



## Course: Patient Safety Solutions

### Topic: Infection prevention and control



### Summary

**Health care-associated Infection (HCAI) is defined as an infection acquired in a hospital by a patient who was admitted for a reason other than that infection and/or an infection occurring in a patient in a hospital or other facility in whom the infection was not (latently) present at admission. This includes infections that are acquired in the hospital, but appear only after discharge, as well as occupational infections among health-care staff.**

The increased rate of HCAI observed in developing and developed countries over the past 20 years has created new and serious challenges in health care. It is important and urgent to address HCAI because of:

**Increased rates of HCAI:** The spread of these infections affects hundreds of millions of people worldwide. They increase patients' suffering and prolong the length of stay in hospital.

**Resistance to treatment:** Increasing numbers of infections are being caused by pathogens resistant to conventional treatments. Today, more than 70% of bacterial HCAs can be considered resistant to drugs used to treat them.

Infected patients:

- have longer hospital stays
- are treated with less effective drugs that are more toxic and/or more expensive
- some patients will not recover and others may develop long-term complications.

- Hundreds of millions of patients are affected by HCAI worldwide each year, leading to significant mortality and financial losses for health systems and patients.
- Of every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire at least one HCAI.
- In developed countries, HCAI affects 5-15% of hospitalized patients and 9-37% of intensive care units (ICU) patients.
- Approximately 5 million HCAs are estimated to occur in acute care hospitals in Europe annually, resulting in 25 million extra days in hospital.
- In England, more than 100 000 cases of HCAI lead to over 5 000 deaths directly attributed to infection each year.
- The estimated HCAI incidence rate in the USA was 4.5% in 2002; approximately 100 000 deaths were attributed to HCAI.
- There is an increased risk of HCAI in developing countries. Pooled data from a limited number of studies in hospitals show the prevalence of HCAI to be 15.5% and as high as 47.9 per 1000 patient-days in adult ICUs.
- The risk of surgical site infections (SSI) in developing countries is significantly higher than in the developed world. Pooled cumulative incidence of SSI was 5.6 per 100 surgical procedures, which was the leading infection in hospitals.
- In Europe HCAI represents an economic burden of 13–24 billion Euros annually.
- The annual economic cost of HCAI in the USA in 2004 was approximately US\$ 6.5 billion.



## The economic burden

The costs associated with treating patients suffering from HCAI are significant. Longer hospital stays and the need for a higher level of care add to health-care budgets, as well as the economic burden borne by patients and families.

## The global response

- **WHO Clean Care is Safer Care** and the campaign **SAVE LIVES: Clean Your Hands** focus on engaging government commitment to *addressing* HCAI and improving hand hygiene at the point of care. The *WHO Guidelines on Hand Hygiene in Health Care* recommend the 'Five Moments for Hand Hygiene.
- The **Centers for Disease Control and Prevention (CDC)** campaign to prevent antimicrobial resistance in health-care settings through the use of strategies for preventing infection, its transmission, diagnosing and treatment of infection and wise use of antimicrobials.
- The **Institute of Healthcare Improvement (IHI)** campaign, **5 Million Lives** to reduce MRSA infections through five key interventions: 1) hand hygiene; 2) decontamination of the treatment environment and equipment; 3) active surveillance of cultures; 4) contact precautions for infected and colonized patients; 5) compliance with protocols for an appropriate use of central venous catheters and ventilator bundles.

## Precautions

Recent recommendations include two levels of precautions:

**Standard precautions** can be applied to all patients in all health-care settings, regardless of a suspected or confirmed infectious agent. These precautions constitute the primary strategy for infection prevention. They are based on the principle that all blood and other bodily fluids, secretions and excretions, excluding perspiration, may contain transmissible infectious agents. These precautions include: hand hygiene, the wearing of gloves, a gown, a mask, eye protection or a face shield, depending on the anticipated exposure; and safe injection practices.

**Transmission-based precautions** should be used when treating patients who are known or suspected of being infected or colonized with infectious agents. Precautions are applied according to the clinical syndrome and the likely etiologic agents, and then modified based on test results. There are three categories: contact precautions; droplet precautions; and airborne precautions.

A set of *universal precautions* or universal blood and body fluid precautions were published by CDC to protect health-care workers from occupational exposure to HIV.

## Causes of infection and transmission route

HCAIs are caused by bacteria, viruses and fungi from human or environmental sources.

**Transmission through direct contact:** Person-to-person transmission can occur when microbes present in blood or other bodily fluids of a patient are transmitted to a health-care worker (or vice versa) through contact with a mucous membrane or breaks (cuts, abrasions) in the skin.

