INFECTION PREVENTION AND CONTROL I

INTRODUCTION

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CHAIN OF INFECTION

SOURCE

TRANSMISSION

SUSCEPTIBLE PERSON

Source in healthcare

Enviroment

Other person

Health-care professional

Patient!

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)

PATIENT as a susceptible person

IMMUNOCOMPROMISED INDIVIDUAL:

- HIV patients,
- oncology patients,
- smokers,
- diabetics,
- alcoholics,
- patients that have autoimmune or other chronic disorders.

INFECTION PREVENTION PRECAUTIONS

Safer care for patients.

Protection for healthcare professionels.

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,…

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 transmision 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. Prevention of needle stick and injuries from other sharp instruments
5. Environmental cleaning
6. Linen - safe handling, transport, and processing of used linen
7. Safe waste disposal
8. Safe patient care equipment

STANDARD PRECAUTIONS

HAND HYGIENE

Microflora of the hand skin

1. **Resident flora (resident microbiota)** - under the superficial cells of the stratum corneum and also found on the surface of the skin (*Staphylococcus epidermidis*, Streptococci, *S. hominis* and other coagulase-negative staphylococci, followed by coryneform bacteria - *propionibacteria*, *corynebacteria*, dermobacteria, and micrococci ….). !!! Persistent colonization by pathogenic flora - S. aureus, Gram-negative bacilli, or yeast.
2. **Transient flora (transient microbiota)** - colonize the superficial layers of the skin and are more amenable to removal by routine handwashing (*Staphylococcus aureus, Proteus mirabilis, Klebsiella spp.,….).*

!!! Often acquired during direct contact with patients or contaminated environmental surfaces adjacent to the patient.

Definitions

Hygienic handrub

- Treatment of hands with an alcohol-based handrub to reduce the transient flora without necessarily affecting the resident skin flora.

Hygienic handwash

- Treatment of hands with a detergent and water to reduce the transient flora without necessarily affecting the resident skin flora.

Surgical hand preparation

History

Studies by Ignaz Semmelweis in Vienna in the mid-1800s:

- maternal mortality rates, mostly attributable to puerperal fever, were substantially higher in one clinic compared with the other (16% versus 7%),
- doctors and medical students often went directly to the delivery suite after performing autopsies and had a disagreeable odour on their hands despite handwashing with soap and water before entering the clinic.
- His hypothesis: "cadaverous particles" were transmitted via the hands of doctors and students from the autopsy room to the delivery theatre and caused the puerperal fever.
- Semmelweis recommended that hands be scrubbed in a chlorinated lime solution before every patient contact and particularly after leaving the autopsy room.
- Following the implementation of this measure, the mortality rate fell dramatically to 3%!!!

Transmission of pathogenes by hands

- diabetics, patients undergoing dialysis for chronic renal failure, and those with chronic dermatitis – high S. aureus skin areas colonization,
- patient gowns, bed linen, bedside furniture and other objects in the immediate environment of the patient become contaminated with patient flora.
- certain microorganisms can also play an important role in environmental contamination due to their long-time survival capacities (G+ - *Acinetobacte baumanii,….)*

NO jewellery!!!

- Several studies have shown that skin underneath rings is more heavily colonized than comparable areas of skin on fingers without rings.
- WHO: *„The consensus recommendation is to strongly discourage the wearing of rings or other jewellery during health care. If religious or cultural influences strongly condition the HCW's attitude, the wearing of a simple wedding ring (band) during routine care may be acceptable, but in high-risk settings, such as the operating theatre, all rings or other jewellery should be removed.*"

Fingernails???

Artificial fingernails

- WHO:*„Consensus recommendations are that HCWs do not wear artificial fingernails or extenders when having direct contact with patients and natural nails should be kept short (0.5 cm long or approximately ¼ inch long)"*

Nail polish

- WHO: *„Freshly applied nail polish does not increase the number of bacteria recovered from periungual skin, but chipped nail polish may support the growth of larger numbers of organisms on fingernails".*

Solutions for handrubbing

Aqueous solution

- the need of immersion of hands
- dilution, stability
- the need od drying
- irritating
- colouring
- frequent use causes damage of hand skin

Alcohol-based disinfectant

- comfortable use
- application on dry hands
- quick drying
- content of protecting substances
- parfumed
- availability at the point of care (within arm's reach)
- Risk: flammable 

Alcohol antiseptics and their efficacy

I

- contain either ethanol, isopropanol or n-propanol, or a combination of two of these products,
- solutions containing 60–80% alcohol are most effective, with higher concentrations being less potent,
- **no activity against bacterial spores**, and very poor activity against some non-enveloped (non-lipophilic) viruses.

