

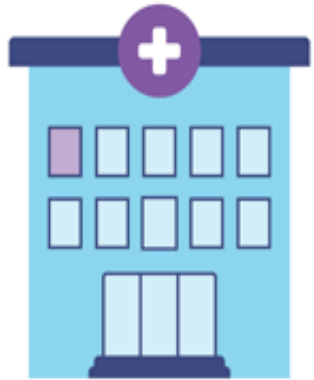


Healthcare Associated Infections (HAI) (Nosocomial Infections)

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HEALTHCARE-ASSOCIATED INFECTIONS ARE A CONCERN IN ALL COUNTRIES



7 to 10%

Of every 100 hospitalised patients, 7 in high-income and 10 in low and middle-income countries, will acquire at least one healthcare-associated infection.

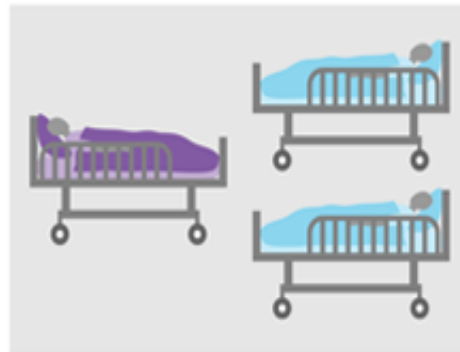


1 in 4

A quarter of healthcare-associated infections in long-term acute care settings are caused by antibiotic-resistant bacteria.

1 in 3

A third of patients in intensive care units (ICUs) in high-income countries are affected by at least 1 healthcare-associated infection.



Objectives:

- **Define HCAs**
- **Designate major types of HCAs**
- **Describe chain of HCAs (source, susceptible patients, modes of transmission)**
- **Identify the principles of prevention and control of HCAs.**

Health care-associated infection (HAI)

also referred to as “nosocomial” or “hospital-acquired infection”

An infection acquired by a patient during the process of care (including preventive, diagnostic and treatment services) in a hospital or other health-care facility, which was not present or incubating at the time of admission; HAIs can also appear after discharge. HAIs may also be acquired by health workers during health care delivery, and by visitors.

An infection is frequently considered a HAI if it appears ≥ 48 hours after admission, and within 10 days after hospital discharge.

WHY???

Within hours after admission, a patient's flora begins to acquire characteristics of the surrounding bacterial pool. Most infections that become clinically evident after 48 hours of hospitalization are considered hospital-acquired.

Infections that occur after the patient is discharged from the hospital can be considered healthcare-associated if the organisms were acquired during the hospital stay.

HAIs cover any infection contracted:

- **As a direct result of treatment in, or contact with, a health or social care setting**
- **As a result of healthcare delivered in the community**
- **Outside a healthcare setting (for example, in the community) and brought in by patients, staff or visitors and transmitted to others**

PERSONS AT RISK OF INFECTION IN HEALTHCARE FACILITIES

1-Healthcare workers (HCWs)

