Advanced Infection Prevention and Control Training

Prevention of catheter-associated urinary tract infections (CAUTI): a trainer’s guide

Outline of the module
The “Prevention of catheter-associated urinary tract infections (CAUTI)” advanced training module is part of a broader infection prevention and control (IPC) training package targeting individuals and teams in IPC who work or intend to work as IPC focal points. 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.

Learning objectives of the module
The module aims to equip the IPC focal point to:
1. explain the problem of CAUTI;
2. explain catheter use, occurrence of CAUTI and related risk factors;
3. recognize CAUTI and understand management principles;
4. explain evidence-based (multimodal) implementation strategies for CAUTI prevention including appropriate catheter insertion, maintenance and removal.

Overview
This module is to be delivered as a half-day training session. It comprises a blend of PowerPoint slides, audiovisual material and a student handbook. The training is divided into four sessions:

   **Session 1**: the problem of CAUTI (30 minutes);
   **Session 2**: catheter use, occurrence of CAUTI and related risk factors (60 minutes);
   **Session 3**: recognizing CAUTI and understand management principles (60 minutes);
   **Session 4**: implementing evidence-based (multimodal, quality improvement-informed) strategies for CAUTI prevention during catheter insertion, maintenance and removal (60 minutes).

Materials needed
All materials should be collected and reviewed prior to starting the training:
- PowerPoint slide deck;
Advanced Infection Prevention and Control Training

- trainer’s guide;
- student handbooks (these include handouts and group work instructions);
- CAUTI insertion and removal animation videos;
- *IFIC basic concepts of infection control*, Chapter 8 on CAUTI prevention;
- laptop and data projector capable of playing video and audio;
- flipcharts and pens;
- paper and pens for students to use during group work.

**Evaluation**

The same pre- and post-training test (Annex 1, p. 30) will be distributed to participants at the beginning and end of this module to help gauge their knowledge of CAUTI prevention. The pre-training test will develop a baseline, measuring existing knowledge, and identify knowledge gaps. The post-training test will assess the knowledge gained through the module.
### Details of presentation slides, with resources for the trainer

The table below sets out the module’s sessions and lists the associated resources for the trainer. The last column in the table provides the trainer with preparatory pre-reading resources, information for further reading if needed at any point and/or key references to direct the students to do further reading offline.

<table>
<thead>
<tr>
<th>Slide no.</th>
<th>Slide image</th>
<th>Notes: descriptions and suggestions for the trainer to consider</th>
<th>Resources required</th>
</tr>
</thead>
</table>
| 1         | ![Slide 1](image1.png) | **Introduce** yourself and **welcome** the participants to the module.  
If there are any safety/administrative announcements, **make** them now. | – |
| 2         | ![Slide 2](image2.png) | **Read** the slide.  
**Give** a 1–2 minute overview of the whole module. | – |
## Advanced Infection Prevention and Control Training

### The symbols explained
- **Green**: You are encouraged to participate in discussion questions where you can use your own experience and prior knowledge.
- **Blue**: You are encouraged to participate in group activities to drill into key topics.
- **Red**: Essential content (not to be missed).
- **Amber**: Key reference for consolidating meaning.
- **White**: Some suggested answers to activities/group work.
- **Green**: In-depth case study applying learning into practice.
- **Blue**: Video material to supplement learning.
- **Blue**: Required reading or reflection outside of the classroom.

### Competencies
At the end of this module, the IPC focal point should be able to:
- advocate the importance of addressing CAUTI and its burden;
- identify IPC risk factors and moments during catheter insertion, management and removal that need improvement;
- promote and use evidence-based (multimodal) strategies for CAUTI prevention during catheter insertion, maintenance and removal.

### Learning objectives
On completion of this module, the student should be able to:
- explain the problem of CAUTI;
- explain catheter use, occurrence of CAUTI and related risk factors;
- recognize CAUTI and understand management principles;
- implement evidence-based (multimodal) strategies for CAUTI prevention during catheter insertion, maintenance and removal.

---

### Read the explanations from the screen.

### Ice breaker
- At this point **ask** the participants to introduce themselves to the person next to them and share with them one fact about why they are interested in IPC.
- **Allow** 2–3 minutes for the exchange of information.
- Then **allow** 10 minutes for rapid sharing of information learned during the exercise. Go round the room, asking each person to tell us the name and the fact about their partner.

---

### Competencies
**Emphasize** that these are the learning outcomes that the attendees will attain through completion of this module.

### Learning objectives
**Emphasize** that these objectives are the knowledge and skills that the attendees will be able to demonstrate on completion of the module.

---

### Competencies
**Emphasize** that these are the learning outcomes that the attendees will attain through completion of this module.
State that the first session explains the problem of CAUTI and its burden of disease.

Say:
“Before we begin, can I please ask for a volunteer to read the following poem – ‘The catheter’s lament’?”