Alcohol antiseptics and their efficacy

II

- non-enveloped viruses (hepatitis A and enteroviruses -poliovirus) may require 70–80% alcohol to be reliably inactivated.

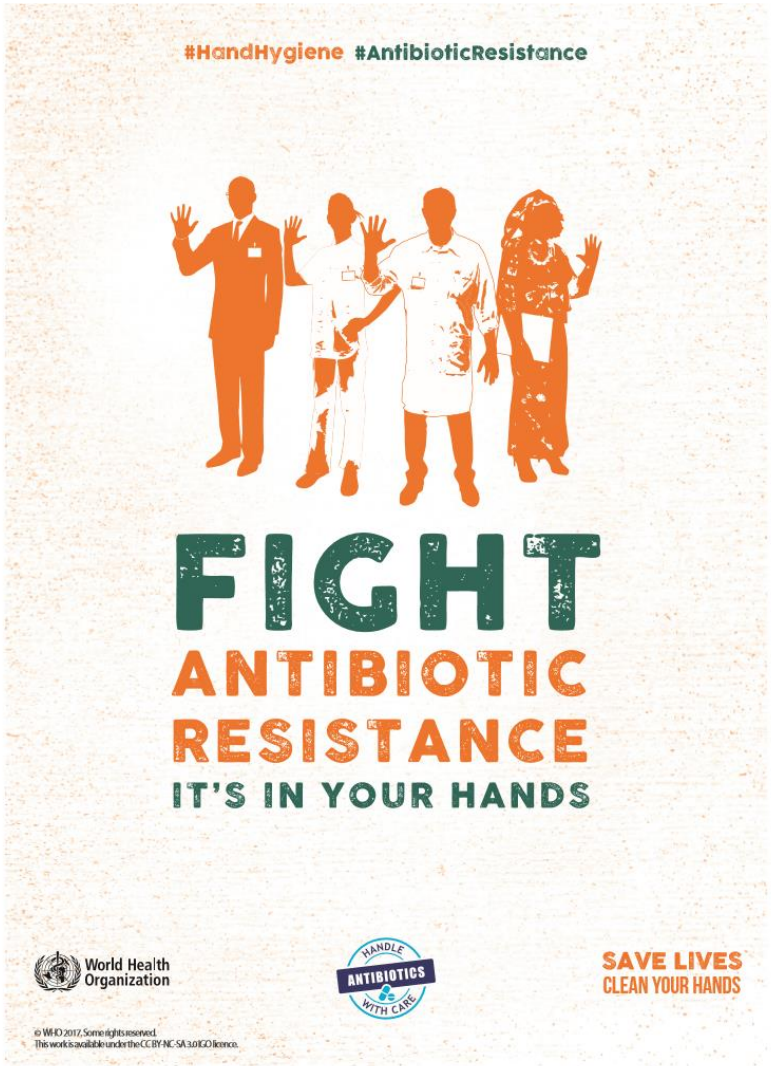
Activity against viruses (German Association for the Control of Virus Diseases **[DVV]**)	Virucidal against enveloped viruses (incl. HBV, HIV, HCV)	15 sec
Tested for activity against enveloped viruses (following the **DVV**)	Influenza A virus (avian)	15 sec
	Influenza A virus (human)	15 sec
Tested for activity against non-enveloped viruses (**DVV**)	Adenovirus	1 min
	Poliovirus	3 min
Tested for activity against non-enveloped viruses (following the **DVV**)	MNV	15 sec
	Rotavirus	15 sec

Centres for deasease control and prevention CDC

- https://www.youtube.com/watch?v=BaHTZdJWYVw

5th May

International Hand Hygiene Day



Handwashing

WHEN?

- Hands visibly dirty, contaminated with proteinaceous material, or visibly soiled with blood or body fluids (also before eating or after using the toilet!)
- The only method of decontamination of hands in exposure of spore-forming pathogenes (e.g., Clostridium difficile).

