

# INFECTION PREVENTION AND CONTROL

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# OVERVIEW

1. Introduction
2. Standard precautions
3. Safe waste disposal
4. Prevention of needle stick and injuries from other sharp instruments
5. Linen - safe handling, transport, and processing of used linen
6. Isolation precautions

# INTRODUCTION

# CHAIN OF INFECTION

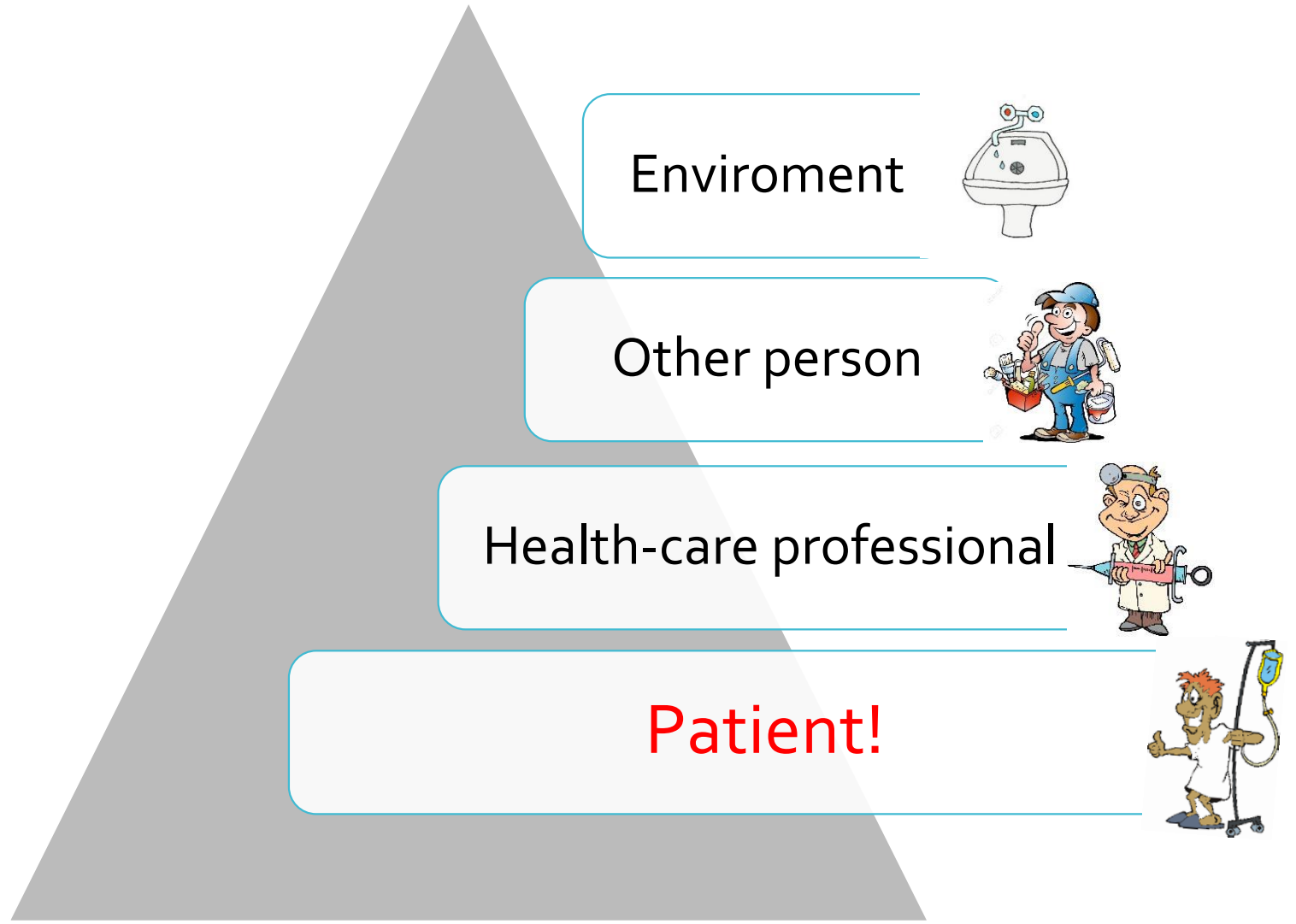


SOURCE

TRANSMISSION

SUSCEPTIBLE  
PERSON

# Source in healthcare



# PATIENT as a source

- **WHEN:**
  - misdiagnosed
  - in incubation period
  - abortive or latent form of infection
  - carrier of resistant agent (MRSA),  
TBC, VHB, VHC,...



You are certainly not healthy,  
because medicine is so advanced  
today that a healthy person  
basically does not exist!

