, GA: Centers for Disease Control and Prevention; 2009 (<https://www.cdc.gov/infectioncontrol/guidelines/cauti/index.html>).

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Handout 7. Types of catheterization and catheters

Three types of catheter are used in health care:

- **indwelling (Foley) catheters** – urethral (most common) or suprapubic (e.g. abdominal stab wound);
- **external catheters (condom catheters/Paul's tubing)** – typically used for men with serious functional or cognitive impairment, such as dementia – generally more comfortable and carry a lower risk of infection than indwelling catheters;
- **short-term (intermittent) catheters** – for use when a patient may need a catheter for a short period of time after surgery.

Urinary catheters come in different sizes to accommodate adults and paediatrics and the anatomical differences between males and females; e.g. Foley sizes 12–18 French/Fr for adults and 6–8 Fr for paediatrics.

Urinary catheters are also available in different materials including latex, silicone (to minimize biofilm formation; good for latex allergies) and a range of other materials, such as silicone-elastomer, hydrogel coated and antimicrobial coated (silver alloy coating).

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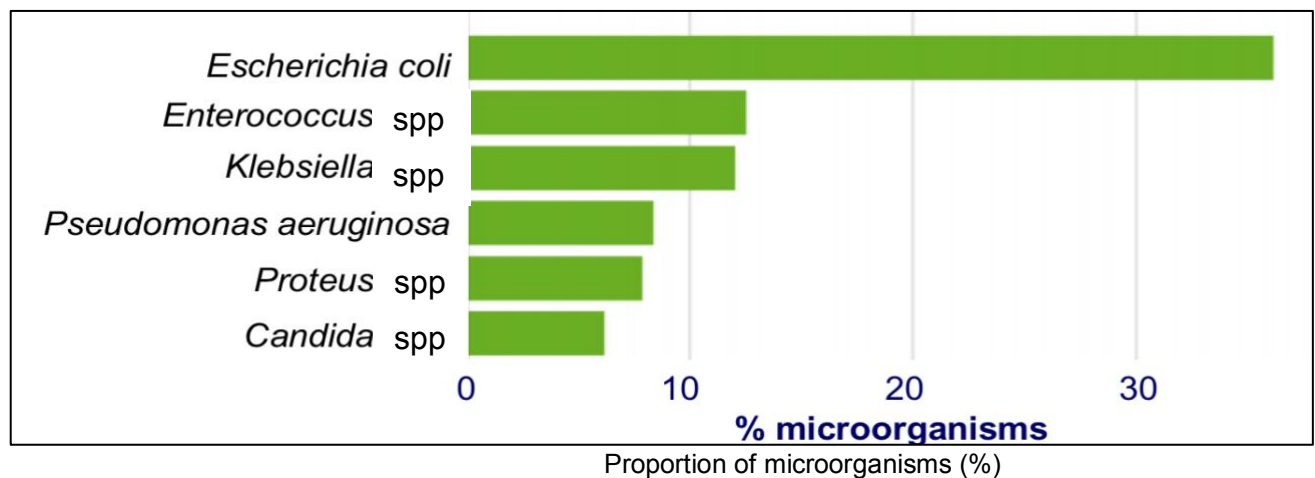
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Handout 8. Common microorganisms causing CAUTI

Distribution of pathogens for CAUTI reported in the United States of America, 2016

Pathogen	Proportion of pathogens (%)
<i>Escherichia coli</i>	23.9
<i>Candida albicans</i>	11.7
<i>Pseudomonas aeruginosa</i>	10.3
<i>Klebsiella (pneumoniae/oxytoca)</i>	10.1
<i>Enterococcus faecalis</i>	7

Most frequently isolated organisms in urinary tract infections in Europe, 2011–2012



Sources: National Healthcare Safety Network (NHSN) [website]. Atlanta, GA: Centers for Disease Control and Prevention; 2018 (<https://www.cdc.gov/nhsn/datastat/index.html>);

Most frequently isolated microorganisms in HAls [website]. Solna: European Centre for Disease Prevention and Control; 2018 (<https://ecdc.europa.eu/en/publications-data/point-prevalency-survey-database/microorganisms-and-antimicrobial-resistance-1>).