Say:
“This was written by a infection prevention practitioner from the United Kingdom; it very simply gets across the message that a urinary catheter has serious risks associated with its use. It should be used only when absolutely necessary and removed as soon as it is no longer needed. For the rest of the module we will...
### Advanced Infection Prevention and Control Training

<table>
<thead>
<tr>
<th>10</th>
<th>Key points to note (1)</th>
<th><strong>Read</strong> the slide or <strong>ask</strong> a participant to read it.</th>
<th><strong>Refer to handout 1 in the student handbook, p. 3.</strong></th>
</tr>
</thead>
</table>
|    | **Refer to handout 1 in the student handbook** | - 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). |  |

<table>
<thead>
<tr>
<th>11</th>
<th>The critical role of hand hygiene</th>
<th><strong>Read</strong> the slide or <strong>ask</strong> a participant to read it.</th>
<th><strong>Refer to handout 2 in the student handbook, p. 4:</strong> <a href="http://www.who.int/gpsc/5may/hh-urinary-catheter_poster.pdf">http://www.who.int/gpsc/5may/hh-urinary-catheter_poster.pdf</a></th>
</tr>
</thead>
</table>
|    | **Refer to handout 2 in the student handbook** | - 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 bacteruria), unless they have a documented infection. |  |

<table>
<thead>
<tr>
<th>12</th>
<th>Key points to note (2)</th>
<th><strong>Read</strong> the slide or <strong>ask</strong> a participant to read it.</th>
<th></th>
</tr>
</thead>
</table>
|    | **Refer to handout 1 in the student handbook** | - Don’t change the catheter routinely if it is functioning properly.  
- Maintain closed drainage.  
- Bladder irrigation/washout and use of antiseptics/anti-microbial 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. |  |

**Explore and build on these simple messages.**

**Emphasize** that *before* insertion you must assess the need for catherization.

It is important to **point out** that two people are needed to perform insertion, and assistance is needed to help the person inserting the catheter to ensure that an aseptic non-touch technique is followed during the procedure.

**Recap** that the critical moments are 2 and 3 inside the patient zone with the emphasis on preventing microbial transfer from the hands of health workers to the patient during insertion and management.

**Emphasize** that there is no need to change routinely as long as the catheter is working properly. In fact, routine changing of catheters poses its own set of risks:

- it introduces possible infection if aseptic technique is not followed (moment 2);
- it can lead to additional and unnecessary costs – more detail will be provided on this later.

There is no evidence that it will reduce chances of infection.
Advanced Infection Prevention and Control Training

13

**Supplementary information**


Say

“This publication is additional reading material to supplement this module.”

The chapter should be provided as one of the key resources for participants.

14

**Questions on the use of indwelling urinary catheters**

1. Who has inserted a catheter before?
2. When is catheterization necessary?
3. How frequently are catheters used in your facility?
4. What are the potential complications?

Pose the slide questions, one at a time.

Ask participants to raise their hands or shout out answers.

Record answers on a flipchart for future reference as required.

Allow 5 minutes for this activity.

Flipcharts and markers

15

**Epidemiology of CAUTI**

- In low- and middle-income countries (LMICs), CAUTIs are one of the major health care-associated infections (HAIs) but are largely preventable.

- As many as 65–70% of CAUTI cases are preventable.

Read the slide or ask a participant to read it.

Emphasize the points that the reduction in infection can be achieved not only by using aseptic technique during insertion and maintenance but also through the application of a multimodal approach, including daily review of the need for a catheter and early removal. The module will focus on these points throughout since they are so important.

16

**Incidence of HAIs in LMICs among high-risk patients**

Note:
- CR-BSI = catheter-related bloodstream infection
- VAP = ventilator-associated pneumonia

Say:

“The increased burden of health care-associated infections (HAIs) in low- and middle-income countries (LMICs) particularly affects high-risk populations, such as patients in intensive care units (ICUs), with HAI frequency several times higher than in high-income countries,”
particularly for device-associated infections.

This graph shows the overall incidence of HAI in LMICs among high-risk patients. The HAI incidence density in settings with limited resources significantly varied between 4.1 and 91.7 episodes per 1000 patient-days.

But if we look at CAUTI, we see that the pooled cumulative incidence among adult ICU patients in LMICs was 8.8 per 1000 urinary catheter-days (95% CI 7.3–10.4); slightly higher than catheter-related bloodstream infections (CR-BSI) but lower than ventilator-associated pneumonia (VAP)."

---

**Incidence of HAIs in high-income countries among high-risk patients**

Say:

“Here, in contrast to the previous slide, we have the overall incidence of HAI in high-income countries among high-risk patients.

HAI incidence density ranged from 13.0 to 20.3 episodes per 1000 patient-days and pooled cumulative incidence was 17.0 episodes per 1000 patient-days in adult high-risk patients in industrialized countries.

Although it may look as if the rates on the previous slide were lower than rates reported here, this is not the case. This is simply due to the different y axis ranges.”
Say:
“This is a summary of the data presented. In most cases, you can see that in LMICs, incidence of CAUTI is at least twice as high as that reported in high-income countries. Although CAUTI may not have the highest levels of incidence reported among types of HAI, we mustn’t forget that it is one of the major causes of bloodstream infections and sepsis.”

Ask:
“So what is the impact of CAUTI for patients?”
Ask a participant to read the slide.

Ask:
“And what about the impact of CAUTI on health services?”
Ask a participant to read the slide.