**EACH PATIENT CAN BE INFECTIOUS!!!**

# TRANSMISSION in healthcare facilities

- The most frequent route is **a contact, mostly indirect way** of transmission.

- **Most transmissions of pathogens happen via healthcare workers hands!**  
*(WHO Guidelines on Hand Hygiene in Health Care)*



# HAI

## Susceptible host

### Intrinsic risk factors

→ Patient related

- Extremes of age
- Obesity or malnutrition
- Smoking, alcoholism,...
- Comorbidities (diabetes, heart failure,...)

NON-MODIFIABLE

### Extrinsic risk factors

→ Procedure related

- Invasive procedures (applying invasive device, surgery, ...)
- Endoscopy
- Treating by specific medicaments (ATB, immunosuppressive,...).
- Duration of hospitalization, re-hospitalization.
- Artificial implants

MODIFIABLE



INFECTION  
PREVENTION  
PRECAUTIONS



Safer care for patients.



Protection for healthcare professionals.

# Healthcare associated infections (HAI)

## Definition

- Healthcare associated infection means diseases or pathologies related to the presence of infectious agents or its products in association with exposure to healthcare facilities or healthcare procedures or treatments.

(definition for the purpose of Recommendations of the Council of the European Union, 2009)



in hospital

in outpatient medical facilities

in long-term care facilities

in day- care centres

in assisted living facilities etc.

# HAI

WHAT  
EXACTLY  
are they?

- Occur in a patient during the process of care in a hospital or other health care facility.
- Are not present and incubating at the time of admission.
- Can also appear after discharge.
- Represent the most frequent adverse event during care delivery.



"The patient in the next bed is highly infectious. Thank God for these curtains."

## HAI definition from:

### 1) EU law

<http://eur-lex.europa.eu>

### 2) National Healthcare Safety Network (NHSN)

A nosocomial infection associated to the current hospital stay is defined as infection that matches one of **the case definitions**

**AND**

- the onset of symptoms was on Day 3 or later (day of admission = Day 1) of the current hospital admission

**OR**

- the patient underwent surgery on day 1 or day 2 and develops symptoms of a Surgical Site Infection before day 3

**OR**

- an invasive device was placed on day 1 or day 2 resulting in an HAI before day 3.

# HAI

## Frequency

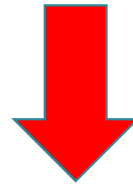


- **Frequency of HAIs from WHO data:**
  - In developed countries in average at least **7%** of hospitalized patients.
  - In developing countries in average **15.5%** of hospitalized patients.
- **ECDC** - Point prevalence survey of healthcare associated infections and antimicrobial use in European acute care hospitals 2016–2017:
  - Prevalence of HAI in acute care hospitals in the PPS sample was **5.9%** (country range: 2.9–10.0%).
  - HAI prevalence was highest in patients admitted to ICU, where **19.2%** patients had at least one HAI.

# HAI

## Consequences

- Prolonged hospital stay
- Long-term disability
- Unnecessary death
- Increased additional cost for care
- High cost for patient and his family
- Increased antibiotic resistance of germ
- Occupational hazards for healthcare workers



**Prevention of HAIs is worth of a great attention across the world!**



# HAI

## Epidemiological distribution

### NON- SPECIFIC

- Common community-acquired infections brought by patient or other person.
- Primary pathogens
- e.g. respiratory or gastrointestinal infection

### SPECIFIC

- Infection associated with specific procedures in health care facilities.
- Often caused by resistant microorganisms (**superbugs**) or opportunistic pathogens.
- e.g. urinary tract infection, blood-stream infection, ventilator-associated pneumonia,...

HAI  
Influencing  
factors  
of transmission  
risks among the  
various  
healthcare  
settings

1. The population characteristics (e.g., increased susceptibility to infections, type and prevalence of devices),
2. intensity of care,
3. exposure to environmental sources,
4. length of stay,
5. frequency of interaction between patients/residents with each other and with HCWs,
6. organizational characteristics : organizational priorities, goals, and resources, influence how different healthcare settings adapt transmission prevention guidelines to meet their specific needs.



# HAI

## Specific risks in various wards

|

- **Intensive care units (ICUs)** – for **patients immunocompromised** by disease state and/or by treatment modalities, as well as patients with major trauma, respiratory failure and other life-threatening conditions.



- **Burn units** – **burn wounds** can provide **optimal conditions** for colonization, infection, and transmission of pathogens.



# HAI

## Specific risks in various wards II

- Pediatrics - a high prevalence of **community acquired infections** among hospitalized infants and young children who have not yet become immune either by vaccination or by natural infection.



