

Topic 9: Minimizing infection through improved infection control

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Why infection control is relevant to patient safety

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The spread of infection in health-care settings today affects hundreds of millions of people worldwide. In a WHO sponsored prevalence survey study [1] conducted in 55 hospitals of 14 countries representing four WHO regions (South-East Asia, Europe, the Eastern Mediterranean and the Western Pacific) it was found that, on average, 8.7% of hospital patients suffer health care-associated infections. At any time, over 1.4 million people worldwide suffer from infectious complications acquired while in hospital being treated for a medical condition. In the United States, about 90 000 patients die each year. Health care-associated increase suffering for the patients and keep them in hospital longer. Many suffer permanent disability and a significant number die. This alarming rate has led to increased attention by clinicians, managers, institutions and governments to preventing infection.

Box 6 lists some of the WHO statistics about the high rate of infection throughout the world. Everybody, health professionals and patients alike, has a responsibility to decrease the opportunities for contamination of clothing, hands and equipment that have been associated with transmission routes. This topic sets out the main areas where cross-infection occurs and identifies the activities and behaviours, which if routinely practised by everyone, would lead to reduced health care-associated infections.

Box 6. WHO: health care-associated infection: scale and cost

- Between 5% and 10% of patients admitted to modern hospitals in the developed world acquire one or more infections.
- The risk of health care-associated infection in developing countries is from 2 to 20 times higher than in developed countries. In some developing countries, the proportion of patients affected by a health care-acquired infection can exceed 25%.
- In the United States, 1 out of every 136 hospital patients becomes seriously ill as a result of acquiring an infection in hospital; this is equivalent to two million cases and about 80 000 deaths a year.
- In England, more than 100 000 cases of health care-associated infection lead to over 5000 deaths directly attributed to infection each year.
- In Mexico, an estimated 450 000 cases of health care-associated infection cause 32 deaths per 100 000 inhabitants each year.
- Health care-associated infections in England are estimated to cost £1 billion a year. In the United States, the estimate is between US\$ 4.5 billion and US\$ 5.7 billion per year. In Mexico, the annual cost approaches US\$ 1.5 billion.

Keywords

Infection control, hand hygiene, transmission, cross-infection, health-acquired infections, drug resistant, multidrug-resistant organisms, MRSA (methicillin-resistant staphylococcus aureus) infection, antiseptic handwashing agents, bloodborne virus infections.

Learning objective

The objective of this topic is to demonstrate the devastating effects of inadequate infection control and to show students know they can minimize the risks of contamination.

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Learning outcomes: knowledge and performance

What students need to know (knowledge requirements):

- know the extent of the problem;
- know the main causes and types of infections.

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What students need to do (performance requirements):

- apply universal precautions;
- be immunized against Hepatitis B;
- use personal protection methods;
- know what to do if exposed;
- encourage others to use universal precautions.

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WHAT STUDENTS NEED TO KNOW (KNOWLEDGE REQUIREMENTS)

Know the extent of the problem

The urgency

The link between handwashing and the spread of disease was established about 200 years ago and until relatively recently, infection control was managed through the administration of antibiotics and the efforts of infection control nurses who generally considered infections an inevitable problem associated with an older and sicker population [2]. This is no longer the case, given the extent of the infected population, the different routes of transmission and the costs associated with it. Today, more than two billion people are infected with the airborne tuberculosis (TB) bacilli (the microbes which cause TB).

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Multidrug-resistant TB remains a significant problem because the standard drugs are no longer working [3]. A number of antimicrobial-resistant organisms found in hospital settings such as MRSA, (methicillin-resistant staphylococcus aureus) and VRE (vancomycin-resistant enterococcus) also make treatment extremely difficult.

Each year, 490 000 new multidrug-resistant TB cases are diagnosed [4]. Over one million people died from TB in 2006, equating to 4500 deaths per day. TB is contagious and spreads through the air. One infected person can infect on average 10–15 people every year.