State that the second session will elaborate on appropriate catheter use, occurrence of CAUTI and related risk factors.
### Advanced Infection Prevention and Control Training

#### Say:
“Before delving into this session, let’s first get a sense of everyone’s baseline knowledge about the anatomy of the urinary tract, urinary catheters and urinary tract pathophysiology.”

#### Ask
participants to refer to handout 4 in the student handbook.

#### Instruct
students to work in pairs on the quiz. **Allow** 15 minutes for this activity.

<table>
<thead>
<tr>
<th>Quiz 1</th>
<th>Refer to handout 4 in the student handbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The bladder is sterile – TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>2. The urethra is usually sterile in healthy non-catheterized people – TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>3. In healthy non-catheterized people urine flow flushes out any invading bacteria – TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>4. A urinary catheter is a foreign body – TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>5. Reflux of contaminated urine from collecting bag is not an infection risk – TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>6. A urinary catheter (OK if all correct responses) - a. is a foreign body allowing potentially harmful pathogens to enter the bladder — TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>b. disrupts the protective mechanisms against infection — e.g. urine flow — TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>c. causes damage during insertion that expresses the urinary tract to colonization and infection — TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>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 — TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>7. Bacteria can only ascend into the urinary tract on the outside of the catheter (i.e. extraluminal route) — between catheter and urothelial surface — TRUE/FALSE</td>
<td></td>
</tr>
<tr>
<td>8. CAUTION can only be caused via contaminated equipment and/or the hands of health care workers (exogenous infection) — TRUE/FALSE</td>
<td></td>
</tr>
</tbody>
</table>

#### Using the slide as a prompt - ask
students to call out what they consider the correct answers and stimulate discussion.

Share the correct answers (see Annex 2, p. 33 in this guide).

For additional reading to accompany the quiz answers, **refer** participants to handout 5 in the student handbook.

### Uropathogens: routes of entry
- Bacteria enter the urinary tract via two possible routes:
  - the *extraluminal* route — between the urinary catheter and the surface epithelium of the urethra,
  - the *intraluminal* route — this can occur during a rupture in the closed drainage system and/or defective asepsis, such as when collecting specimens or if the bag is disconnected.
- Infections can be:
  - **endogenous** (self-infection): typically by colonization of the urethral meatus, rectum or vagina.
  - **exogenous** (cross-infection): via contaminated equipment and/or the hands of health personnel.

#### Read
the slide or ask
a participant to read it.

**Emphasize** that the aseptic technique is designed to prevent both exogenous and endogenous infection and that daily catheter care aims to minimize endogenous infection – more detail will be provided on this later.
Advanced Infection Prevention and Control Training

State that these are two most common routes where microbes can gain entry into the catheter during both insertion and maintenance (i.e., extraluminal, through the surface of the catheter in contact mucous membranes; intraluminal, by contamination of urine due to break of closed drainage or contamination of the collection bag). In both cases, adherence to the catheter surface facilitates this process including biofilm production and bacteria proliferation and resulting in access to the urinary system.

Haematogenous spread is another source in which the microbes in the blood can enter the urinary system from a patient with bacteraemia, but this is a less common source of infection.

Split participants into groups and write on two flipchart:
- as many indications for catheterization as they can think of;
- as many reasons for not using a urinary catheter as they can think of.
- Allow a total of 20 minutes (10 minutes plus 10 minutes plenary feedback).

Read the slide or ask a participant to read it.

As you work through the appropriate indications, keep referring to the flipcharts.

Stimulate participants to comment on how they did – how do their answers compare with those listed in the next few slides?

Refer to handout 6 in the student handbook, p. 16.
### Advanced Infection Prevention and Control Training

#### 29

**Appropriate indications – for use in hospitalized medical patients (2)**

4. Severe pressure ulcers or similarly severe wounds
   - Note: this includes stage II or IV or unstable pressure ulcers or skin grafts of other types that cannot be kept clear of urinary incontinence despite wound care; other urinary management strategies (e.g. barrier creams, absorbent pads, prompt 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

---

#### 30

**Appropriate indications – for use in hospitalized medical patients (3)**

6. Hourly measurement of urine volume required to provide treatment – e.g. for management of hemodynamic instability, hourly titration of fluids, drips (such as vasoressors 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, or 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)

---

#### 31

**Appropriate indications – for use in hospitalized medical patients (4)**

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

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

---

#### 32

**Inappropriate uses – in hospitalized medical patients (1)**

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 surgery

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

---

**Read the slide or ask a participant to read it.**

**Refer to handout 6 in the student handbook, p. 16.**

---

**Read the slide or ask a participant to read it.**

**Refer to handout 6 in the student handbook, p. 16.**

---

**Read the slide or ask a participant to read it.**

**Encourage participants to comment on what they listed on the flipcharts – how do their answers compare with those listed in the next few slides?**

**Refer to handout 6 in the student handbook, p. 16.**
Advanced Infection Prevention and Control Training

33

Inappropriate uses – in hospitalized medical patients (2)
6. Random or 24-hour urine sample collection for sterile or non-sterile specimens if possible by other collection strategies (e.g. barrier creams, absorbent pads, prompted toileting or non-indwelling catheters)
7. Patient or family request when there are no expected difficulties managing urine otherwise in non-dying patient, including during patient transport
8. Patient ordered for “bed rest” without strict immobility requirement (e.g. lower-extremity cellulitis)
9. Preventing urinary tract infection (UTI) in patient with fecal incontinence or diaphoresis or management of frequent, painful urination in patients with UTI

Read the slide or ask a participant to read it.