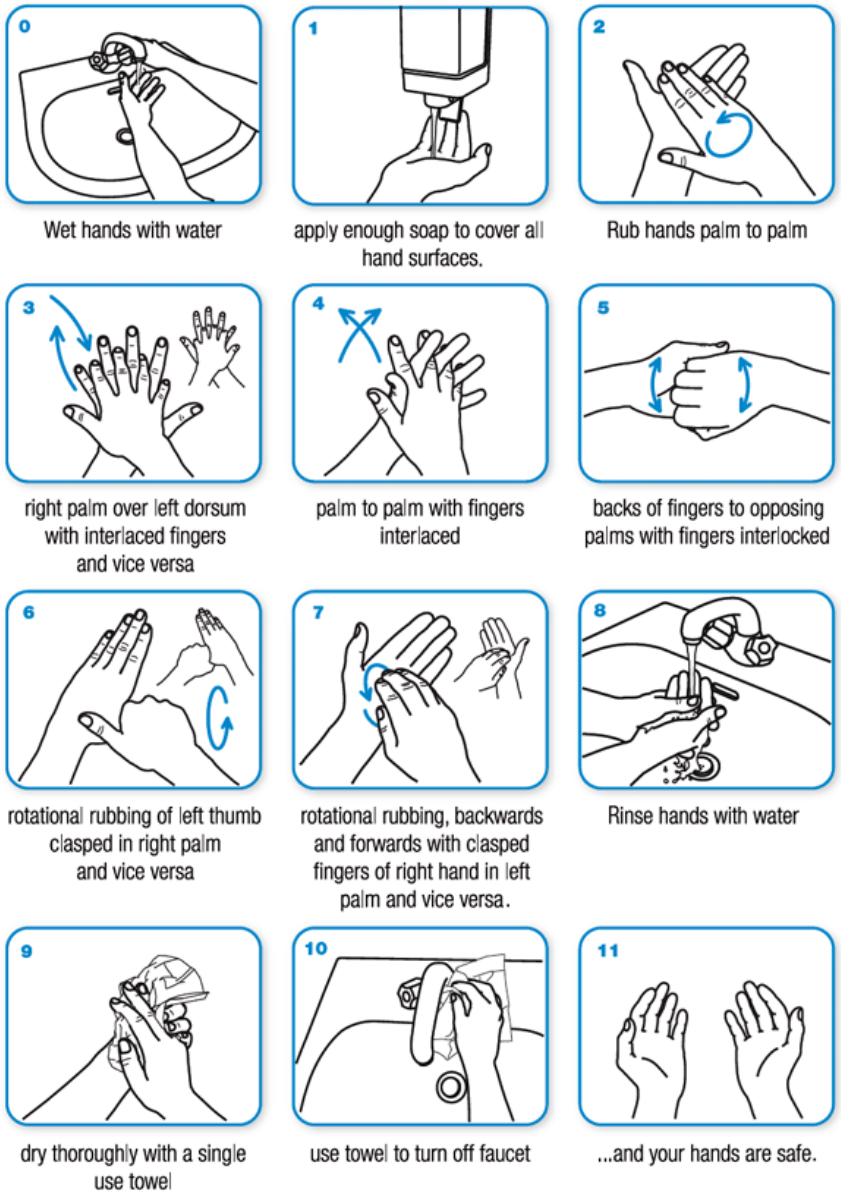
- **Use an alcohol-based handrub as the preferred means for routine hand antisepsis in all other clinical situations**

