

# Aseptic Techniques

## Introduction

Aseptic technique is a general term involving practices that minimize the introduction of microorganisms to patients during patient care. There are two categories of asepsis; general asepsis which applies to patient care procedures outside the operating theatre and surgical asepsis relating to procedures/processes designed to prevent surgical site infection. This chapter will focus primarily on general aseptic procedures as insertion of intravenous catheters or urinary catheters and examples of “no-touch” technique.

Aseptic techniques are used to reduce the risk of post-procedure infections and to minimize the exposure of health care providers to potentially infectious microorganisms.

Aseptic techniques include practices performed just before, during, or after any invasive procedures.

Poor adherence to aseptic techniques results in considerable morbidity and mortality. Even in countries with well-established infection control programs, hospital-acquired infections (HAI) related to poor compliance with aseptic techniques is an important public health problem. For example, in the United States surgical site infections are the third most frequently reported infection accounting for 14% to 16% of all hospital-acquired infections.<sup>30</sup> Data on surgical site infections is not available in Egypt; however, other sources of data suggest that there is poor compliance in aseptic techniques during critical procedures. For example, extrinsic contamination of intravenous fluids has been observed in intensive care units, in obstetric wards, and in dialysis centers.<sup>8</sup> These studies suggest that breakdowns in aseptic techniques occur both in the preparation and in the maintenance of IV fluids. Poor adherence to aseptic techniques, such as the reuse of needles and syringes between patients has also been implicated in transmission of blood-borne pathogens (e.g., HIV and HCV) in Egypt.<sup>6</sup>

It is important that all health care facilities establish policies regarding procedures that require aseptic techniques. Health care personnel who perform these procedures should be trained in aseptic technique and should

demonstrate competency. It is particularly important for staff to understand why aseptic techniques are needed and for the hospital director to ensure that adequate equipment and supplies are available. Supervision and monitoring of infection control activities is a critical element of infection control.

## Principles of Asepsis

Numerous non-surgical procedures require aseptic techniques in order to prevent transmission of infectious agents.

### **Procedures with the highest risk for causing infections include:**

- The placement of medications or devices into sterile body spaces such as:
  - The placement of intravenous lines.
  - The placement of indwelling urinary catheters.
- Wound care.
- During the preparation and administration of intravenous fluids
- During insertion of intravenous and intramuscular injections of medication, especially from multidose vials.

### **Key processes for performing medical (non-surgical) procedures with aseptic techniques include:**

- Hand antisepsis and the appropriate use of gloves.
- Skin antisepsis of the site of insertion of invasive devices, e.g., IVs
- Using and maintaining sterile patient care equipment, e.g., multidose medication vials, IV fluids and devices, by minimizing contact with non-sterile surfaces or reuse of equipment and devices intended for single patient use.
- The introduction of a sterile item into a patient should always be performed with a no-touch-technique. This means that the skin in the area of insertion should not be touched after skin antisepsis. Similarly, IV administration tubing should be kept sterile and tops of vials of medication should be disinfected prior to entry.

Aseptic techniques are practiced for all invasive medical procedures. Types of handwashing and gloves are different according to the procedure performed (see table below). Most disease transmission occurs due to actions of health care personnel (HCP) that ignore basic concepts of aseptic techniques such as the reuse of syringes/needles, the touching of a sterile device onto a non-sterile surface, and the entering of a sterile solution without adequate decontamination of the port of entry.

**Table 5: Recommendations for preparing hands and skin during procedures requiring aseptic techniques**

Procedure	Example	Hand hygiene	PPE	Preparation of skin	Critical steps
<b>Insertion of peripheral (IV) catheter</b>	IV therapy	Routine handwash. (Antiseptic hand wash/ handrub (in high risk areas or immunocompromised patients)	Disposable nonsterile gloves (Use sterile gloves in high risk areas or immunocompromised patients).	Fast acting antiseptic is needed (Alcohol is OK but the site needs to be thoroughly cleaned).	<ul style="list-style-type: none"> <li>Do not touch the area of insertion after antiseptics of the skin.</li> <li>Apply sterile dressing after insertion.</li> <li>Remove IV:                             <ul style="list-style-type: none"> <li>If any sign of infection (redness, swelling, pus, tenderness) or no longer needed.</li> <li>After 72-96 hours.</li> </ul> </li> </ul>
<b>Preparation of IV fluids and medications</b>	Mixing of IV fluids and medication	As indicated above	As indicated above	Not applicable	<ul style="list-style-type: none"> <li>Use a special clean area that is not in contact with biological materials and that has a surface that can be easily cleaned.</li> <li>Disinfect the port of entry (rubber or plastic) with alcohol prior to each insertion of a needle.</li> <li>Use only sterile diluent to reconstitute the medication</li> <li>Use a new sterile syringe and needle every time you add something to the IV fluid.</li> </ul>
<b>Administration of injectable medications</b>	IV injection	As indicated above	As indicated above	Fast acting antiseptic is needed (alcohol is OK but the site needs to be thoroughly cleaned)	<ul style="list-style-type: none"> <li>Disinfect rubber opening with alcohol prior to administration of medication.</li> <li>For ampoules and multidose vials:                             <ul style="list-style-type: none"> <li>Use a new sterile syringe and needle each time you enter an IV;</li> <li>Never enter vial with a syringe that has been used on another patient;</li> <li>Get rid of ampoules immediately after single use;</li> <li>Never reuse opened ampoules.</li> </ul> </li> <li>Follow manufacturers recommendations for storing and discarding multidose vials</li> </ul>