- Pediatric intensive care unit patients and the lowest birthweight babies have **high rates of central venous catheter-associated bloodstream infections**.

# Possibilities of prevention

## Standard precautions

the basic level of infection control precautions

to be used, as a minimum, in the care of all patients.

prevent transmission from both recognized and unrecognized sources

## Isolation precautions

In specific situation

mostly aimed on recognized pathogen

differ from the way of transmission

# STANDARD PRECAUTIONS

## WHO

1. Hand hygiene
2. Personal protective equipment (PPE)
3. Respiratory hygiene and cough etiquette
4. Safe patient care equipment
5. Safe waste disposal
6. Prevention of needle stick and injuries from other sharp instruments
7. Linen - safe handling, transport, and processing of used linen
8. Environmental cleaning



# STANDARD PRECAUTIONS

Safe waste disposal

# MEDICAL WASTE

## NON-RISK

- Recyclable waste
- Biodegradable waste
- Other non-risk waste

## REQUIRING SPECIAL ATTENTION

- Human anatomical waste
- **Sharps**
- Pharmaceutical waste
- Cyto-toxic pharmaceutical waste
- **Infectious waste**
- Radioactive waste

# MAIN STRATEGIES FOR HANDLING

- Waste segregation
- Labeling (using international symbol of danger)
- Safe collection - max. 24 hours in wards
- Safe handling
- Development of protective measures for HCF staff (immunisation, PPE, training,...) and the environment
- Waste minimization and recycling



# INFECTIOUS WASTES



- must be collected in leak-proof and mechanical resistant containers or bag
- carefully sealed and transported to a central storage facility/delivery point in a way that precludes direct contact
- final decontamination with appropriate methods (burning, autoclaving,..)



# STANDARD PRECAUTIONS

Prevention of needle stick and  
injuries from other sharp instruments

# PREVENTION OF NEEDLE STICK AND INJURIES FROM OTHER SHARP INSTRUMENTS

I

- **Engineering controls** should be used as the primary method ((e.g., self-sheathing anesthetic needles, safety scalpels, and needleless IV ports).
- **Work-practice** controls are behavior-based and should be used when engineering controls are not available.



# PREVENTION OF NEEDLE STICK AND INJURIES FROM OTHER SHARP INSTRUMENTS

II

- Place used disposable syringes and needles, scalpel blades, and other sharp items **in appropriate puncture-resistant containers** located as close as possible to the area where the items are used.



AFTER  
EXPOSURE  
BLOOD  
SAMPLING  
IN  
CZECH  
REPUBLIC

|                    |                                     | Till 72<br>hours | After 90<br>days | After 180<br>days |
|--------------------|-------------------------------------|------------------|------------------|-------------------|
| <b>HBV</b>         | Anti - HBs                          | +                | + -              | + -               |
|                    | HBs Ag<br>(pouze u<br>neočkovaných) | +                | + -              | + -               |
| <b>HCV</b>         | Anti - HCV                          | +                | +                | +                 |
| <b>HIV</b>         | Anti – HIV<br>1,2                   | +                | +                | -                 |
| <b>Liver tests</b> | ALT, AST                            | +                | +                | +                 |

# STANDARD PRECAUTIONS

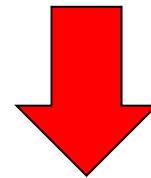
Linen - safe handling, transport,  
and processing of used linen

## LAUNDRY IN A HEALTH- CARE FACILITY

- bed sheets and blankets, patient apparel, uniforms, fabrics, suits, gowns, and drapes for surgical procedures, e.t.c.
- often contaminated with body substances (blood, skin, stool, urine, vomitus) and other body tissues and fluids (bacterial load  $\sim 10^6 - 10^8$  CFU/100 cm<sup>2</sup> of fabric )
- potential source of bacterias, viruses or ectoparasites (scabies)
- following standard precautions and current control measures can effectively reduce the risk for staff and patients

## RISK FOR PATIENTS

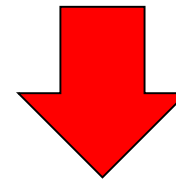
- in hospitals with good existing hygiene system laundry is rarely detected as a vehicle of HAI transmission
- higher risk exists in neonatal wards (e.g. contaminated clean linens as a vehicle for transmission of staphylococcus from hands of staff → the local epidemic of neonatal pemphigus)



continual safe handling in HCF and high quality standards in laundry facilities are required to maintain low risk