The increased rate of health care-associated infections in just the last 20 years in developing and developed countries has thrown up new challenges for modern health care. Today, antibiotics are often ineffective and more than 70% of hospital acquired bacterial infections are resistant to at least one of the drugs commonly used to treat them [5]. This means that this large group of infected patients stay longer in hospitals and are treated with less effective drugs that are more toxic, and/or more expensive. Among health care-associated infections, surgical site infections are a major source of infection. One study published nearly 20 years ago showed that in certain hospitals in sub-Saharan Africa [6] surgical site infections were the leading causes of illness and death. Health care-associated infections are also a problem in primary and community settings.

Country responses

Recognizing this worldwide crisis, WHO established the campaign *Clean hands are safer hands* and joins other campaigns by addressing the high infection rates through the implementation of endorsed guidelines aimed at reducing death from transmission of health care-associated infections [7,8].

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The CDC's campaign to *Prevent antimicrobial resistance* aims to prevent antimicrobial resistance in health-care settings by a range of strategies aimed at preventing infection, diagnosing and treating infection, using antimicrobials wisely and preventing infection transmission. The campaign is targeting clinicians who treat particular patient groups such as hospitalized adults, dialysis patients, surgical patients, hospitalized children and long-term care patients [9].

The IHI campaign called the *5 million lives* aims to reduce MRSA infections through the implementation of five key interventions:

1. hand hygiene;
2. decontamination of environment, equipment;
3. active surveillance cultures;
4. contact precautions for infected and colonized patients;
5. compliance with central venous catheter and ventilator bundles.

Today, health-care professionals have to be vigilant in applying a range of prevention methods designed to control a variety of pathogens in all health-care environments, not just hospitals. When a student works on the wards, visits a clinic or does a home visit they are as capable of transmitting an infection as are all health-care workers. Multidrug-resistant organisms do not discriminate and while they are mainly found in acute care settings, any setting where patients are treated provides an opportunity for the emergence and transmission of antimicrobial-resistant microbes.

Student knowledge of universal precautions

The CDC [10] defines universal precautions as a set of precautions designed to prevent transmission of human immunodeficiency virus (HIV), hepatitis B virus (HBV) and other bloodborne pathogens when providing first aid or health care. Under universal precautions, blood and certain body fluids of all patients are

considered potentially infectious for HIV, HBV and other bloodborne pathogens. The precautions require students to apply infection control principles as set out above—correct handwashing, using gloves, a mask, a gown and eyewear and handle needles safely as well as safe disposal.

A 2006 cross-sectional study of medical staff and medical students at two hospitals in Iran showed that only 54% of students had heard about universal precautions [11]. Students should be habitually applying universal precautions as soon as they enter the hospital environment. It is easier to learn how to do something right the first time than trying to undo bad habits.

The economic burden

The costs associated with caring and treating patients suffering from infections are significant and have added a substantial economic burden to the health-care budgets of all countries. Estimates of the cost of infections range from US\$ 4500–5700 million a year in the United States, £1000 million a year in the United Kingdom, 5% of the annual budget of a county hospital in Trinidad and Tobago and up to 10% of Thailand hospital budgets and 70% of the entire health budget for Mexico [1].

The main causes and types of infections

Main types of infections

Infectious diseases are caused by pathogenic micro-organisms such as bacteria, viruses, parasites or fungi; the diseases can be spread, directly or indirectly, from one person to another. Zoonotic diseases are infectious diseases of animals that can cause disease when transmitted to humans.

Health care-associated infections

Infections are caused by bacteria, fungi or viruses entering the body through one or more of the following routes.

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- person–person via hands of health-care providers patients and visitors;
- personal equipment (e.g. stethoscopes, computers) and clothing;
- environmental contamination;
- airborne transmission;
- carriers on the hospital staff;
- rare common-source outbreaks.

Patients vulnerable to colonization and infection include those with severe disease, recent surgery or implanted medical devices such as urinary catheters or endotracheal tubes. Epidemiological evidence suggests that multidrug-resistant organisms are carried from person-to-person by health-care professionals.