**Indirect transmission:** Infections can be transmitted indirectly through devices such as thermometers, stethoscopes, other inadequately decontaminated equipment, medical devices or toys, which health-care workers pass from one patient to another. This is probably the most common mode of transmission in health-care settings.

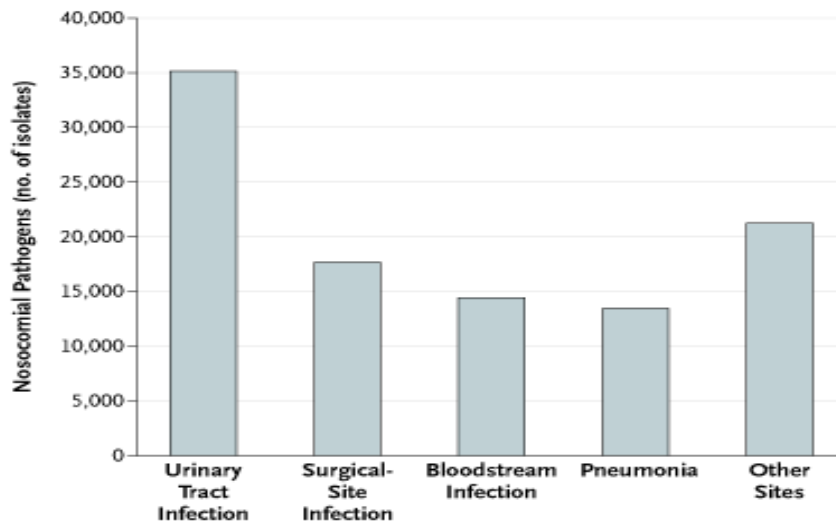
**Droplet transmission:** Respiratory droplets carrying pathogens are generated when an infected person coughs, sneezes, or talks, as well as during procedures such as suctioning or intubation.

**Airborne transmission** of infectious diseases occurs through the dissemination of either airborne droplet nuclei (particles arising from desiccation of suspended droplets) or small particles in the respirable-size range containing infectious agents that remain infective over time and distance (e.g. spores of *Aspergillus* spp. and *Mycobacterium tuberculosis*).

**Percutaneous exposure** occurs through contaminated sharps.

**Patient populations particularly susceptible to health care-associated infection**

include those with severe underlying medical conditions, those having recently undergone surgery, or those with indwelling devices, such as urinary catheters or endotracheal tubes.



**The following four types of infections account for about 80% of all HCAI:**

- surgical site infections;
- urinary tract infections, usually associated with catheters;
- bloodstream infections associated with the use of an intravascular device;
- pneumonia associated with ventilators.

Evidence shows that infection rates can be reduced if health-care providers comply with infection prevention and control guidelines and patients leave hospital as soon as possible.

**Preventing health care-associated infection: Priority areas**

**1. Environmental cleanliness**

Environmental cleanliness in the hospital is essential for minimizing infections. The choice of disinfecting agents will depend on many factors and each facility should have existing policies and procedures on these issues.

**2. Sterilization/disinfection of equipment, devices and instruments**

Equipment, devices and instruments must be sterilized/disinfected, strictly following recommendations.

**3. Medical devices labelled “for single use”**

Devices labelled “for single use” are designed by manufacturers with the intention of not being re-used. For example, single-use injection syringes should never be re-used because the risk of infection is very high. Sterile, single-use injection devices include sterile hypodermic syringes, sterile hypodermic needles, auto-disable syringes for immunization purpose, syringes with a re-use prevention feature for general purpose, and syringes with needlestick prevention features (e.g. safety syringes) for general purposes.

**4. Hand hygiene**

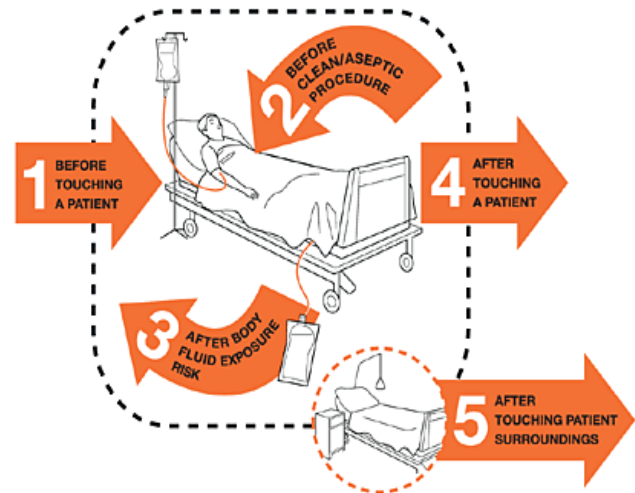
Hand hygiene is the single most important intervention that health-care providers can practise to prevent HCAI. An indication for hand hygiene arises every time that there is a possibility of microorganism transfer from one skin or surface to another surface. WHO’s “My 5 Moments for Hand Hygiene” are:

1. before touching a patient;
2. before a clean/aseptic procedure;

3. after bodily fluid exposure risk;
4. after touching a patient;
5. after touching patient surroundings.