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Handout 9. Collecting a catheter specimen of urine from the sampling port

The sampling port can be used when it is necessary to test urine when the patient has possible or probable CAUTI; otherwise, sending routine urine sampling for culture is *not* recommended.

The sample must be collected through the sampling port using aseptic technique (key hand hygiene moments 2 and 3).

- Disinfect port by wiping with a 70% alcohol swab.
- Do not disconnect the closed drainage bag.
- Do **not** obtain the sample from the drainage bag or send catheter tips for culture.
- If the sampling port is not available, the sample can be aspirated from the connecting tube using a sterile small-bore needle/syringe and transferred into a sterile container (not best practice).

The specimen should be transported to the lab **within two hours** or refrigerated.

- If a refrigerator is not available, use a dedicated **ice box**, or add **boric acid** as a preservative.

Useful resource

- The culture of culturing – the importance of knowing when to order urine cultures [online presentation]. Rockville, MD: Agency for Healthcare Research and Quality; 2017 (<https://www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/cauti-ltc/modules/implementaion/education-bundles/urine-culturing/whento-order/cultures-slides.html>).

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Handout 10. Four key IPC principles and practices

Always use a multimodal strategy to guide implementation of CAUTI prevention interventions. The following four principles and practices are critical for CAUTI prevention.

1. **Avoid unnecessary urinary catheters.**

- 1.1. Each patient must be assessed for need of a catheter and reasons noted/ticked against the criteria on a checklist (in addition to alerts/reminders, prompts and use of bladder scans).

2. **Insert urinary catheters using aseptic technique** (see Aseptic Non Touch Technique (ANTT) poster, handout 12).

- 2.1. Hand hygiene must be observed at the right moments (see handout 2).
- 2.2. Proper insertion technique (maintaining sterile field) must be used.
- 2.3. A strong supportive system is required, including:
 - catheter insertion pack or appropriate individual sterile supplies (see slide 63: insertion packs for CAUTI);
 - sterile urinary catheter (one extra in case of contamination);
 - urinary catheter bag;
 - two pair of gloves: one clean and one sterile;
 - waterproof drape;
 - saline or sterile antiseptic solution;
 - syringe with sterile water in amount designated by catheter manufacturer;
 - water-soluble sterile lubricant OR anaesthetic gel;
 - sterile cleansing balls and forceps;
 - urine receptacle, sterile specimen container;
 - other: adequate lighting, sheet for draping patient, clean trolley with waste bag attached to it, hand hygiene materials.
- 2.4. Support should be provided through use of algorithms, checklists, nurse empowerment, training and competency development, and good documentation.

3. **Maintain urinary catheters based on recommended guidelines.**

- 3.1. **Secure catheter** to prevent irritation of the urethra.

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- 3.2. Maintain an **unobstructed urine flow**.
- 3.3. Maintain a **sterile, continuous closed drainage system**.
- 3.4. Maintain the **drainage bag below the level of the bladder and off the floor**, and empty when indicated.
- 3.5. Perform **hand hygiene**, i.e. the five moments specific to catheter care.
- 3.6. Perform regular **meatal hygiene**, i.e. once per day, after bowel action.
- 3.7. Support should also be provided through use of algorithms, checklists, nurse empowerment, training and competency development, and good documentation.

4. Review urinary catheter necessity daily and remove promptly.





- 4.1. Address the importance of timely removal to reduce CAUTI risk:
 - **review** urinary catheter necessity daily;
 - **record** the reason for keeping catheter in situ each day;
 - **remove** the catheter promptly when no longer needed.
- 4.2. The review can be supported by reminders/stop orders for removal, nurse empowerment and patient/family communication on the need for catheterization.
- 4.3. Institutional culture and power dynamics will influence the implementation of this element.

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Handout 11. Multimodal strategy trigger questions

If you decide to target CAUTI prevention in your facility, the WHO multimodal strategy will support the development of an improvement plan. The first step is to discuss with the IPC team and or committee the current situation to help collect baseline information for action planning – the table below provides some trigger questions to gather information for action.