Aseptic Techniques

Procedure	Example	Hand hygiene	PPE	Preparation of skin	Critical steps
<b>Insertion of a central venous catheter</b>	Chemo-therapy line in adults, Umbilical artery catheter in neonates	Hand antiseptis with antiseptic hand wash or antiseptic handrub	-Sterile gloves recommended - Gown - Eye Protection	Fast acting antiseptic is desirable	<ul style="list-style-type: none"> <li>• Prepare sterile area prior to insertion</li> <li>• Do not allow the catheter to touch any non-sterile area (no touch technique)</li> <li>• After insertion, apply sterile dressing.</li> <li>• Remove catheter after any sign of infection.</li> <li>• Avoid placing in areas that are easily contaminated (groin)</li> </ul>
<b>Collection of body fluids from sterile body sites</b>	Spinal tap, thoracentesis, abdominal paracentesis	Hand antiseptis	-Sterile gloves - Gown - Eye Protection	Fast acting antiseptic is desirable	<ul style="list-style-type: none"> <li>• Use no-touch technique</li> </ul>
<b>Procedures that come in contact with mucous membranes</b>	Bronch-oscopy, Endoscopy, Tracheal suction	Hand antiseptis	Nonsterile gloves sufficient	In general, none is required	
	Urinary tract catheterization	Hand antiseptis	Sterile	Mild soap & water to cleanse urethral meatus is sufficient	<ul style="list-style-type: none"> <li>• Maintain a closed drainage system.</li> <li>• Handwashing before and after emptying drainage bags.</li> <li>• Catheters should not be changed routinely as this exposes the patient to increased risk of bladder or urethral trauma</li> </ul>

Hands of health care workers are the most common source of cross-infection. A clear policy on hand hygiene is therefore essential and should be followed by all personnel. Although the use of gloves reduces the transmission of bacteria, hand washing is still essential after the gloves have been taken off in order to remove any contamination that might have occurred via small punctures, and the multiplication of organisms that occurred in the warm, moist environment caused by glove wearing.

## Intravenous Therapy

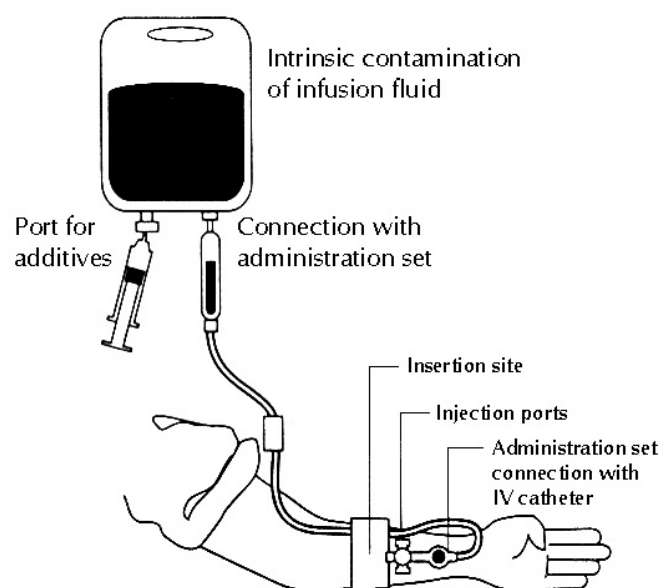
At any given time 25% of in-patients may have a peripheral cannula in situ. This is one of the most common invasive procedures performed in the hospital and yet application of aseptic technique during this procedure is often neglected.<sup>9</sup>

### Definition

An intravenous catheter is a catheter with a lumen that is inserted into a vein to provide intravenous therapy. Since this is a foreign body, which produces a reaction in the host, it can cause production of a film of a fibrinous material on the inner and outer surfaces of the catheter. This biofilm may become colonized by microorganisms and will protect them from host defense mechanisms. Microbial contamination may cause local sepsis or septic thrombophlebitis or bacteremia / septicemia. Infection control measures are designed to prevent the microorganisms from entering the equipment, the catheter insertion site, or the bloodstream.