WHO [12] defines a health care-associated infection (also called “nosocomial”) as: An infection acquired in hospital by a patient who was admitted for a reason other than that infection [1]. An infection occurring in a patient in a hospital or other health-care facility in whom the infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility [4].

The following four types of infections [13] account for more than 80% of all health care-associated infections:

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- urinary tract infections usually associated with catheters:
 - catheter-associated urinary tract infections are the most frequent, accounting for about 35% health care-associated infections;
- surgical infections:
 - these are second in frequency, about 20%;

- bloodstream infections associated with the use of an intravascular device:
 - about 15%;
- pneumonia associated with ventilators:
 - about 15%.

The evidence shows that infections rates in the first two categories can be reduced when health-care workers comply with infection control guidelines and patients leave hospital as soon as possible. Many infected patients (about 25%) are in an ICU with more than 70% of the patients having micro-organisms resistant to one or more antibiotics [13].

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Preventing health care-associated infections in four areas

Over the course of training, medical students will experience many environments where there is a risk of transmission of infection. Students should approach every situation as having the potential to infect a patient or a health-care worker or themselves. This means that students will need to routinely undertake activities to prevent infection such as correct handwashing, effective sterilization procedures and correct gloving and gowning.

Infections are preventable when health-care workers use the right techniques and remain on the look out for unclean and unsafe situations.

1. *In the hospital*

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Studies show infections are minimized when hospitals are:

- are visibly clean;
- use increased levels of cleaning during outbreaks;
- use hypochlorite and detergents during outbreaks.

2. *Personal attention to handwashing*

Everyone working in health care, whether it is a hospital or a clinic, needs to be aware of hand

hygiene. Applying correct hand hygiene procedures requires medical students to understand why hands need to be decontaminated.

Decontamination refers to the process for physical removal of blood, bodily fluids and the removal or destruction of micro-organisms from the hands. WHO has developed easy-to-follow brochures and diagrams to help health-care workers follow correct handwashing procedures, available on the WHO web pages at http://www.who.int/gpsc/tools/Five_moments/en/index.html

In addition, students need to:

- know how to clean hands;
- the rationale for choice of clean hand practice;
- techniques for hand hygiene;
- how to protect hands from decontaminants;
- promote adherence to hand hygiene guidelines.

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Handwashing today is the single most important intervention *before and after* patient contact. Every health-care worker is required to act responsibly and without fail to apply the techniques for handwashing at every patient encounter. They also should advise patients and families of the importance of handwashing and give them permission to remind the staff.

Hospitals can make it easier for staff by providing alcohol hand rubs beside the beds. Alcohol rubs rapidly kill bacteria and have few side-effects for the staff. However, when hands are heavily soiled, alcohol rubs are not a substitute for soap.

Factors to consider to maintain clean hands:

- the level of contact with the patient or objects;
- the extent of the contamination that may occur with the contact;

- the activities being performed;
- the susceptibility of the patient.

How to clean hands:

- limited studies available to test the technique of hand decontamination;
- methods based on expert opinion:
 - before clinical shift begins remove all wrist and hand jewelry;
 - cuts and abrasions covered with waterproof dressings;
 - fingernails kept short clean and free from nail polish.

Effective handwashing technique:

- preparation:
 - wetting hands under tepid running water;
 - washing and rinsing.
- then apply liquid soap or antimicrobial preparation:
 - solution must have contact with whole surface area of hands—vigorous rubbing of hands for 10–15 seconds (especially tips of fingers, thumbs and areas between fingers).
- drying:
 - use good quality paper towel.

See a handwashing technique described in a leaflet developed by WHO to assist health-care workers at <http://www.who.int/gpsc/tools/GPSC-HandRub-Wash.pdf>, accessed April 2008

Promoting the use of hand hygiene guidelines

- The use of protective equipment:
 - assess the risks to patients, carers and self;
 - everyone should be educated about standard principles and trained in the use of protective equipment;
 - adequate supplies of disposable aprons, single use gloves and face protections are easily available wherever care is delivered;
 - gowns should be available on the advice of the infection control team.