Component	Trigger questions
1. Build it <small>(system change)</small> 	<ol style="list-style-type: none"> 1. Can necessary supplies be procured easily, affordably and when needed? 2. Is the infrastructure supportive of CAUTI prevention (e.g. can hand hygiene be performed at the point of care, is there adequate lighting, can patient privacy and dignity needs be met?) 3. Are enough catheters available to ensure single use? 4. Are there enough jugs to ensure decontamination between catheterization?
2. Teach it <small>(training & education)</small> 	<ol style="list-style-type: none"> 1. Is everyone who catheterizes trained on the four key principles and practices? 2. How is competency assured? 3. Are regular refresher courses/seminars/grand rounds provided? 4. Are policies/guidelines/protocols available/accessible, and consistent with current evidence? 5. Are patients/families taught about measures they can take to prevent CAUTI?
3. Check it <small>(monitoring & feedback)</small> 	<ol style="list-style-type: none"> 1. Are existing monitoring and feedback (audit) tools available and accessible – e.g. WHO hand hygiene observational audit tools? 2. Have monitoring and feedback tools been developed in your institution? 3. Are checklists available? 4. Are CAUTI surveillance systems in place? 5. Is someone with data analytic skills available to analyse and interpret the data to ensure effective feedback to the right people?
4. Sell it <small>(reminders & communications)</small> 	<ol style="list-style-type: none"> 1. Are posters available (either commercially or developed in-house to act as reminders or cues to action – e.g. to remind about timely removal?) 2. Is technology available to support reminders in the workplace – e.g. text messages? 3. Are bundles used to promote the right practices? 4. Do team meetings/ward rounds routinely address patients with indwelling urinary catheters?

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5. Live it (culture change) 	<ol style="list-style-type: none">1. Are there champions on wards who are informed about the four principles and practices and actively promote them, thus providing the message “we take CAUTI seriously here”?2. Do staff feel empowered to challenge suboptimal practices in a safe way?3. Do senior clinicians and nurses support and promote the other four parts of the multimodal strategy – e.g. by releasing staff to attend training?
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Handout 12. Aseptic Non Touch Technique (ANTT) poster

- Prep patient**
- Apply waterproof pad & gown
 - Ask patient to lift gown pre step 9

Preparation zone



1
Clean hands
with alcohol gel
or soap & water



2
Clean trolley
according to local
policy



3
Gather equipment
onto bottom shelf

Patient zone



4
Apply apron
(Re-clean hands if
required)



5
Open catheter pack
Prepare a Critical Aseptic
Field (Sterilized drape) &
position waste bag



6
Open equipment
onto the Critical Aseptic
Field using non-touch
technique (NTT)



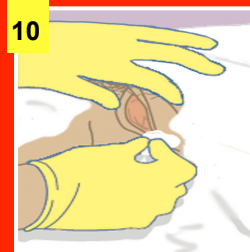
- Clean hands
- Apply sterilized
gloves



8
Prepare equipment
using NTT



9
Apply aseptic field
drapes over genitals &
between legs



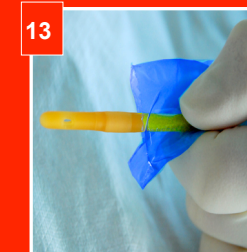
10
Clean urethral
orifice with normal
saline & gauze



11
Insert sterile
lubricating gel



- Dispose gloves
- Clean hands
- Apply sterilized gloves



13
Insert catheter
using NTT by touching
only the plastic
wrapping



14
Inflate balloon
using NTT



15
Attach collection
bag using NTT



16
Dispose of waste &
gloves then apron and
immediately...

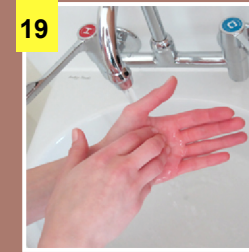


17
Clean hands
with soap & water

Decontamination zone



18
Clean trolley
according to local
policy



19
Clean hands
with alcohol hand rub
or soap & water

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May 2018 version

Handout 13. Two case studies – Kenya and United States of America

Case study 1. The multimodal strategy in action – example of CAUTI prevention in Kenya

The setting for the Tillekeratne et al. study is a medical ward of a Kenyan public district hospital in 2012. The CAUTI prevention strategy was based on a multimodal low-cost intervention consisting of:

- training and education, including a lecture series with videos;
- reminders and communications, including reminder signs in the workplace; and
- culture change, including IPC rounds by nurses/matrons.