### Intravenous Infusion – Sites of Possible Contamination

Fig. 7: Intravenous Infusion System



**Note:**

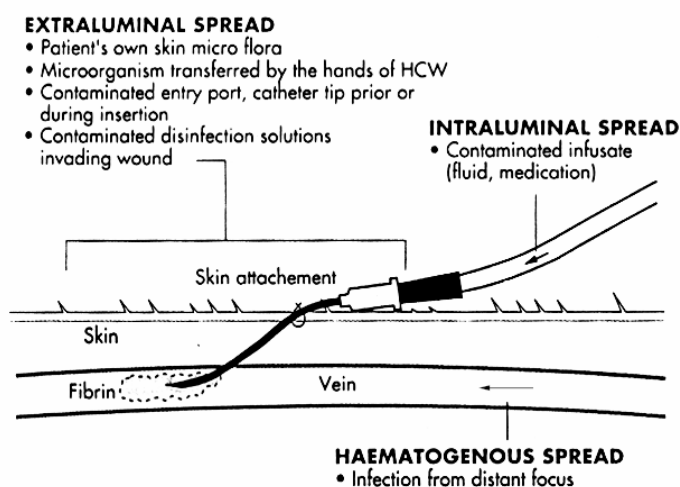
- Indications for insertion of catheters should be strict (e.g. severe dehydration, blood transfusion, parenteral feeding).
- Good asepsis is required during insertion of the catheter and during maintenance of the insertion site. The site should be kept dry and free from contamination by covering with a dressing that is secure and comfortable for the patient.

**Sources and routes of transmission**

**Sources of infection may be:**

- **Intrinsic:** This is usually due to contamination or faulty sterilization of fluids during manufacture. Examples of organisms growing in the infusate are Klebsiella, Enterobacter or Pseudomonas spp. Infection will arise only rarely from intrinsic contamination; however, if the infusate is contaminated during preparation it can result in widespread infection among recipients of this product.
- **Extrinsic:** This is due to contamination of the IV catheter during the insertion, the administration of the fluid, or from the hands of the HCP inserting or caring for the IV device. However, the most important reservoirs of pathogens causing catheter-related infection are the skin flora at the insertion site and at the hub. Infection is caused mainly by microorganisms residing on the patient's skin, e.g., Staphylococcus epidermidis, Staphylococcus aureus, and diptheroids. Microorganisms almost universally grow in a biofilm on the catheter surfaces (initially on the external surface but with longer duration, also the inner surface) and may be released into the bloodstream.<sup>11, 31</sup>

**Fig. 8: Sources and routes of transmission of infection from IV System**



## Procedure for Inserting Peripheral IV Cannulae

1. Ensure that the patient is comfortable and is aware of the procedure – this reduces anxiety.
1. Collect all equipment necessary to set up an IV infusion.
3. Select a cannula that will fit easily into the vein – size 18 or 20 gauge is usually appropriate. The correct sized cannula reduces trauma and congestion of the vein.
4. Place the patient's arm on a clean towel.
5. Avoid shaving the skin insertion site. Instead, clip hair if necessary.
6. Wash hands routinely & wear clean gloves. If the patient is in high risk ward or immunocompromised, use antiseptic hand wash or antiseptic handrub & sterile gloves.
7. Apply a tourniquet to the patient's non-dominant forearm.
8. Apply skin antiseptic to the IV insertion site with 70% isopropyl alcohol for at least 30 seconds and allow to dry before inserting the cannula.

### Note:

The IV site should not be touched after disinfection. If the tourniquet has been in place for a sufficient length of time, touching should not be necessary.

9. Insert the cannula into a vein, preferably of an upper limb, using the no touch technique. Do not attempt repeated insertions with the same cannula. If the first insertion is not successful, then the procedure should be repeated with a new cannula.
10. Look out for flash-back and advance the cannula slowly.
11. Release the tourniquet and apply a sterile dressing.
12. Connect up the administration set.
13. Clean site with a 70% isopropyl alcohol swab.
14. Anchor the cannula with clean tape and label the tape with insertion date.
15. Leave the site visible and dry.
16. Discard all sharps carefully in the container provided.
17. Wash and dry hands.

## Possible Sources of Infection

### 1. Factors related to equipment and to fluids:

- Cannula-material that is itself thrombogenic. For example, polyethylene and polypropylene are more reactive than Teflon®, which is in turn more reactive than steel or silicone-coated Teflon®.
- Contaminated administration sets.
- Needles puncturing IV fluid bottles used as air inlets or for other reasons.
- Three-way taps and stopcocks.
- Infusion fluids.
- Contaminated or loose dressings, adhesive tapes, or film.
- Contaminated splints used to stabilize joints.
- Large bandages used to cover the insertion site (these can be contaminated by the patient's blood and body fluids).

## **2. Factors related to insertion and to duration:**

- Patient's skin flora if skin antisepsis is inadequate.
- Hands of staff, other patients, or visitors.
- Contaminated skin antiseptics.
- Unstable cannulae – movement increases the risk of bacterial contamination.
- Cannulae left in for over 96 hours.
- Insertion of cannula into a previously infected vein. Alternate arms should be used for IV therapy that lasts longer than 96 hours.
- Septicaemia (endogenous infection).