3. *The use of personal protective equipment*

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Personal protective equipment includes the use of gowns, gloves, aprons, eye protection and face masks. Students will usually be told by a supervisor or tutor the type of protective equipment that should be used for each procedure. This is usually based on assessment of the risk of micro-organism transmission to the patient or to the carer as well as the risk of contamination of the health-care practitioner's clothing and skin by the patient's blood, bodily fluids, secretions or excretions.

Gloves

Gloves are now an everyday part of clinical practice. There are two main indicators for wearing gloves in the clinical setting:

- to protect the hands from contamination with organic matter and micro-organisms;
- to reduce the risk of transmitting micro-organisms to both patients and staff.

Even if a student is required to wear gloves this does not replace the need for cleaning one's hands. Gloves are not free from defects and sometimes leak. If a glove tears, is damaged in any way or leaks, the student should remove the gloves to perform hand hygiene and replace with new gloves. Every time a glove is worn it must be discarded appropriately after each task and the hands cleaned. This is because gloves are made for single use because they can carry micro-organisms.

However, health-care professionals still need to assess whether gloves are needed because overuse can lead to skin sensitivity and adverse reactions. Although standards exist for the quality of medical gloves, studies show that even when gloves are worn there is the possibility of contamination. The use of gloves as a barrier method cannot be relied upon to remove all of the risks associated with contaminated hands. The

following principles apply.

- gloves must be worn for:
 - all invasive procedures;
 - contact with sterile sites;
 - contact with non-intact skin or mucous membranes;
 - all activities assessed as having a risk of exposure to blood, bodily fluids, secretions and excretions, and handling sharps or contaminated instruments.
- gloves should be worn only once and should be put on immediately before the care activity, removed immediately afterwards and changed between patients and episodes of care;
- gloves must be disposed of as clinical waste and hands must be decontaminated by washing appropriately.

Aprons (gowns) and face masks

A few studies show high levels of vancomycin-resistant enterococci contamination of gowns, gloves and stethoscopes immediately after contact with infected patients. International guidelines recommend that protective clothing be worn by all health-care workers who have close contact with the patient and the patient's equipment or materials. Students should be guided by their clinical teachers as to the type of clothing to be worn.

Guidelines suggest that health-care professionals:

- wear disposable plastic aprons when in close contact with the patient, material or equipment or when there is a risk that clothing may become contaminated;
- dispose of plastic aprons after each episode of care or procedure. Non-disposable protective clothing should be sent for laundering;
- wear full-body, fluid-repellent gowns when there is a risk of extensive splashing of blood, bodily fluids, secretions or excretions with the exception of perspiration.

Face masks and eye protection should be worn when there is a risk of blood, bodily fluids, secretions and excretions splashing into the face and eyes. Respiratory protective equipment is to be worn when caring for patients with respiratory infections transmitted by airborne particles.

4. *The safe use and disposal of sharps*

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Students should be aware of the significant problem for health-care workers caused by needle stick injuries, which are as prevalent as injuries from falls and handling and exposure to hazardous substances. Many health-care workers continue to be infected by bloodborne viruses even though they are largely preventable:

- keep handling to a minimum;
- do not recap needles, bend or break after use;
- discard each needle into a sharps container at the point of use;
- do not overload a bin if it is full;
- do not leave a sharp bin where children can reach it.

These safety measures are repeated below in the checklist for universal precautions.

Tuberculosis (TB)

The WHO web site demonstrates through its numerous reports that describe the prevalence and the devastating effects and suffering caused by TB. In response to rising rates of TB, a major campaign to stop the increase has been initiated in many countries with some small success. Students need to be aware of their own role in minimizing the spread of TB. TB is spread via the air from people who have TB affecting the lungs. It is contagious. The disease is spread by coughing, sneezing, talking or spitting that send the TB germs (bacilli) into the air. People then breathe in the bacilli. Some people will not develop an infection because their immune system keeps it dormant. When the immune system fails a person

the disease will become active and the person becomes infectious. Students should apply universal precautions at all times. Universal precautions are described later in this topic. If TB is a major problem in your country then additional information about the prevalence of TB in your country and strategies for containing the spread of TB would be appropriate to cover.