Refer to handout 6 in the student handbook, p. 16.

34

Types of catheterization and catheters
Refer to handout 7 in the student handbook

Say:
“These images are examples of different types of catheter.
Handout 7 in your student handbook outlines these same examples, along with additional details pertaining to each type.

You can see images of the two types of indwelling catheter – an indwelling (Foley) catheter and a short-term (intermittent) catheter, which is used when a patient may need a catheter for a short period of time; for example, after surgery.

Some of you may also be familiar with external or condom catheters typically used for men with serious functional or cognitive impairment.”

Refer to handout 7 in the student handbook, p. 18.

35

Role of biofilms in CAUTI
https://www.youtube.com/watch?v=3_5S6zAa

- Biofilms are clusters of microorganisms and extracellular polymeric matrix.
- They can form on internal/external surfaces of catheters shortly after insertion and ascend to the bladder in 1–3 days.
- Shedding of bacterial cells from biofilms can lead to infection.
- Some biofilms block catheters, leading to bladder/kidney stones (e.g. crystalline biofilms form from bacteria that produce urea, such as Proteus spp.).
- They prevent penetration of antimicrobial agents and result in failure of treatment.

Read the slide or ask a participant to read it.

If time is available the short video may be shown to illustrate biofilm formation.
Common microorganisms causing CAUTI
Refer to handout 8 in the student handbook
- Escherichia coli
- Klebsiella spp.
- Proteus spp.
- Pseudomonas aeruginosa
- Staphylococcus aureus
- Coagulase-negative staphylococci
- Enterococcus faecalis
- Candida albicans
(yeast often seen due to antibiotic use)

Questions: risk factors for CAUTI
Three questions:
1. Patient risk factors – which patients are at risk?
2. Health care worker risk factors – how does the health worker affect risk of CAUTI?
3. System-related factors – what are the health system factors that affect risk of UTI? (Think multimodal!)

Refer to handout 8 in the student handbook, p. 19.

Read the slide, posing the questions one at a time.
Ask participants to respond, encouraging broad participation from all students. Allow 10 minutes in total for this activity.
Answers are on the following slides.
### Patient-related risk factors (1)

- The key risk factor is duration of catheterization.
  - Unnecessary catheter placement should be reduced and duration minimized.

### Patient-related risk factors (2)

- Factors that alter the physiology (e.g. pregnancy)
- Impaired immunity (e.g. diabetes, HIV, chemotherapy)
- Severity of illness, other infections
- Female gender
- Older age (>50 years)
- Malnutrition, dehydration
- Faecal incontinence, incomplete emptying of bladder

### Health care worker-related risk factors – defective IPC practices (1)

- Failure to remove catheter in a timely way (>2 days – remember the biofilm!)
- 3–7% increased risk with each day a catheter remains
- Lack of documentation and record-keeping – no review/removal plan
- Absence of routine checks

### Health care worker-related risk factors – defective IPC practices (2)

- Overuse/inappropriate use of catheters (e.g. for specimen collection/nursing convenience)
- Lack of asepsis during insertion and maintenance (including defective hand hygiene at moments 2 and 3)
- Reuse of catheters
- Emptying of bags from different patients into a communal container
- Incorrect positioning of urine bag (e.g. on floor; raising above the level of the bladder, causing back-flushing) and drainage tubing
- Putting antiseptic solution in urinary bag
- Routine flushing of catheter
- Inappropriate urine specimen collection (no sampling ports)
- Contamination during disconnection of drainage system

**Read the slide or ask a participant to read it.**

Be sure to **emphasize** that getting the catheter out as soon as possible is the top priority to avoid problems for the patient.
### Advanced Infection Prevention and Control Training

<table>
<thead>
<tr>
<th>Page</th>
<th>Image</th>
<th>Text</th>
</tr>
</thead>
</table>
| 42   | ![Image](image1.png) | **Say:**

“In the following pictures, I want you to tell me what you think the problems are in each. Let us start with this one.”

**Allow 2 minutes’ discussion for each scenario, with participants shouting out various answers.** |
| 43   | ![Image](image2.png) | **Say:**

“The main fault here is the leaking urine bag, which should be addressed.” |
| 44   | ![Image](image3.png) | **Say:**

“Now, what can you see here that poses a problem?” |
| 45   | ![Image](image4.png) | **Say:**

“Remember what was just discussed as a health care worker-related risk factor – incorrect positioning of the urine bag.

The main fault here is that the catheter bag is resting on the floor.” |
Read the slide or ask a participant to read it.

Say:
“Think about these factors in relation to your institution/workplace – is your workplace multimodal in its approach to CAUTI prevention?
We will discuss the use of multimodal strategies to improve CAUTI prevention later.”

Say:
“Now let us move onto the third session in this module – recognizing CAUTI and understanding management principles.”

Read the slide or ask a participant to read it.