The catheter utilization ratio decreased from 0.14 to 0.09 ($p < 0.001$) from pre- (eight weeks) to post-intervention (seven weeks). The number of CAUTIs pre-intervention was 13 (for 30.4 infections per 1000 catheter-days). Post-intervention there were zero CAUTIs ($p = 0.002$).

Source: Tillekeratne LG, Linkin DR, Obino M, Omar A, Wanjiku M, Holtzman D et al. A multifaceted intervention to reduce rates of catheter-associated urinary tract infections in a resource-limited setting. *Am J Infect Control.* 2014;42(1):12–16.

Case study 2. The multimodal strategy in action – example of CAUTI prevention in the United States of America

In this study by Knoll et al., set in the Minneapolis Veterans Administration Medical Center (a tertiary care referral centre in the USA), a bundled intervention was implemented between October 2002 and March 2010. The intervention included multiple types of education, a system redesign to ensure resources were in place, staff rewards, two phases of feedback and the involvement of a dedicated urinary catheter nurse.

From phase one to phase three the mean daily percentages of non-ordered and non-indicated Foley catheter use decreased from 17% to 5.1% and from 15% to 1.2% ($p \leq 0.001$), respectively.

Source: Knoll BM, Wright D, Ellingson L, Kraemer L, Patire R, Kuskowski MA et al. Reduction of inappropriate urinary catheter use at a Veterans Affairs hospital through a multifaceted quality improvement project. *Clin Infect Dis.* 2011;52(11):1283–90

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Handout 14. Additional reading list

CDC/NHSN surveillance definitions for specific types of infections. Atlanta, GA: Centers for Disease Control and Prevention; 2018
(https://www.cdc.gov/nhsn/pdfs/pscmanual/17pscnosinfdef_current.pdf).

Chenoweth CE, Saint S. Urinary tract infections. *Infect Dis Clin N Am*. 2016;30(4):869–85.

Dougherty L, Lister S, editors. *The Royal Marsden manual of clinical nursing procedures*, ninth edition. London: Wiley-Blackwell; 2015.

Gould CV, Umscheid CA, Agarwal RK, Kuntz G, Pegues DA; Healthcare Infection Control Practices Advisory Committee. Guideline for prevention of catheter-associated urinary tract infections 2009. *Infect Control Hosp Epidemiol*. 2010;31(4):319–26.

High impact interventions: care processes to prevent infection, fourth edition. Seafield: Infection Prevention Society in association with NHS Improvement; 2017.

How-to guide: prevent catheter-associated urinary tract infections. Cambridge, MA: Institute for Healthcare Improvement; 2011
(<http://www.ihl.org/resources/Pages/Tools/HowtoGuidePreventCatheterAssociatedUrinaryTractInfection.aspx>).

Lo E, Nicolle LE, Coffin SE, Gould C, Maragakis LL, Meddings J et al. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2014 update. *Infect Control Hosp Epidemiol*. 2014;35(5):464–79.

Loveday HP, Wilson JA, Pratt RJ, Golsorkhi M, Tingle A, Bak A et al. epic3: national evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *J Hosp Infect*. 2014;86 Suppl 1:S1–70.

Meddings J, Saint S, Fowler KE, Gaies E, Hickner A, Krein SL et al. The Ann Arbor criteria for appropriate urinary catheter use in hospitalized medical patients: results obtained by using the RAND/UCLA appropriateness method. *Ann Intern Med*. 2015;162 (9 Suppl):S1–S34.

Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals – protocol version 5.3. Stockholm: European Centre for Disease Prevention and Control; 2016
(<https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/PPS-HAI-antimicrobial-use-EU-acute-care-hospitals-V5-3.pdf>).

Saint S, Greene MT, Krein SL, Rogers MA1, Ratz D, Fowler KE et al. A program to prevent catheter-associated urinary tract infection in acute care. *N Engl J Med*. 2016;374:2111–9.