WHAT STUDENTS NEED TO DO (PERFORMANCE REQUIREMENTS)

Medical students have a responsibility to make every effort to minimize the spread of infection and to encourage patients and other health-care workers to actively engage in practices that minimize the spread of infection both in the community and in the hospitals and clinics.

Students need to

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- practise universal precautions;
- be immunized against Hepatitis B;
- use personal protection methods;
- know what to do if exposed;
- encourage others to use universal precautions.

Apply universal precautions

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WHO has developed the following checklist for health-care workers.

Practise universal precautions [8]

Students must handwash after any direct contact with patients.

The WHO campaign has published techniques for correct handwashing and safe health care. The following strategies can be found on the web pages of the WHO *Clean hands are safer hands* campaign at

http://www.who.int/gpsc/tools/Five_moments/en/index.html, accessed April 2008

Before contact with each and every patient a student should clean their hands before touching a patient.

This is important to protect the patient against harmful micro-organisms carried on the hands. Students may have been travelling on a bus immediately before entering the hospital and the ward where they intend to take a history from a patient. In doing so they may shake the hand of the patient or comfort the patient as a humane gesture. They may also be requested to assist a patient to move from the bed to a chair, or to a sitting area for more privacy. They might be required to perform a physical examination, take the pulse of the patient or blood pressure and abdominal palpation.

A student should clean hands before an aseptic task.

It is essential that students clean their hands immediately before any aseptic task. This is necessary to protect the patient against harmful micro-organisms, including the patient's own micro-organisms, entering his or her body. Students must protect against transmission through contact with mucous membrane: oral/dental care, giving eye drops, secretion aspiration. Often students will be treating patients who have open wounds and any contact with non-intact skin: skin lesion care, wound dressing, any type of injection is an opportunity for transmission. Medical devices are well known for harbouring potentially harmful micro-organisms and contact with devices such as catheter insertion, opening a vascular access system or a draining system must be done with careful preparation. Students should also be diligent in preparation of food, medications and dressing sets.

After contact with each and every patient a student should clean hands after any risk of exposure to body fluids.

Students should habitually clean their hands

immediately after an exposure risk to body fluids and after glove removal. Cases of transmission have been known to occur even with gloving. This is essential to limit the opportunity of the student receiving an infection. It is also necessary to maintain a safe health-care environment.

Medical students will inevitably come into contact with mucous membrane and with non-intact skin, as detailed in the indication "before aseptic task". Understanding the risks will help the student practise safe health care. They will also have contact with medical devices or clinical samples such as drawing and manipulating any fluid sample, opening a draining system, endotracheal tube insertion and removal.

At times they will be required to clean up a patient's urine, faeces or vomit. Students often help out in the hospital and clinic and may find themselves handling waste (bandages, napkin, incontinence pads), cleaning of contaminated and visibly soiled material or areas (lavatories, medical instruments). They need to be particularly aware of the importance of clean hands after such activities.

Students should wash hands after actual patient contact.

All students should clean their hands after touching a patient and his or her immediate surroundings. This should be done using one of the methods available to the clinic or hospital immediately after the patient contact is over. This is because in busy environments there are many distractions and busy people tend to rush onto the next job or patient. Many people forget in the rush to wash their hands. Forgetting to wash hands can lead to the student getting an infection and increasing the chances of the micro-organisms spreading throughout the environment. Saying goodbye to the patient by shaking a hand or touching a shoulder provides opportunities for micro-organisms to be transferred to the student

and vice versa. Activities in addition to those mentioned above that involve direct physical contact include helping a patient to move around, to get washed or to give a massage, which are known routes for micro-organisms spreading to others. Students performing clinical examination such as taking pulse, blood pressure, chest auscultation and abdominal palpation are all opportunities for cross-infection.