# RISKS FOR WORKERS

- inappropriate handling brings infection transmission risk for workers
- routes of transmission:
  1. direct contact (e.g. frequent transmission way of scabies) or
  2. aerosols generated from sorting and handling contaminated textiles (e.g. if soiled linens are shaken)



good practise and use appropriate PPE are required



## COLLECTING, TRANSPORTING, AND SORTING CONTAMINATED TEXTILES

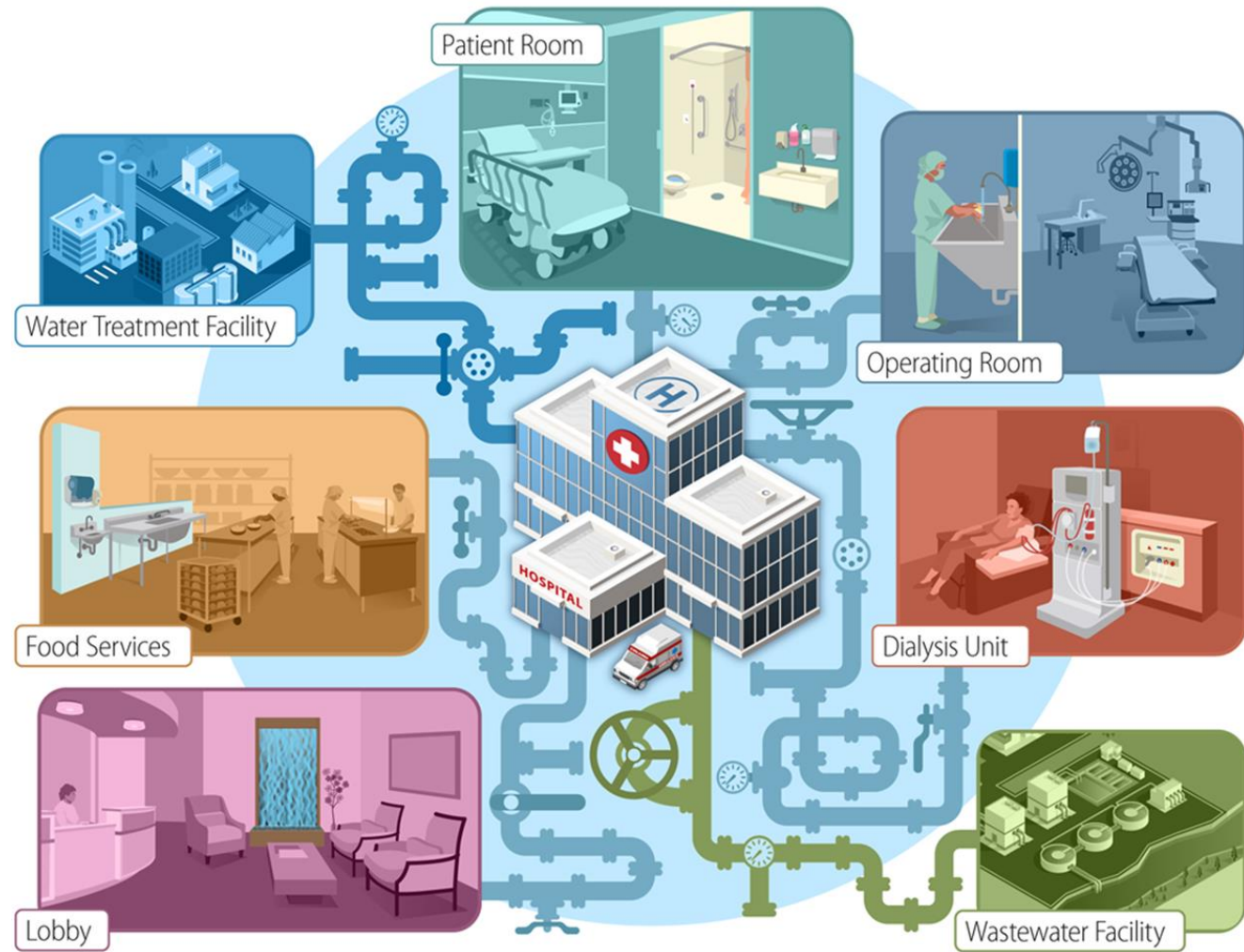
- handling with a minimum of agitation!
- placing in appropriate containments or bags (leak-resistant for wet....) following determined sorting requirements given by laundry facility (colour, type of linen, personal clothes,...)
- identifying bags containing contaminated laundry with labels with regard to safe transport and other handling



# WATER SAFETY

# HEALTHCARE PLUMBING SYSTEMS

|



# HEALTHCARE PLUMBING SYSTEMS

II

- large complex water systems with many specific final use
- risk of stagnant or slow-moving water - **biofilms**
- could be a source of some opportunistic pathogens
- especially hot water system can encourage microbial growth
- represents the risk for immunosuppressed patients
- **the most common and dangerous contamination with *Legionella pneumophila***

NATIONAL  
HYGIENIC  
LIMITS FOR  
*LEGIONELLA*  
*SPP.*  
IN HOT  
WATER  
(CZ)

- 100 CFU/100 ml – **recommended** for standard healthcare wards
- 0 CFU/100 ml – **required** for wards with immunocompromised patient (intensive care unit, oncology, transplantation units, neonatology,...)