Ask students to focus on the last bullet point – i.e. why CAUTI has no classic signs and symptoms of UTI – the presence of the catheter itself influences this.

Read the slide or ask a participant to read it.

Emphasize that this very is a important slide.

Say:
“The definition of CAUTI for surveillance must be applied in a consistent manner to ensure that comparison of HAI rates can be made. This applies to definitions of all HAIs, because the definitions are epidemiological and not clinical.”
The surveillance definition **must not** be used to make clinical decisions relating to the treatment of patients – this decision must be based on the clinical condition of the patient.”

**CDC definition of CAUTI (1)**

Patient must meet criteria 1, 2 and 3 below:
1. Patient had an indwelling urinary catheter in place for over two days on the date of event AND it was either:
   - present for any portion of the calendar day on the date of event
   - OR
   - removed the day before the date of event.

**Inform** the students that there is no international agreement on definitions of surveillance of HAIs but the Centers for Disease Control and Prevention (CDC) and European Centre for Disease Prevention and Control (ECDC) definitions are those most commonly used.

**Say:**

“It is essential that before surveillance you decide which definition you are going to use so that compression can be made, as different definitions will give you different results. The ECDC definitions provide more options for making the diagnosis including without microbiological support.”

**CDC definition of CAUTI (2)**

2. Patient has at least one of the following signs or symptoms:
   - fever (>38.0°C) – to use fever in a patient aged over 65 years, the indwelling urinary catheter needs to be in place for more than two calendar days on date of event;
   - suprapubic tenderness (with no other recognized cause);
   - costovertebral angle pain/tenderness (with no other recognized cause);
   - urinary urgency (cannot be used when catheter is in place);
   - urinary frequency (cannot be used when catheter is in place);
   - dysuria (cannot be used when catheter is in place).

**Illustrate** this point by showing that, for example, the CDC definition requires the indwelling urinary catheter to be in place for two days. On the other hand, as we will see in an alternative definition – the ECDC definition gives the duration as seven days, so there are challenges and it is important to agree which definition you will use and be consistent.
3. Patient has a urine culture with no more than two species of organism identified, at least one of which is a bacterium of $\geq 10^5$ CFU/ml (refer to CDC comments in the manual for details).

**Emphasize** that the CDC definition also requires a positive culture result to be obtained.

Read the slide or ask a participant to read it.

---

**ECDC definition of UTI**

<table>
<thead>
<tr>
<th>CDC definition of UTI</th>
<th>Microbiologically confirmed</th>
<th>Microbiologically unconfirmed</th>
<th>Asymptomatic UTI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive culture</td>
<td>$\geq 10^5$ CFU/ml</td>
<td>$\geq 10^5$ CFU/ml</td>
<td>$\geq 10^5$ CFU/ml</td>
</tr>
<tr>
<td>Positive AS</td>
<td>$\geq 10^5$ CFU/ml</td>
<td>$\geq 10^5$ CFU/ml</td>
<td>$\geq 10^5$ CFU/ml</td>
</tr>
</tbody>
</table>

- Positive culture
- $\geq 10^5$ CFU/ml
- Positive AS
- $\geq 10^5$ CFU/ml

**Emphasize** the point about a urinary catheter being present and in situ within seven days of the onset of signs and symptoms in this ECDC definition for UTI-B.

Say:

"So it is important to note that ECDC give you an option that you can make a diagnosis without culture results and for instance you can use a urine dipstick test. However, again it is vital to note that both CDC and ECDC definitions emphasize that you **must not** consider asymptomatic bacteriuria as a UTI."

Read the slide or ask a participant to read it.

---

Ask participants:

"How do you collect a catheter specimen of urine from the sampling port?"

**Encourage** some to share their thoughts, ideas and experience.

After 3 minutes, be sure to **emphasize** the following:

"If a urine specimen is required it must be obtained from the sampling port using aseptic non-touch technique (ANTT).

The sampling port must first be disinfected by wiping with a 70%
## Advanced Infection Prevention and Control Training

<table>
<thead>
<tr>
<th>55</th>
<th>Sending a urine sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The urine sample must be collected using aseptic technique, as outlined in previous slides.</td>
</tr>
<tr>
<td></td>
<td>The sample must be sent in a sterile container as soon as possible (within two hours of collection).</td>
</tr>
<tr>
<td></td>
<td>If delay is anticipated, the sample must be put into a designated refrigerator or ice box; an ice box can be used to transport the sample to prevent overgrowth of bacteria.</td>
</tr>
<tr>
<td></td>
<td>Alternatively, use of boric acid is recommended.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>56</th>
<th>Urine container with preservative boric acid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Using accurate concentrations of boric acid is essential, as it may affect the viability of the bacteria and therefore the bacteriology culture result.</td>
</tr>
<tr>
<td></td>
<td>Use a marked bottle to achieve 1% w/v or 0.1g/10ml.</td>
</tr>
<tr>
<td></td>
<td>The sample should be sent to the laboratory within 4 hours or stored in the fridge until transport to the laboratory is available</td>
</tr>
</tbody>
</table>

alcohol-impregnated swab and allowed to dry. 
Aspirate the urine sample using a sterile small-bore needle and syringe and transfer into a sterile urine container. 
Send to the lab for culture and sensitivity. Record on the microbiology form that it is a catheter specimen of urine and record any antibiotics the patient is receiving.”