2- Patients

3-Visitors



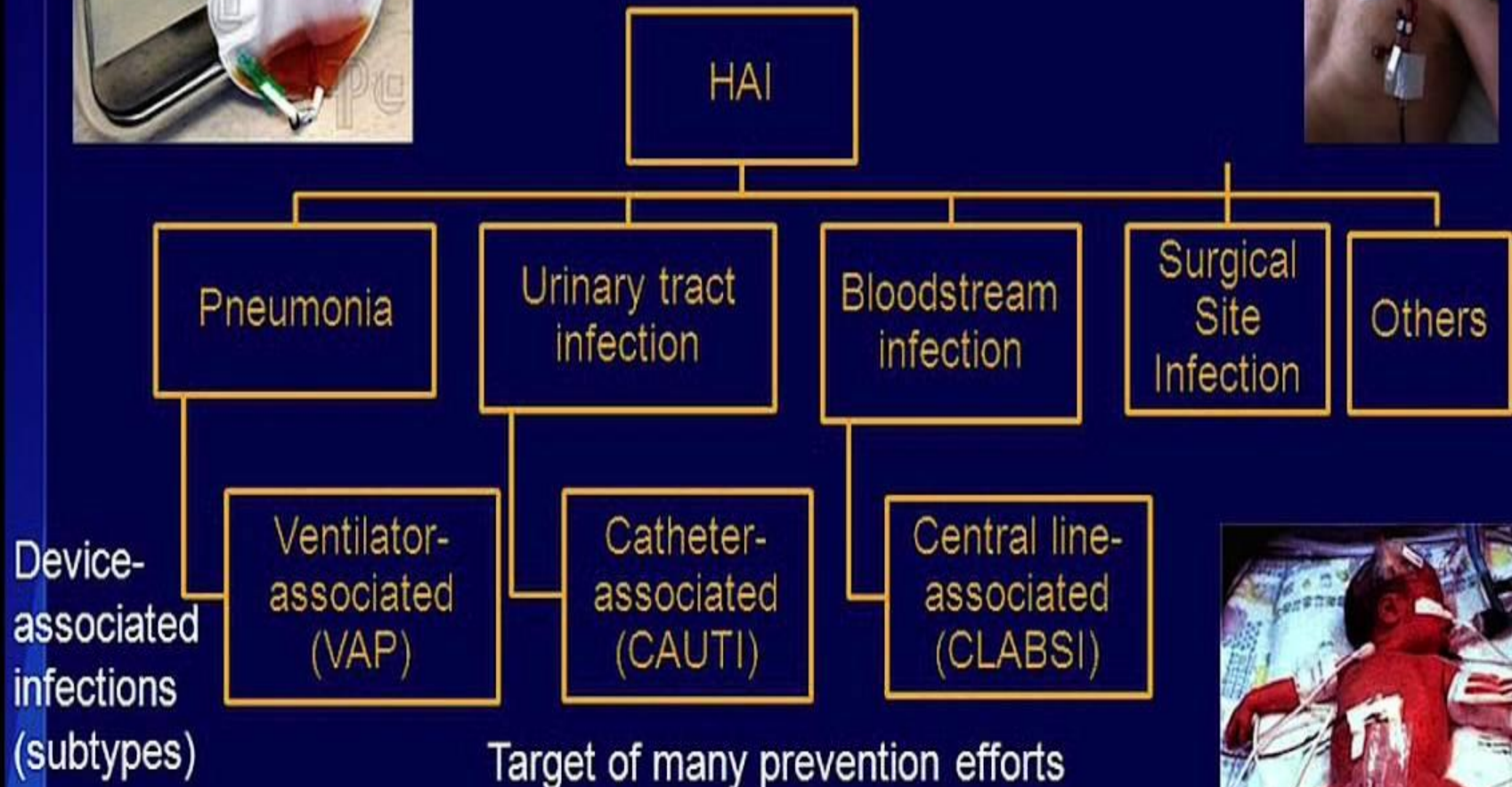
Major Types of HAIs

There are four major types of HAIs, all related to invasive or surgical procedures.

They include:

- **Catheter-associated urinary tract infection**
- **Ventilator-associated pneumonia**
- **Surgical site infection (SSI)**
- **Central line-associated bloodstream infection (CLABSI):**
- **Other types of HAIs include endometritis.**

Healthcare-Associated Infection (HAI) Types



Types of HAI according to magnitude

1 in 20 of hospitalised patients

- 1. Urinary Tract Infection 30-40%**
- 2. Surgical Wound Infection 17-19%**
- 3. Lower resp tract infection 16-18%**
- 4. Skin and soft tissue Infection 6%**
- 5. Bacteremia 8%**

Risk factors of important healthcare-associated infections

▣ **Urinary tract infection**

Extremes of age ,Severity of underlying disease ,Diabetes mellitus ,Duration of catheterization