Students must handwash after contact with patient surroundings

Micro-organisms are also known to survive on inanimate objects. So it is important to clean one's hands after touching any object or furniture in the patient's immediate surroundings when leaving them, even without touching the patient. Students may find themselves helping other staff and change bed linen, adjust perfusion speed, monitor an alarm, hold a bed rail or make room on a side bed table for a patient.

In addition:

- Needles should never be recapped;
- All sharps should be collected and safely disposed;
- Students should use gloves when in contact with bodily fluids, non-intact skin and mucous (see more about this below);
- Students should wear a face mask, eye protection and a gown if there is the potential for blood or other bodily fluids to splash;
- Students should cover all cuts and abrasions including their own;
- Students should always clean up spills of blood and other bodily fluids;
- Students should make themselves aware of how the hospital waste management system works.

Students should be immunized against Hepatitis B [14]

Students, like all health-care workers, are at risk of

infection with bloodborne viruses. The risk of infection to both staff and patients depends on the prevalence of disease in the patient population and the nature of the frequencies of exposures. Students should:

- be immunized as soon as they start seeing patients in hospitals, clinics and the community or in the homes of patients;
- if possible conduct a post-vaccination test.

Students should use personal protection methods [14]

- use needle stick prevention devices where possible;
- let people know if supplies of personal protection are running low;
- provide feedback to the health-care team about the personal protective equipment;
- seek training in use of the equipment;
- model practice on respected and safe senior clinician;
- regularly perform a self-assessment of one's use of personal protective equipment and whether there has been any inappropriate use.

Students should know what to do if exposed [14]

If a student is inadvertently exposed or becomes infected they should immediately:

- notify the appropriate staff in the hospital or clinic as well as a supervisor. It is important that students receive appropriate medical attention as soon as possible.

Students should encourage others to participate in infection control

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Be a role model:

- Students can encourage each other to use correct handwashing techniques by doing so themselves. Students can be leaders in this respect. If another health-care provider has poor technique and finishes much sooner than the student and does not wash his

hands but the student does, it may remind the health-care worker of the correct procedure. Sometimes people only need to be reminded to jolt them out of a false sense of security.

- Students can teach patients about the importance of handwashing: They will often have more time with patients than fully-qualified colleagues. It is also a good time to practise their skills on educating patient about health care and prevention.

Interacting with health-care professionals:

- Students may find themselves working in a clinic or hospital where the health-care professionals including doctors do not follow the institutional or professional guidelines for infection control. They may even observe senior doctors not washing hands or failing to maintain sterile environments. It can be very difficult for students to speak up on such occasions. Culturally, it may not be conceivable that a junior member of staff would challenge a more senior member. Safe health care requires students to maintain the correct techniques even if there is pressure on them to skip some steps. If a student is being pressured to cut corners they should still try to maintain the proper technique. .

Students may routinely observe staff who apply inadequate technique in handwashing.

- When this occurs students should maintain correct handwashing techniques and if appropriate have a discussion about the techniques used in the hospital or clinic and the reasons for the variation. However, in many cultures this may not be appropriate.

Students may routinely observe staff who fail to wash hands.

- How a student deals with this situation will depend on the relationship of the student to

the person who fails to wash their hands, the culture of the hospital and the culture of the society. It could be that a health-care worker was so busy that they inadvertently forgot to wash their hands. The student will have to make a judgement about this based on their knowledge of the doctor's or nurse's habits. If the student knows the person to be very attentive then it may be appropriate to raise it with the person or assist them by handing the alcohol rub or substances in use. In some circumstances such as gatherings of students it may be appropriate to reinforce the importance of correct handwashing technique.

Students may routinely observe staff who ignore correct infection control procedures.

Students may wish to ask the supervisor or team leader to put the issue of handwashing and infection control on the agenda for discussion. Alternatively, they could ask the department head if an expert can come and talk to the staff so that everyone is aware of the infection control guidelines.

Summary

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- know the main guidelines in each of the clinical environments you are assigned;
- accept responsibility for minimizing opportunities for infection transmission;
- apply universal precautions;
- let staff know if supplies are inadequate or depleted;
- educate patients and families/visitors about clean hands and infection transmission;
- ensure patients on precautions have same standard of care as others:
 - frequency of entering the room;
 - monitoring vital signs.