Draw students’ attention to handout 9 in the student handbook for additional reading.

---

<table>
<thead>
<tr>
<th>55</th>
<th>Read the slide or ask a participant to read it.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emphasize the importance of sending the specimen as soon as possible and within two hours of collection – but if this is not possible, stress the importance of refrigeration or using an ice box. This is crucial in order to get accurate results.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>56</th>
<th>Read the slide or ask a participant to read it.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>---------------------------------------------</td>
</tr>
</tbody>
</table>
Advanced Infection Prevention and Control Training

**Urine test strip or dipstick test**

- Urine dipstick tests are a valuable screening tool for UTIs to guide empiric treatment.
- Nevertheless, results should be interpreted with microscopy and clinical information.
- Both test strips and dipstick tests may detect nitrites (metabolic product of typical pathogens of urinary tract), leukocyte esterase from white blood cells/neutrophils.

### Advantages
- Convenient
- Easy to interpret
- Cost-effective
- Short turn-around time
- Can be performed at point of care

### Disadvantages
- Results are time- and storage-sensitive
  - Specified time between specimen collection and test reading
  - False positive/negative results
  - Qualitative

---

**Nitrites and leukocyte esterase**

- **Detection of nitrites**
  - relies on breakdown of urinary nitrites to nitrites (not in normal urine but with many Gram-negative and some Gram-positive bacteria)
  - can give false negative results due to shortened (<4 hours) bladder inoculation time, pH<6.0, presence of nitrate reductase-negative organisms, prostatic or urinary vitamin C

- **Detection of leukocyte esterase**
  - relies on reaction of leukocyte esterase produced by neutrophils
  - can give a positive result, suggesting pyuria associated with UTI
  - can be hindered, as leukocytes may disintegrate in transit
  - can give false positive results due to contamination with vaginal discharge
  - can result in reduced sensitivity due to elevated urine glucose (e.g. diabetes)

---

**Read the slide or ask** a participant to read it.

The following points should be **reinforced**.

- Urine dipsticks are one of the most frequent tests used for diagnosing UTIs in non-catheterized patients.
- This test is not validated for catheterized patients but can be used as a guide, especially in LMICs.
- Highlight the disadvantages of a urine dipstick from the table on the slide.

---

**Read the slide or ask** a participant to read it.

**Say:**

“A dipstick can be used to detect nitrites, which are produced by most common bacteria that are the cause of UTIs, especially Gram-negative bacteria and leukocytes in non-catheterized patients.”

**Emphasize** that the use of urine dipstick results must be interpreted with caution as, in the presence of a urinary catheter, bacteria will be present, and trauma caused by the catheter may also give a reading of positive white blood cells in urine.

**State**, in summary, that there are limitations but the results, coupled with other criteria, can be useful.
<table>
<thead>
<tr>
<th>59</th>
<th>Read the slide or ask a participant to read it.</th>
</tr>
</thead>
</table>
| 60 | Say:  
“We will now start the last session of this module – implementation of evidence-based strategies for CAUTI prevention including catheter care insertion, maintenance and removal.” |
| 61 | Read the slide or ask a participant to read it. (Read quickly – subsequent slides will provide further information on each point.)  
Also let the students know that more detail for later reading is included in handout 10 of the student handbook. |
| 62 | Say:  
“Now we will watch a video about catheter insertion.”  
At key points the video will be paused to highlight the IPC practices of relevance (e.g. hand hygiene at moments 2 and 3, appropriate use of personal protective equipment, cleaning the trolley, the importance of having all necessary equipment in the right place at the right time to minimize the need for hand hygiene and contribute to an...
## Advanced Infection Prevention and Control Training

<table>
<thead>
<tr>
<th>Page</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>After the video, <strong>consolidate</strong> and <strong>reinforce</strong> learning by refocusing on the content of a typical catheter insertion pack. <strong>Read</strong> the slide or ask a participant to read it. <strong>Highlight</strong> the points that use of antiseptic is recommended in some guidelines and is very common for cleaning the catheter before insertion, and further that it is often used during maintenance, but <strong>emphasize</strong> that the evidence suggests that this is not necessary. Sterile saline solution should be used to clean the urethra – this is sufficient and safe.</td>
</tr>
<tr>
<td>64</td>
<td><strong>Read</strong> the slide and mention that these additional videos are available in the NEJM but they are not free.</td>
</tr>
</tbody>
</table>
| 65   | **Say:** “Now the focus is on how to apply a strategy to improve routine practices to prevent CAUTI by using a multimodal approach that addresses the five areas listed on the slide.” **Read** the slide or ask a participant to read it. **Say:** “Targeting only ONE area (i.e. unimodal) for CAUTI prevention – for example, offering one training session – is not likely to
be effective for embedding long-term safe practice. Instead, a multimodal strategy is highly recommended. You may recall from other training that this consists of five elements implemented in an integrated way, according to your local context. Multimodal strategies include bundles that you may be familiar with (such as an implementation tool to improve the care process and patient outcomes in a structured manner).