■ **Pneumonia**

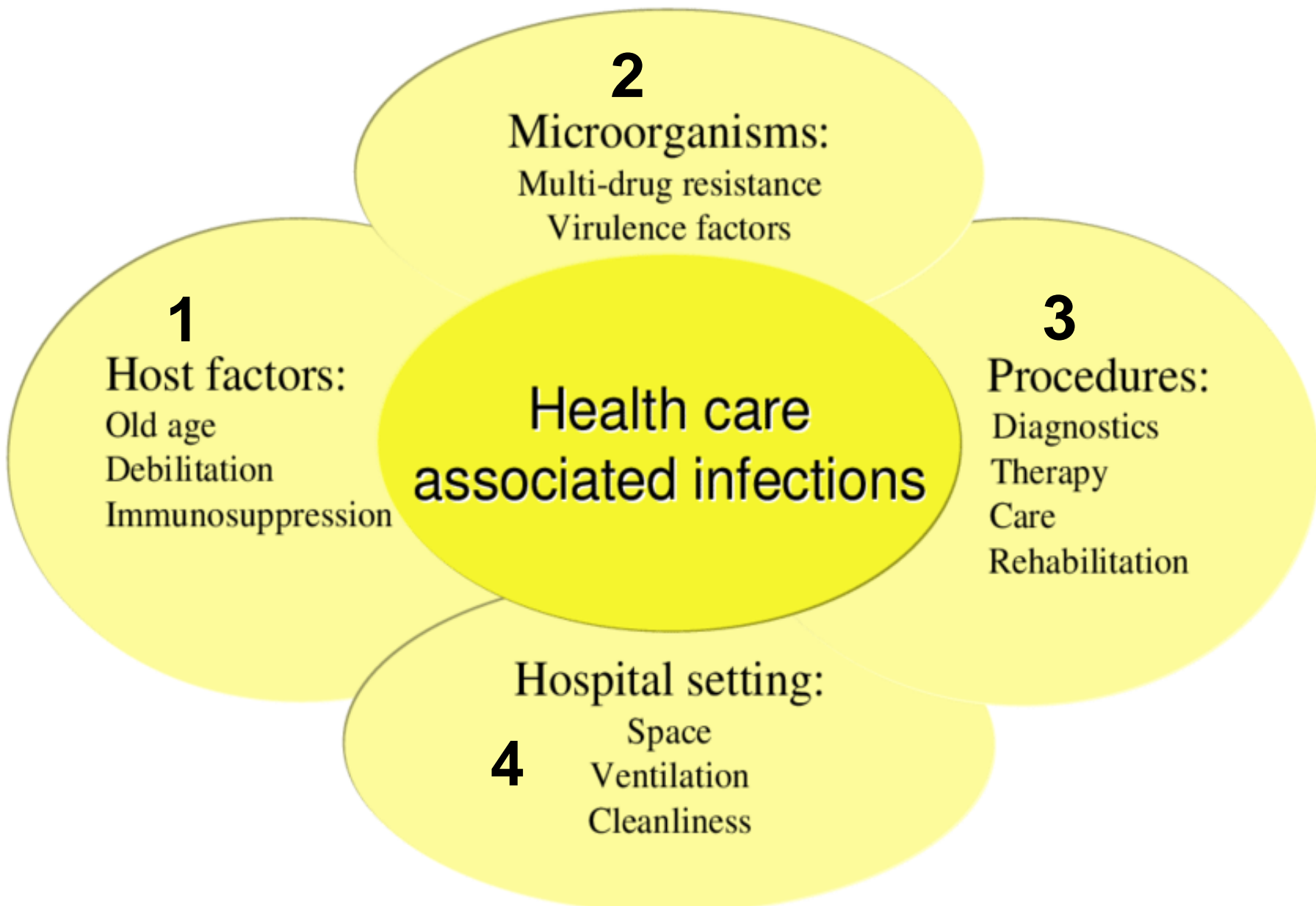
Extremes of age, Underlying disease (COPD, Adult Respiratory Distress Syndrome), Head trauma ,Use of antacids, Re-intubation, Receiving of enteral nutrition

▶ **Surgical site infection**

Extremes of age, Obesity ,Smoking, Diabetes mellitus, Existing infection, Trauma ,Shock ,Prolonged procedure

Symptoms that favor an infection include

- **productive cough**
- **shortness of breath**
- **abdominal pain**
- **rebound tenderness**
- **altered mental status**
- **palpitations**
- **suprapubic pain**
- **polyuria, dysuria**
- **costovertebral angle tenderness.**