**SPECIFIC REQUIREMENTS FOR HYDROTHERAPY  
AND POOLS!**

# ISOLATIONS PRECAUTIONS

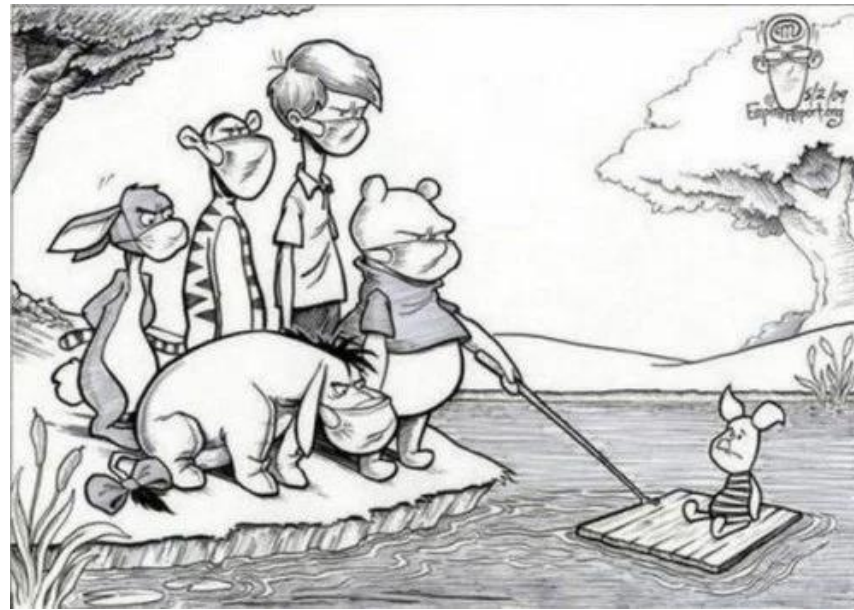
# Isolation precaution

- Syndromic or empiric application (likely pathogen) of transmission-based precautions.
- Based on supposed transmission way:
  1. Contact transmission – direct, indirect
  2. Droplet transmission
  3. Airborne transmission
- **Only for interhuman transmission! (e.g. not for legionellosis)**
- Other possibilities: cohorting, keeping the patient with an existing roommate, ...
- **For all persons in a contact with patient or medical equipment!!!**

# Isolation precautions

## Impact on the patient

- anxiety, depression and other mood disturbances,
- perceptions of stigma,
- reduced contact with clinical staff

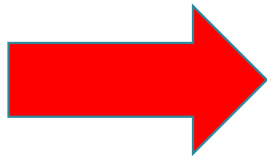




# Isolation precautions

## Impact on the hospital ward

- Specific cleaning precaution
- Dedicated staff
- Organization of rounds (last in the sequence) and e.g. last position in daily surgical schedule
- Individualized patient-care aids
- Increased costs



Indicate individually regarding the compliance capability of the patient and local proposition.

# Contact precautions

- Prevent transmission of infectious agents which are spread by direct or indirect contact with the patient or the patient's environment (MDROs, Clostridium dif., norovirus, ...)
- **Patient placement:** a single-patient room or in multi-patient rooms,  $\geq 1$  m spatial separation between beds.
- **PPE:** gowns, gloves



## Droplet precautions

- Prevent transmission of pathogens spread through close respiratory or mucous membrane contact with respiratory secretions (B. pertussis, influenza virus, adenovirus, rhinovirus, N. meningitides, and group A Streptococcus).
- **Patient placement:** a single patient room or spatial separation of 1.5 m and the curtain between patient beds.
- **PPE:** mask,.....
- Patient transported outside the room: mask (if tolerated) and following Respiratory hygiene/Cough etiquette .

## Airborne precautions

- Prevent transmission of infectious agents that remain infectious over long distances when suspended in the air (e.g., rubeola virus [measles], varicella virus [chickenpox], *M. tuberculosis*, and possibly SARS-CoV)
- **Patient placement:** a single-patient room that is equipped with special air handling and ventilation capacity (HEPA,...).
- Mask or respirator or other PPE, depending on the disease-specific recommendations.