<table>
<thead>
<tr>
<th>Build it</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System change</strong></td>
</tr>
<tr>
<td>• Ensure that the health facility has the necessary infrastructure and resources to enable measures to prevent CAUTI.</td>
</tr>
<tr>
<td>• Good infrastructure and available resources can streamline interventions for consistent care and make implementation easier and safer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pre-prepared CAUTI insertion kits</td>
</tr>
<tr>
<td>• Personal protective equipment</td>
</tr>
<tr>
<td>• Hand hygiene supplies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teach it</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training and education</strong></td>
</tr>
<tr>
<td>• Ensure that practical training and education methods are aligned with the recommendations for CAUTI prevention.</td>
</tr>
<tr>
<td>• Insufficient knowledge – particularly of CAUTI recommendations based on scientific evidence and why they are important – is a major obstacle to change.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Onsite courses</td>
</tr>
<tr>
<td>• Use of simulations and videos</td>
</tr>
<tr>
<td>• Group discussions</td>
</tr>
<tr>
<td>• Bedside training</td>
</tr>
<tr>
<td>• Training support materials (handouts, e-learning, etc.)</td>
</tr>
</tbody>
</table>

---

**Say:**

“Now let’s take each component of that multimodal strategy and consider how it applies to CAUTI prevention.”

**Read** the slide or ask a participant to read it.

**Ask:**

“Does this make sense? Each safe process (recommendation) you are trying to achieve will need to have the right infrastructure and resources in place to achieve success. Think about the video we just watched and the infrastructure and equipment that were needed to make it happen safely.”

---

**Say:**

“Does this make sense to you? Would you agree that the right education and training is critical for successful improvement? Think about the video again – safely inserting a catheter is a skill that requires excellent, evidence-based training and
ongoing education to keep the practitioner up to date.”

Say:
“This slide highlights what is referred to as a photographic guideline that can be used to support training – it can act as an aide-memoire.
This poster can also be displayed on the wall in a clinical setting to act as a visual reminder of the right practices. (In a moment we will look at reminders in the workplace.)"

Refer to handout 12 in the student handbook, p. 25.

Say:
“Having the right structures, systems and equipment is important, and training health workers on the right processes and practices is key. But to instil these behaviours and ensure they become the routine standard of care, monitoring, audit and feedback have an important role.”

Read the slide or ask a participant to read it.

Explain that this slide is one example of documentation/forms used.

Highlight critical elements that a monitoring form should include such as the following.

- “The form prompts you to record the reason for catheter insertion, so in a way it is promoting best practices and trying to prevent inappropriate use.
- It addresses things like patient consent, which is useful for considering the patient’s views and rights.
- It facilitates daily checking and prompts the health care worker to consider each day
### Advanced Infection Prevention and Control Training

<table>
<thead>
<tr>
<th>71</th>
<th>72</th>
<th>73</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sell it</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reminders and communications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- This element is to remind and encourage health professionals to recognize the importance of CAUTI prevention practices through visual methods and good communication.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- It also involves communication with patients and their visitors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Communications to senior leaders and decision-makers about CAUTI and prevention strategies should be considered.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Example of a reminder</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My 5 Moments for Hand Hygiene Focus on caring for a patient with a Urinary Catheter</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Live it</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Culture change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Create an environment and perceptions that facilitate awareness of prevention at all levels.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Nurture a climate that understands and prioritizes safety and IPC issues.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- The culture of a hospital influences how teams work together and how valued people feel – and how they perform day to day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- It can influence staff perceptions of their ability to make a change – e.g. to safer, evidence-based practices.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Say:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Effective communications to remind busy health workers of the actions they have to take play a major part in achieving success, so this should be part of your strategy. We have all seen many posters in our settings, but there are also other types of reminders.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Say:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“This is an example of an available reminder mentioned earlier.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Say:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“The final part of the multimodal strategy is about the culture – especially a culture of safety within a hospital. I am sure you would all agree that the culture in an hospital can affect how change or improvement happens. So however hard it is to address, this must be considered in your strategy.”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Ask** whether the catheter is still required. All of these help to minimize the risk of CAUTI.”

Say whether there are any questions.

Read the slide or ask a participant to read it.
### Advanced Infection Prevention and Control Training

<table>
<thead>
<tr>
<th>74</th>
</tr>
</thead>
</table>

**Draw** participants’ attention to handout 13 in the student handbook.

**Allow** 20 minutes in total for these case studies.

**Read** through the first case study and ask if there are any questions – **allow** 10 minutes for this case study.

The main point of this closing exercise is to conclude the module and bring all of the learning points together.

The Kenya study highlights how a multimodal approach can work in low-resource settings. In this medical ward the authors used training and education and videos to strengthen the technical skill of the health care workers and reinforced best practices through signage in the workplace (such as posters). Focusing on “Live it” or culture change, nurses were empowered and legitimized to perform rounds to check on who had a catheter in place and why, and to encourage early removal.

**Ask** a participant to read out the USA study.

**Prompt** the students to highlight which elements of the multimodal strategy are being addressed here – **allow** 10 minutes for this case study.

- **Build it** – system redesign: ensure resources are in the right place and appoint a dedicated catheter nurse (this also embraces “teach it” – this nurse would be intensively trained on best practices).
- **Teach it**: the study highlights multiple types of education.