### **Hand rubbing or hand washing**

Hand rubbing with an alcohol-based handrub is the preferred method in most routine clinical situations, because alcohol acts more quickly than soaps, to inactivate microorganisms, its effect lasts longer and the cleaning procedure takes less time to perform. On repeated use in health-care settings, drying and scaling of skin are less severe if correct formulations of handrubs are used. Handrubbing is more easily done at the point of care since it is not dependent on the availability of clean water and soap. There are specific situations in which hand washing is recommended, however.



### **WHO Guidelines on Hand Hygiene in Health Care**

The recommendations in the WHO Guidelines on Hand Hygiene in Health Care are:

- before routine clinical work begins, remove all wrist and hand jewellery and cover cuts and abrasions with waterproof dressings;
- fingernails should be kept short and false nails should not be worn;
- wash hands with soap and water whenever they are visibly dirty or visibly soiled with blood or other bodily fluids and after using the toilet;
- when exposure to potential spore-forming pathogens is suspected/proven, and during outbreaks of *Clostridium difficile*, hand washing with soap and water is preferred;
- use an alcohol-based handrub as the preferred means for routine hand antisepsis when hands are not visibly soiled;
- if an alcohol-based handrub is not available, wash hands with soap and water.

### **5. The use of personal protective equipment**

Personal protective equipment (PPE) includes gowns, gloves, aprons, eye protection, shoe covers and face masks.

#### **Gloves**

The WHO Glove Use Information Leaflet recommends the following behaviours:

- the use of gloves does not replace the need for hand hygiene by either hand rubbing or hand washing;
- wear gloves when it can be reasonably anticipated that contact with blood or other potentially infectious materials, mucous membranes, or non-intact skin will occur;
- remove gloves after caring for a patient. Do not wear the same pair of gloves for the care of more than one patient;
- when wearing gloves, change or remove gloves during patient care if moving from a contaminated body site to either another body site (including non-intact skin, mucous membrane or medical device) within the same patient or the environment;
- the reuse of gloves is not recommended. In the case of glove reuse, implement the safest reprocessing method.

#### **Gowns and face masks**

Gowns prevent contamination of clothing with blood, bodily fluids and other potentially infectious material. Guidelines suggest that health-care providers should:

- wear disposable plastic aprons when in close contact with patients, material or equipment, or when at risk of contamination;
- dispose of plastic aprons after each 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/or excretions splashing into the face and eyes.

## 6. The safe use and disposal of sharps

Health-care providers should be aware of the significant problem of needle-stick injuries. The use of the following practices is recommended to avoid these injuries:

- keep handling of sharps to a minimum;
- do not recap, bend or break needles after use;
- discard each needle directly into a sharps container at the point of use immediately after use;
- do not overload a sharps bin if full;
- do not leave a sharps bin where children can reach it;
- needles collected from patients should be placed in a sharps container inside a safe box to minimize the risk to community pharmacists;
- always report injuries from needles in line with local policy.

Health-care providers have a responsibility to make every effort to minimize the spread of infection and to encourage patients and other health-care providers to engage in practices that minimize the spread of HCAI.

### Health-care providers need to:

- practise standard precautions, including hand hygiene;
- be immunized against hepatitis B;
- know what to do if they have a sharps injury or are exposed to blood or bodily fluids, or are exposed to another potential pathogen;
- take appropriate precautions when they themselves are ill to avoid infecting patients and/or contaminating the working environment;
- act as role models for good clinical practice and patient safety and encourage others to use appropriate precautions;
- be proficient in the use of diverse instrument sterilization methods and technologies.

## Summary

In order to minimize the incidence of HCAI:

- know the main guidelines in each of the clinical environments where they are working;
- accept responsibility for minimizing opportunities for infection transmission;
- apply standard and transmission-based precautions;
- let staff know if supplies are inadequate or depleted;
- educate patients and their families/visitors about clean hands and infection transmission.

### **Effective infection prevention and control requires knowledge about:**

- ***the extent of the problem;***
- ***the main causes and types of HCAI;***
- ***modes of transmission in health-care settings;***
- ***main principles and methods for HCAI prevention and control.***