HOW TO TEACH THIS TOPIC

Teaching strategies/formats

This topic can be delivered in a number of ways but the best way for this topic is to have the students practising infection control techniques in a simulated environment.



Simulation exercises

Different scenarios could be developed that are written to emphasize the educational components of infection control. Students attending the Israel Center for Medical Simulation (<http://www.msr.org.il>) practise washing their hands and then the hands are covered with a “blue gel” and put under a ultraviolet light to reveal the areas that were missed in washing hands. Students are surprised at how much they miss.

Different scenarios could be developed that are written to emphasize the educational components of infection control, for example:

- practising the techniques of assertiveness in different situations:
 - patient–doctor interactions in which the doctor fails to wash their hands;
 - student–patient interactions in which the student fails to wash their hands;
 - student–supervisor interactions in which the supervisor fails to wash their hands;
- role play using a “person approach” and then a “system approach” to a breach of infection protocols.



An interactive/didactic lecture

Use the accompanying slides as a guide covering the whole topic. The slides can be PowerPoint or converted to overhead slides for a projector. Start the session with a case study selected from the Case Study Bank and get the students to identify some of the issues presented in the story.

Panel discussions

Invite a panel of respected clinicians to give a summary of their efforts to minimize the transmission of infection. Students could have a pre-prepared list of questions about the prevention and management of infections.



Small group discussion session

The class can be divided up into small groups and three students in each group be asked to lead a discussion about the causes and types of infection. Another student could focus on the reasons why some hospitals either support correct handwashing techniques or ignore them.

The tutor facilitating this session should also be familiar with the content so information can be added about the local health system and clinical environment.

Teaching activities

This topic offers many opportunities for integrated activities during the time when students are assigned to any of the wards or clinics. These activities can start from the very first years in the hospital and clinic environments.

Operating room and ward activities

Students could also visit a patient who has an infection as a result of their health care. They could discuss with the patient the impact of the infection on their health and well-being. The meeting is not to discuss how or why the patient was infected but rather to discuss the impact of the infection

Students attend an infection control meeting observe and record what activities are undertaken by the team to ensure that everyone complies with the infection control guidelines

Students could observe a team who is treating patients who are known to have infections. They

should observe if they do anything differently to other health-care workers.

Students could follow a patient through the peri-operative process and observe the activities aimed at minimizing transmission of infection.

Students should examine and critique the protocol used for infection control including observations of the team's knowledge and adherence of it.

After these activities students should be asked to meet in pairs or small groups and discuss with a tutor or clinician what they observed and whether the features or techniques being observed were present or absent, and whether they were effective.

CASE STUDIES

Hepatitis C: reusing needles

This case shows how easy it is to inadvertently reuse a syringe.

Sam, a 42-year-old man, was booked for an endoscopy at a local clinic. Prior to the procedure he was injected with sedatives, but after several minutes the nurse noticed Sam seemed uncomfortable and required additional sedation. She used the same syringe, dipped it in the open sedative vial and re-injected him. The procedure continued as normal.

Several months later, Sam, suffering from swelling of the liver, stomach pain, fatigue and jaundice, was diagnosed with Hepatitis C. The Centers for Disease Control was contacted, as 84 other cases of liver disease were linked to the clinic. It was believed that the sedative vial may have been contaminated from the backflow into the syringe and that the virus may have been passed on from the contaminated vial. Several health-care workers

commented that reusing the syringe on the same patient (and thus dipping a used syringe into a common vial) was common practice.

Reference

Centers for Disease Control and Prevention, Atlanta. *Syringe reuse linked to hepatitis C outbreak*. Sonner S, Associated Press

Bloody cuffs

This case illustrates the importance of adhering to infection control guidelines. It also illustrates why people should always adopt procedures that assume a possible transmission.