Refer to handout 13 in the student handbook, p. 27.
Advanced Infection Prevention and Control Training

- Check it: it includes two phases of feedback.
- Sell it: this is not explicitly addressed here.
- Live it: the use of rewards could be considered as part of a culture that supports safe practices; also, assigning a dedicated nurse suggests that the climate of the hospital values safe practices.

References/information sources


Acknowledgements

- The Zimbabwe Infection Prevention and Control Project led the original development of this module.
- Benedetta Allegranzi, Nizam Damani and Julie Storr (Department of Service Delivery and Safety, WHO) led the overall coordination and refinement.
- Anthony Twyman (Department of Service Delivery and Safety, WHO) contributed to the development.
- Sanujay Sair, Jennifer Weddings, Milissa Manojlovich, Debbie Zawoi and Russel Olmsted (University of Michigan) provided a detailed review for technical accuracy.

There is no need to read the slide – just explain that there are further reading materials on all of the topics addressed here.

Refer to handout 14 in the student handbook, p. 28.

Read the slide.

Thank everyone for attending.
Annex 1. Pre- and post-training test

The same pre- and post-training test (p. 32 below) should be distributed to participants at the beginning and end of this module to gauge their knowledge of CAUTI. The pre-training test will develop a baseline, measuring existing knowledge, and identify knowledge gaps. The post-training test will assess the knowledge gained through the module.

This page contains the answers to the test; please ensure two copies of the master form on p. 32 are printed for each student. Hand one out at the start of the session to collect initial data from participants and the other at the end to assess progress.

FORM WITH ANSWERS – for trainer

Advanced IPC knowledge exam: CAUTI prevention

All questions are multiple choice. Please circle one answer or all that apply as per each question’s instructions.

CAUTI prevention

1. Which of the following is the correct statement? (Please circle one answer.)
   a. The bladder is sterile while the urethra is colonized with bowel and vaginal flora at its lower end.
   b. The urethra is sterile while the bladder is colonized with bowel and vaginal flora.
   c. The bladder and urethra are sterile.
   d. The bladder and urethra are both colonized with bowel and vaginal flora.

2. Which of the following form one of the four key principles and practices in the prevention of CAUTI? (Please circle one answer.)
   a. Always insert urinary catheters in the operating theatre.
   b. Review urinary catheter necessity weekly.
   c. Avoid unnecessary urinary catheters.
   d. Always place the urinary catheter bag directly on the floor.

3. Please mark which component of the multimodal strategies (1, 2, 3, 4 or 5) corresponds to each example.
   1. Build it: system change
   2. Teach it: training and education
   3. Check it: monitoring and feedback
4. Sell it: reminders and communications

5. Live it: culture change

- Hold a monthly IPC champion award programme for health care workers. (5)
- Discuss with management that enough catheters are available for single use. (1)
- Include CAUTI prevention key principles in IPC staff training when they are hired and subsequently annually. (2)
- Put up posters in the ward on IPC reminders. (4)
- Ensure CAUTI interventions are included in regular IPC assessments. (3)
Advanced IPC knowledge exam: CAUTI prevention

All questions are multiple choice. Please circle one answer or all that apply as per each question’s instructions.

CAUTI prevention

1. Which of the following is the correct statement? (Please circle one answer.)
   a. The bladder is sterile while the urethra is colonized with bowel and vaginal flora at its lower end.
   b. The urethra is sterile while the bladder is colonized with bowel and vaginal flora.
   c. The bladder and urethra are sterile.
   d. The bladder and urethra are both colonized with bowel and vaginal flora.

2. Which of the following form one of the four key principles and practices in the prevention of CAUTI? (Please circle one answer.)
   a. Always insert urinary catheters in the operating theatre.
   b. Review urinary catheter necessity weekly.
   c. Avoid unnecessary urinary catheters.
   d. Always place the urinary catheter bag directly on the floor.

3. Please mark which component of the multimodal strategies (1, 2, 3, 4 or 5) corresponds to each example.
   1. Build it: system change
   2. Teach it: training and education
   3. Check it: monitoring and feedback
   4. Sell it: reminders and communications
   5. Live it: culture change

   • Hold a monthly IPC champion award programme for health care workers.
   • Discuss with management that enough catheters are available for single use.
   • Include CAUTI prevention key principles in IPC staff training when they are hired and subsequently annually.
   • Put up posters in the ward on IPC reminders.
   • Ensure CAUTI interventions are included in regular IPC assessments.
Annex 2. Quiz 1 answers

1. The bladder is sterile True

2. The urethra is usually sterile in healthy non-catheterized people False

3. In healthy non-catheterized people urine flow flushes out any invading bacteria True

4. A urinary catheter is a foreign body True

5. Reflux of contaminated urine from collecting bag is not an infection risk False

6. A urinary catheter:
   a. is a foreign body allowing potentially harmful uropathogens to enter the bladder Correct
   b. disrupts the protective mechanisms against infection – e.g. urine flow Correct
   c. causes damage during insertion that exposes the urinary tract to colonization and infection Correct
   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 Correct

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 False

8. CAUTI can only be caused via contaminated equipment and/or the hands of health care workers (exogenous infection) False