## **Protective Clothing for Inserting IV Cannula**

Masks, caps, and gowns are not necessary. Non-sterile gloves are used when inserting IV cannula (sterile gloves are used in high risk and immunocompromised patients). The use of gloves and of an apron or gown will protect the HCP if profuse bleeding is likely.<sup>31</sup>

## **Maintenance of IV Lines**

- Inspect regularly for swelling or for signs of infection.
- Keep the insertion site clean and dry.
- Assess the need for continuing catheterization every 24 hours.
- Remove the catheter at first sign of infection or at 72-96 hours.
- The change of IV administration set:

- The closed circuit system should always be maintained and it is not allowed to disconnect the IV set from the cannula unless for changing it.
- When changing solutions, this may require a change of IV line if solutions are known to have expected interactions. If not, we may use the same IV administration line, if the iv line is removed from the port of the completed solution and reinserted at the new one immediately and the port sterilization and disinfection is guaranteed.
- IF closed circuit system is maintained, iv administration line could be changed after 72 hours or within 24 hours if initiation of an infusion of lipid emulsions and change it immediately if initiation of an infusion of blood, or blood products.
- Avoid cut downs especially in legs.
- Wipe the hub of the cannula with an alcohol-impregnated swab before attaching the administration set. The Luer lock should be kept as clean and dry as possible.

#### **Minimal requirements:**

- Thorough hand washing /hand rub by the HCP before the insertion of the catheter and during maintenance procedures.
- Thorough antisepsis of skin at insertion site.
- No touch technique during insertion, maintenance, and removal of catheter.
- Secure the IV line to prevent movement of catheter.
- Maintain the closed system.
- Protect the insertion site with a sterile dressing.
- Inspect the insertion site daily and remove catheter as early as possible and if there are any signs of infection.
- Only well trained staff should set up and maintain infusions.

### **Procedure for Inserting Central Venous Catheters CVC**

1. Collect all necessary equipment.
2. Place the patient in a suitable position.
3. Wash hands using an antiseptic solution or an alcohol handrub.
4. Wear sterile gloves.
5. Apply antiseptic to the insertion site (e.g. alcoholic povidone iodine), with friction for at least 3 minutes prior to venipuncture. Allow the site to dry before inserting the catheter.
6. Surround the site with a large sheet of sterile drapes.

7. Insert the central line as swiftly as possible maintaining “no touch” technique throughout the procedure.
8. Blood should be aspirated freely to ensure that the catheter is in a vascular space before injecting fluid.
9. Leave the site clean and dry after insertion.
10. Cover the site with a sterile (transparent) dressing for easy inspection. Sterile gauze may be used but should not be covered with an impervious dressing, as this increases the risk of infection.
11. Disinfect the hub with an alcohol swab before each connection to the administration set.
12. Check drug incompatibilities.
13. Do not routinely replace CVCs to prevent catheter-related infection.
14. Central venous catheters should be removed if infected or at the end of therapy.
15. Gloves should be removed and hands washed.

## Protective Clothing during Insertion of CVC

The insertion of CVC lines requires medical asepsis and should be carried out wearing gown, gloves, and a mask. Large sterile drapes should also be used.

### Tips:

- Fluids and hyperalimentation should be administered via a closed system. Potential points of entry for bacteria occur when the system is broken, e.g. by three-way taps and stop corks.
- Suitable alternatives, e.g. multi-flow systems, can be shut off independently and the administration set changed as required.
- Triple-lumen catheters can also be connected and disconnected individually. Discontinued administration sets should not be left hanging on the drip stand awaiting re-connection.
- Use clinical judgment regarding the need to remove a CVC in a patient who is febrile.

## Management of the Febrile Patient Receiving IV Therapy

Patients with IV devices can become febrile. All such cases require further investigation:

- **Redness and swelling:** The insertion site should be inspected for redness or swelling – if it appears infected, the tip of the intravenous catheter should be removed and sent (in a sterile container) for semi-quantitative culture.

- **Peripheral IV site:** Peripheral blood cultures should be taken from a peripheral site, preferably the opposite arm.
- **CVC site:** Cultures of blood obtained through a CVC are frequently contaminated by microorganisms in the hub. Unless the laboratory has techniques to quantify microbes from these cultures, the information obtained may be misleading and, therefore, this should be avoided.
- **Chemotherapy:** A patient showing signs of infection during a course of chemotherapy, when the central line cannot be removed, should be given appropriate antibiotics (e.g. a glycopeptide alone or with an aminoglycoside) until the end of therapy. The line should be removed and sent for culture.
- **Hyperalimentation:** There seems to be no advantage in covering the feeding period with antibiotics and it is best to replace the line as soon as possible, under antibiotic cover (to reduce the risk of septicemia), and then maintain therapy for 5-7 days if clinically indicated.
- **Catheter care:** The after-care of IV catheters is crucial. The site should be inspected daily and dressed aseptically when any moisture around the insertion site is noted.