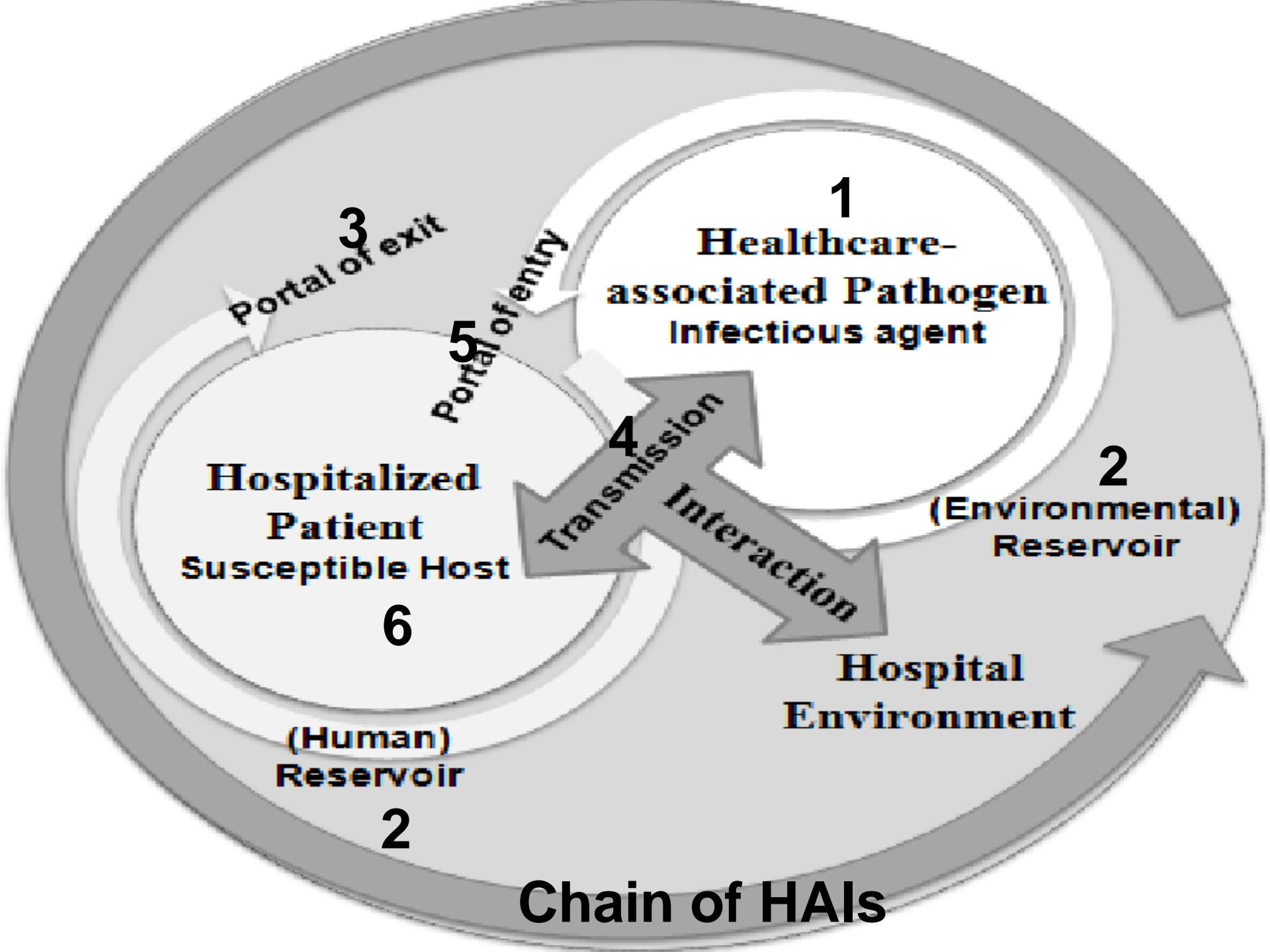
FACTORS INFLUENCING HEALTH CARE ASSOCIATED INFECTIONS

2/17/2024

Risk factors for HAIs can be grouped into three general categories:

- **Medical procedures and antibiotic use**
Antibiotic-resistant microorganisms are responsible for most of HAIs
- **Organizational factors**
- **Patient characteristics.**

The behaviors of health care providers and their interactions with the health care system also influence the rate of HAIs.