How to handwash

by WHO

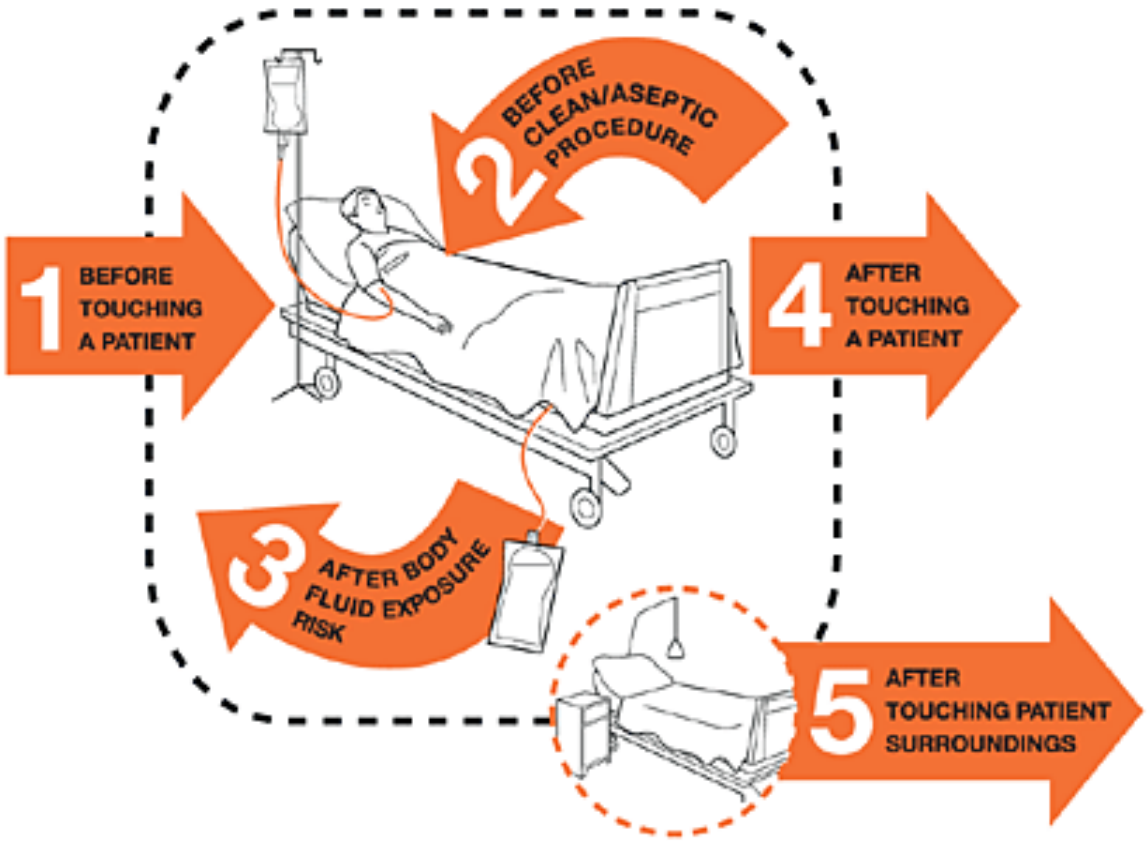
- Wet hands with water and apply the amount of product necessary to cover all surfaces.
- Rinse hands with water and dry thoroughly with a single-use towel.
- Use clean, running water whenever possible.
- Avoid using hot water, as repeated exposure to hot water may increase the risk of dermatitis.

The technique for handwashing



Handrubbing

WHEN?



How to handrub

by WHO

- Apply a palmful of alcohol-based handrub and cover all surfaces of the hands. Rub hands until dry.

The technique for handrubbing

Frequently missed areas

(by CDC)

BBE

BBE = Bare Below the Elbows

(Initiative of SHEA, Special Report, Medscape Infectious Diseases, 2014)

- Preventive strategy to improve the effectiveness of hand hygiene.
- Hands and forearms are free of jewellery and sleeves are above the elbow.
- Long sleeves have been found to be contaminated with pathogens MRSA) , and can impede appropriate hand hygiene.

Rules for use of gloves!!!

1. Handwashing or handrubbing must be performed before donning gloves to prevent glove contamination and possible cross-transmission in case of glove damage or improper use/efficacy.
2. Gloves must be removed to perform handwashing or handrubbing to protect a body site from the flora from another body site or skin area previously touched within the same patient.
3. Hand hygiene must be performed immediately after glove removal to prevent HCW contamination and further transmission and dissemination of microorganisms.

STANDARD PRECAUTIONS

RESPIRATORY HYGIENE
COUGH ETIQUETTE

INFORMATION FOR PATIENTS AND VISITORS

Post this information in entrance for patients:

- COVER YOUR MOUTH / NOSE WHEN COUGHING OR SNEEZING.
- USE AND DISPOSE OF TISSUES.
- PERFORM HAND HYGIENE AFTER HANDS HAVE BEEN IN CONTACT WITH RESPIRATORY SECRETIONS.

!

What should we do?

- Provide resources for performing **hand hygiene in or near waiting areas.**
- **Offer masks to coughing patients and other symptomatic persons** when they enter the dental setting.
- **Provide space** and encourage persons with symptoms of respiratory infections to sit **as far away from others as possible**.