## Injection Safety and Proper Use of Multidose Vials

WHO estimates that at least 50% of the world's 12 billion injections administered each year are unsafe. Among adverse events associated with injections, infections with the blood-borne pathogens hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV)) contribute to the heaviest disease burden. WHO estimates that unsafe injections result in 80,000 – 160,000 new HIV infections, 8 – 16 million new HBV infections, and 2.3 – 4.7 million new HCV infections each year and result in 1.3 million deaths.<sup>32</sup> Unsafe injections also transmit parasitic (malaria), bacterial, and other viral infections. Some adverse events associated with injections, such as abscesses, appear relatively quickly, whereas other infections may not be obvious for years or decades, e.g. HIV, and HCV.<sup>6,8</sup>

### Note: Reported infectious injection adverse events<sup>33</sup>

Bacterial infections	Viral	Parasitic
<ul style="list-style-type: none"> <li>• Abscesses</li> <li>• Septicemia</li> <li>• Toxic shock syndrome</li> <li>• Tetanus</li> </ul>	<ul style="list-style-type: none"> <li>• Hepatitis B virus infection</li> <li>• Hepatitis C virus infection</li> <li>• Human Immunodeficiency Virus infection</li> <li>• Viral hemorrhagic fevers</li> </ul>	<ul style="list-style-type: none"> <li>• Malaria</li> </ul>

In Egypt a high percentage of injections occur outside the formal health care setting. It is estimated that 20-40% of injections are provided by persons who have no formal training in the provision of medical care. Injection-associated transmission of blood-borne pathogens can be prevented through a strategy to reduce injection overuse and to achieve injection safety.

## Instruction for Giving a Safe Injection

### Definition

A safe injection does not harm the recipient, does not expose the provider to any avoidable risks, and does not result in any waste that is dangerous for other people.

The best infection control practice for safe injections is to eliminate unnecessary injections. Besides decreasing the risk of infection transmission, this also saves resources. If an injection is unavoidable, providers should follow the following guidelines:

#### 1. Use sterile injection equipment

- Use a sterile syringe and needle for each injection and to reconstitute each unit of medication.
- Inspect the packaging for breaks in the package. Discard needle and/or syringe if the package has been punctured, torn, damaged by exposure to moisture, or if it has expired.<sup>34</sup>

#### 2. Prevent contamination of injection equipment

- Prepare each injection in a clean designated area where blood or body fluid contamination is unlikely.
- Discard any needle that has been touched or contaminated in a safety box.<sup>34</sup>

#### 3. Prevent needle stick injuries to the provider

- Anticipate and take measures to prevent sudden patient movement during injection.
- Avoid recapping and other hand manipulations of needles. If recapping is necessary, use a single-handed scoop technique. Do not bend, break, or cut needles prior to disposal.
- Collect used syringes and needles at the point of use in a safety box that is puncture-proof and leak-proof and that can be sealed before becoming completely full.<sup>34</sup>

#### 4. Prevent access to used needles

- Close and seal safety boxes when they are three quarters full for transport to a secure area for disposal. After closing and sealing safety boxes, do not open, empty, re-use, or sell them.
- Manage sharps waste in an efficient, safe, and environment-friendly way in order to protect people from voluntary and accidental exposure to used injection equipment.<sup>34</sup>

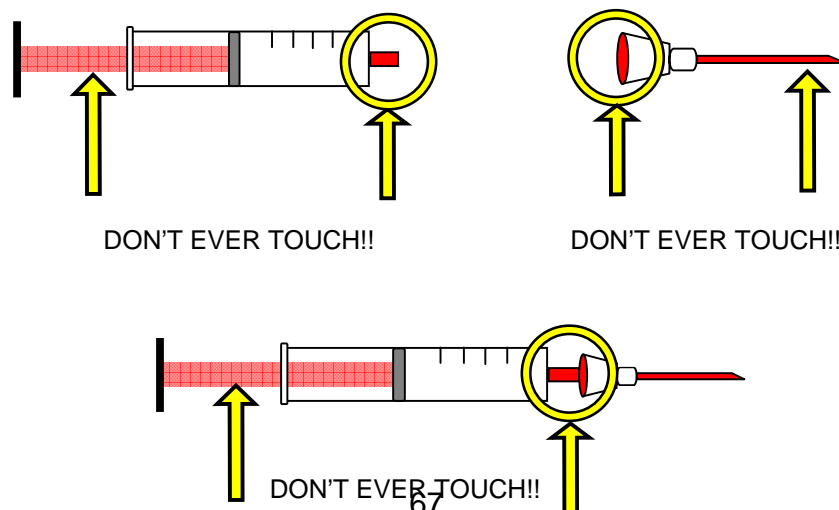
## 5. Other practice issues

- **Provider's hand hygiene and skin integrity.** Perform hand hygiene (i.e., wash or antiseptic hand wash/handrub) prior to preparing injection material and before giving injections. Avoid giving injections if skin integrity is compromised by local infection or other skin condition (e.g., weeping dermatitis, skin lesions, cuts).
- **Swabbing of vial tops or ampoules.** Swabbing of ports of multi-dose vials with disinfectant before re-entering with a new needle is recommended. For swabbing use an appropriate disinfectant (e.g., alcohol 70-90%) and a clean disposable swab and maintain appropriate contact time. Do not use cotton balls that have been stored wet.
- **Skin preparation prior to injection.** Wash skin that is visibly dirty. Swab the skin with an appropriate antiseptic (e.g., alcohol 70-90%) prior to giving an injection. Use a clean disposable swab and maintain appropriate contact time. Do not use cotton balls that have been stored wet.<sup>34</sup>