Jack, a 28-year-old male, and Sarah, a 24-year-old woman, were involved in a severe motor vehicle collision when Jack's car slammed into a cement pillar. They were brought into the emergency department with Jack suffering massive injuries and Sarah with severe cuts to her upper body from the shattered glass of the car. Jack was bleeding profusely when he was placed in the trauma bay. His blood pressure was taken and the cuff (made of nylon and fabric) became completely saturated with blood, so much that it could be wrung out. He was taken to surgery but later died.

Sarah, with cuts to her upper body, was placed in the same trauma bay where Jack had been treated. The same, unwashed, blood saturated cuff that was used on Jack was placed on her arm.

One nurse noted that the blood soaked cuff had been used on both patients; however, other staff members shrugged off the incident.

A letter from the medical examiner weeks later revealed that Jack was HIV and HBV positive and that the motor vehicle collision had been a suicide.

Reference

AHRQ – Agency for Healthcare, Research and Quality Web mortality and morbidity
<http://www.webmm.ahrq.gov/case.aspx?caseID=12&searchStr=bloody+blood+pressure+cuff>

A failure to check a child's intravenous drip site

A father brought his 2-year-old daughter Chloe into the emergency department of a regional hospital on a Friday evening. Chloe had a recent history of a 'chesty cold' and had already been seen as an outpatient. The medical officer admitted Chloe for treatment of pneumonia. An intravenous (IV) cannula was inserted in her left upper foot and a bandage applied. Chloe was admitted to the ward and was under the care of nursing staff, a general practitioner and visiting medical officer over the weekend.

The intravenous cannula site was not inspected until early on Sunday evening (nearly 48 hours later), despite the fact that damage to the skin is a known risk factor in infants that can occur within 8 to 12 hours. There was an area of necrosis noted on the left heel and ulcers developed later on the left upper foot. After discharge and outpatient treatment locally, Chloe was eventually admitted to a major children's hospital where she required ongoing treatment. She also developed behavioural problems as a result of her experience.

Reference:

Case Studies—Investigations. *Health Care Complaints Commission Annual Report 1999–2000*: 59.

TOOLS AND RESOURCES

WHO guidelines: *WHO guidelines on hand hygiene in health care (advanced draft): a*

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HOW TO ASSESS THIS TOPIC

A range of assessment methods are suitable for this topic including observational reports, reflective statements about surgical errors, essays, MCQ paper, SBA, case-based discussion and self-assessment. Students can be encouraged to

develop a portfolio approach to patient safety learning. The benefit of a portfolio approach is that at the end of the student's medical training they will have a collection of all their patient safety activities. Students will be able to use this to assist job applications and their future careers.

The assessment of knowledge about infection control is assessable using any of the following methods.

- portfolio;
- case-based discussion;
- OSCE station;
- written observations about how a hospital or clinic practises infection control;
- reflective statements (in particular) about:
 - how a hospital or clinic educates staff about infection control;
 - the role of hierarchy in the hospital influences infection control practices;
 - the systems in place for reporting breaches of infection control;
 - the role of patients in minimizing the transmission of infection;
 - the effectiveness or the infection control guidelines.

The assessment can be either formative or summative; rankings can range from unsatisfactory to giving a mark. See the forms in Appendix 2.

HOW TO EVALUATE THIS TOPIC

Evaluation is important in reviewing how a teaching session went and how improvements can be made. See the Teacher's Guide (Part A) for a summary of important evaluation principles.

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SLIDES FOR TOPIC 9: MINIMIZING INFECTION THROUGH IMPROVED INFECTION CONTROL

Didactic lectures are not usually the best way to teach students about patient safety. If a lecture is being considered, it is a good idea to plan for student interaction and discussion during the lecture. Using a case study is one way to generate group discussion. Another way is to ask the students questions about different aspects of health care that will bring out the issues contained in this topic such as the blame culture, nature of error how errors are managed in other industries.

The slides for topic 9 are designed to assist the teacher deliver the content of this topic. The slides can be changed to fit the local environment and culture. Teachers do not have to use all of the slides and it is best to tailor the slides to the areas being covered in the teaching session.