## Aseptic Injection Practices

Keep the needle and syringe sterile. Because any part of the syringe that you touch becomes contaminated, you should not touch parts that come into contact with the injectable medication. If you touch any of these parts by accident, the syringe and needle are no longer sterile. Discard them immediately and replace them with a sterile syringe and needle.<sup>35</sup>

Fig. 9: Areas of a sterile syringe and needle that should not be touched



Don't touch the needle with your fingers. Health workers sometimes place their fingers on the needle to help guide it in when pushing through the skin. Touching the needle with your fingers contaminates the needle.<sup>35</sup>

### **Don't touch the injection site with your fingers**

After an injection health workers sometimes apply pressure to the injection site with their fingers or with a piece of cotton wool to reduce bleeding. It is a better practice to ask the patient or the adult accompanying small children to hold the cotton on the injection site. If the nurse contaminates his or her fingers with blood, he or she can transmit pathogens from a patient's injection site to another patient.<sup>35</sup>

### **Tips for injection safety**

#### **Practices that can harm recipients and should be avoided**

- Changing the needle but reusing the syringe.
- Loading the syringe with multiple doses and injecting multiple doses.
- Applying pressure to the bleeding sites using a finger.
- Leaving the needle in the vial to withdraw additional doses.
- Touching the needle.
- Reusing a syringe or needle.

#### **Practices that can harm the health care worker and should be avoided**

- Recapping, bending, breaking, and cutting needles.
- Placing needles on a surface or carrying them any distance prior to disposal.

#### **Practices that can harm the community and should be avoided**

- Leaving used syringes in areas with public access.
- Giving or selling used syringes to vendors who resell them.
- Providing used syringes to patients for personal reuse.

### **Procedure for Injection Administration**

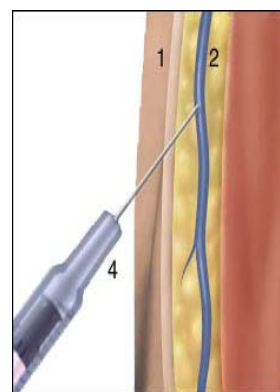
1. Gather all items needed for the injection, e.g.:
  - Sterile needle and syringe
  - Medication

- 70-90% alcohol
  - Cotton pads
  - Gloves, if necessary
  - Band aid, if necessary
  - Tourniquet, if necessary
2. Prepare patient (position)
  3. Wash hands (routine hand-wash), and
  4. Put on gloves when indicated

### Ten steps to administer an intravenous injection (IV) or taking blood sample

1. Apply tourniquet.
2. Search for an appropriate vein.
3. Wash your hands and wear gloves.
4. Apply skin antiseptic (e.g., alcohol) to insertion site.
5. Insert the IV injection using a new sterile syringe.
6. Remove tourniquet
7. Inject medication slowly under strict aseptic conditions (observe patient's reaction carefully).
8. Remove needle while pressing cotton pad onto the injection site.
9. Discard needle/syringe immediately in a puncture resistant safety box - do not recap needle.
10. Cover the site with an adhesive bandage if necessary.

(N.B. The same steps should be applied for drawing blood sample)



**Fig. 10: IV Injection**  
1 Skin; 2 Vein beneath the skin;  
3 Muscle; 4 Syringe

### Seven steps to administer an intramuscular injection (IM)

1. Define injection area.
2. Wash hands if possible.
3. Apply antiseptic to injection site.
4. Inject medication under strict aseptic conditions using a new sterile syringe.
5. Remove needle while pressing cotton pad onto injection site.
6. Discard needle/syringe immediately in a puncture resistant safety box - do not recap needle.

7. Cover the site with an adhesive bandage if necessary.

### Observe the patient when beginning an IV infusion

If fever or shivering develops during infusion of an IV fluid, stop using the IV fluid even if the fluid is clear and change to a new sterile fluid since pyrogens or bacteria which are not visible could be responsible.

## Proper use of multi-dose vials

Multi dose-vials of medication or of other fluids can become vehicles for transmitting infections between patients.<sup>34, 36</sup>



**Fig. 11: Use of multi-dose vial**

### Before filling a syringe from a multi-dose vial:

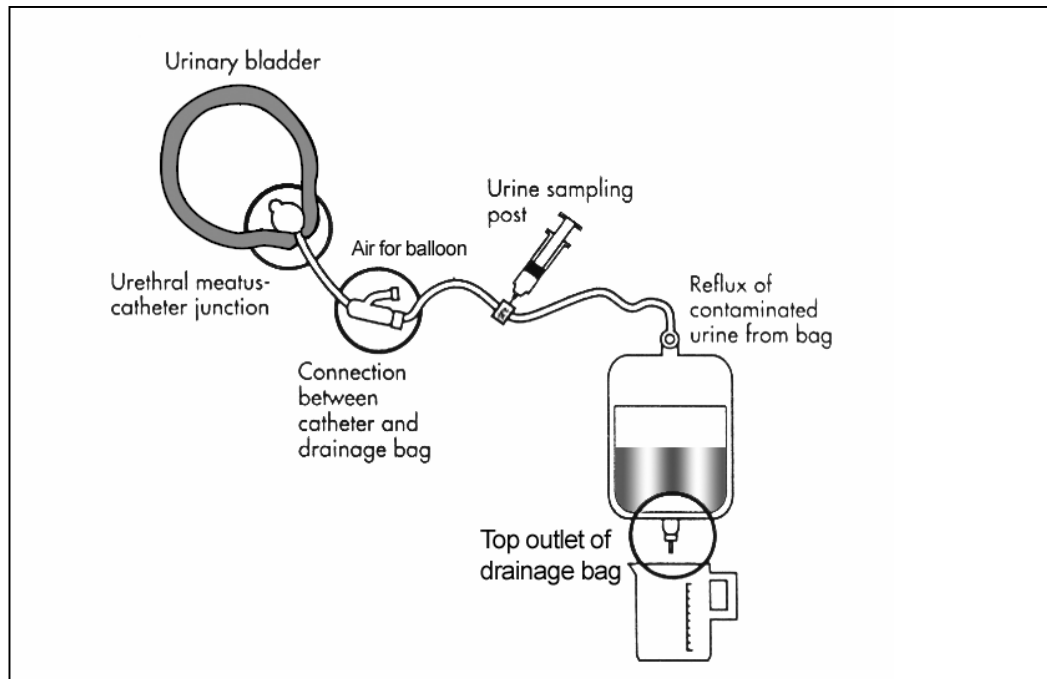
- Inspect for and discard medications with visible contamination or breaches of integrity (e.g., cracks, leaks).
- Check the safety of the product (e.g. not expired, read the label of vial, no particulate matter in the vial, and not turbid).
- Wipe the top of the vial with a fresh cotton swab soaked with 70-90% alcohol and allow it to dry.

To reduce the risk of transmitting infections between patients:

- Use single dose-vials rather than multi-dose vials.
- If multi-dose vials must be used, always pierce the stopper with a sterile needle and syringe every time fluid is withdrawn from a multi-dose vial. Reusing the same syringe to give injections to multiple patients – even if the needle is changed – is not a safe practice, because infections contaminate the multi-dose vial and can be transmitted from patient to patient.
- Avoid leaving a needle in place in the stopper of the vial. This provides a direct route for microorganisms to enter the vial and to contaminate the fluid between each use.
- If multi-dose vials are used that need to be reconstituted, the needle and syringe that was used to reconstitute must be discarded, and for each draw from the vial a new sterile needle and syringe must be used.
- Follow product-specific recommendations for reconstitution, storage, handling, and discarding unused doses.
- Discard needles that have touched an unsterile surface.<sup>34, 36</sup>

## Urinary Catheterization

Fig. 12: Urinary Catheterization System



Urinary catheterization is an aseptic procedure but is also the most common cause of hospital-acquired infections, which can occur during insertion or removal of the catheter. Repeated catheterization causes trauma and results in infection. Patients should be catheterized only if clinically indicated and certainly should not be catheterized only for the convenience of the nursing staff.<sup>9</sup>

About 10% of hospitalized patients have an indwelling catheter. 20-25% of these patients develop urinary tract infections (UTI). It is estimated that hospital acquired UTI accounts for 40% of nosocomial infections. Most of these are associated with instrumentation, particularly indwelling catheterization.

The incidence of infection is directly related to the duration of catheterization; 50% of patients are infected by day 15 of catheterization and almost 100% by 1 month. This means that the first line of prevention is to avoid catheterization as much as possible and to remove the catheter as soon as possible (preferably within 5 days).<sup>9</sup>

### Procedure for Insertion of a Urinary Catheter:

1. Inform the patient and explain the indication and the procedure of catheterization.
2. Lay all necessary equipment on a trolley.

3. Select a catheter that fits the urethra without traumatizing the patient
4. Wash hands thoroughly with an antiseptic hand wash preparation.
5. Put on sterile gloves and use a “no touch” technique.
6. If the patient is male, draw back the foreskin and clean the glans thoroughly with soap and water to remove secretions, followed by swabbing the area with antiseptic. If the patient is a woman, clean the periurethral area by separating the labia and cleanse the vulva, using front to back technique.
7. Insert 2-3 ml of the lubricant (e.g. anesthetic jelly into the urethra). Multiple-use tubes are not recommended because they become contaminated and increase cross-infection.
8. Insert the catheter gently – advance it by holding the inner sterile sleeve. A “no touch technique” should be used in which the operator has no contact with the sterile shaft of the catheter.
9. Collect the urine in a suitable container.
10. Inflate the balloon by instilling the manufacturer’s recommended amount of sterile water.
11. Anchor the catheter to the patient’s thigh.
12. Connect the catheter to the closed drainage bag and hang it below the level of the bed to stop reflux.
13. Wash and dry hands.

**Note:**

It is important to use the correct urinary catheter for the condition. Foley catheters require no more than 5-10 ml water, while hemostasis catheters require 30 ml. The balloon can cause obstruction and stasis of the urine if it is too large, thus increasing the risk of infection.

## Emptying the Drainage Bag

This should be done wearing non-sterile gloves and via the drainage tap at the bottom of the bag. When the bag is empty, the tap should be closed securely and wiped with a tissue. If the bag does not have a tap, then replace it when full. Do not disconnect the bag to empty and then reconnect it.

Wash and dry hands thoroughly after touching the drainage bag.

With proper handling, drainage bags with taps can be left in situ for long periods and are more cost-effective in the long run.<sup>9</sup>

A separate urine bag-collecting receptacle must be used for each patient and each bag should be emptied separately as required. For purposes of measuring urinary output, an integral measuring device is necessary. The urine receptacle

should be heat disinfected if possible and should be stored dry after each use. If heat labile, chemical disinfection could be used. Single-use disposable receptacles may be used. After emptying the receptacle, the gloves should be discarded and hands washed and dried thoroughly.

## **Collecting Urine Samples**

Do not disconnect the drainage bag to obtain a urine sample as this causes an interruption in the closed drainage system and may pose a risk of infection to the patient. If a sample of urine is required for bacteriological examination, it should be obtained from a sampling port or sleeve. This must first 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. Do not obtain a sample for bacteriological culture from the drainage bag.<sup>11</sup> If there is no port or sleeve for collecting urine samples, antiseptic hand wash and wearing sterile gloves should be attempted, wipe the connection between the urinary bag and the catheter with alcohol, disconnect the drainage bag, collect a urine sample in a sterile container, wipe the port of the urinary bag and reconnect.

## **Irrigate Bladder**

Routine irrigation of the bladder (bladder washout) with chlorhexidine or other antiseptics is not effective in prevention of infection and should not be performed. Irrigations rarely eradicate organisms but may introduce infection and can cause inflammation of the bladder wall, and, therefore, can increase the likelihood of systemic invasion. They may also cause damage to the catheter.

If the catheter becomes obstructed and can be kept open only by frequent irrigation, the catheter should be changed, as it is likely that the catheter itself is contributing to obstruction.<sup>11</sup>

## **Prophylaxis and Treatment with Antibiotics**

Routine use of prophylactic antibiotic administration in catheterized patients is not recommended because of its tendency to encourage the emergence of resistant organisms. Treat patients with antibiotics only if there is evidence of clinical infection.

Patients with infected urine at the time of catheterization or of operation should be treated with appropriate antibiotics according to the antibiotic sensitivity of the organism. If antibiotic sensitivity testing is not available, empiric antibiotic treatment can be given according to the local antibiotic policy or to the advice of a medical microbiologist.<sup>11</sup>

### Other precautions:

- The spout from the tap should be completely emptied to prevent a build-up of organisms in stagnant urine.
- The bag should not be allowed to stand on the floor or to rise above waist level.
- Catheters should not be changed routinely as this exposes the patient to increased risk of bladder and urethral trauma. They can be changed if associated with urinary tract infection and antibiotic treatment started. If the catheter will not pass any part of the urethra with gentle pressure or if a trace of blood is seen on the catheter tip on withdrawal, do not preserve or push harder, as serious damage may ensue. In this case, seek help from a more experienced colleague.

### Minimal requirements

- Hand hygiene and cleaning of periurethral area before insertion of a sterile catheter.
- Maintenance of a closed drainage system.
- Hand hygiene before and after emptying bags.

## Wound Inspection and Wound Care

### Surgical Wounds

These should be sterile at operation and, in most cases, after operation. Infection can be introduced during the operation or post-operatively via hands and contaminated dressings. It is best not to interfere with surgical wounds unless indicated, e.g. if there are signs of infection and a change of dressing is required.

### Traumatic Wounds

These are potentially contaminated with environmental and fecal bacteria and may become colonized with hospital pathogens, which may then be transferred to other patients via the hands of the staff.

### Procedure for Wound Care

Wounds must not be touched with dirty hands and wound care should be an aseptic procedure:

1. Lay up a trolley with a sterile wound dressing pack.
2. Remove old dressing and inspect the wound.

## Aseptic Techniques

3. Wash hands aseptically, dry hands and wear sterile gloves.
4. Clean the wound thoroughly using forceps and cotton wool or gauze soaked in a cleaning solution. Do not use hands.
5. Exude any fluids from an infected wound by pressing with two sterile gauze pieces held with two forceps.
6. Take specimens of pus or exudates for bacteriological examination.
7. Apply necessary medication.
8. Wipe the wound site as dry as possible.
9. Cover the wound if indicated.
10. Discard all dirty dressings in a clinical waste bag.
11. Wash and dry hands.

**Note:**

Individual sterile wound dressing packs containing all of the sterile items required to dress a wound are preferable.