Transmission of infection within a health care setting requires three elements:

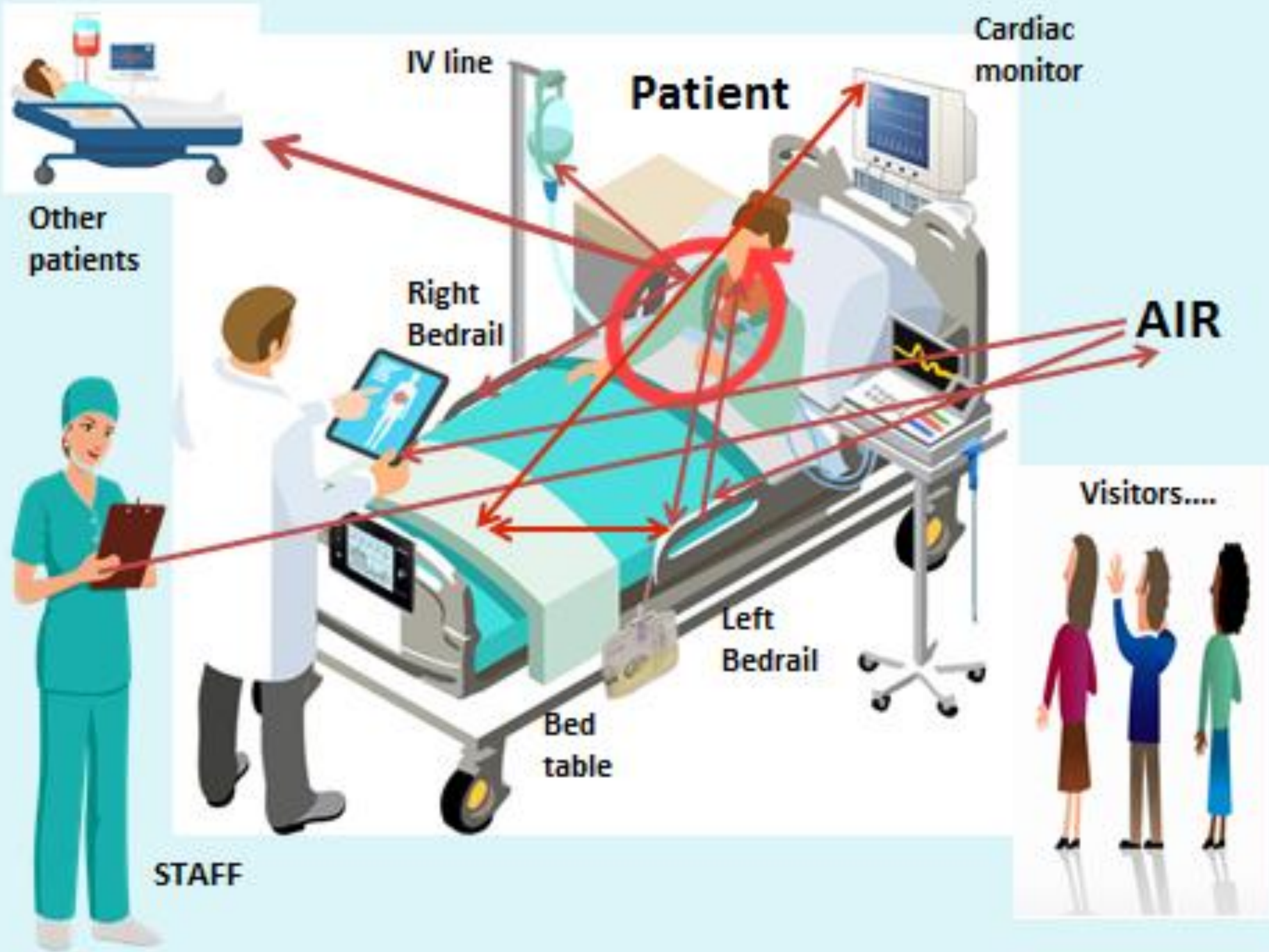
1-source of infecting microorganisms.

2- susceptible host

3- means of transmission of microorganisms to the host

Source of Microorganisms

During the delivery of health care, patients can be exposed to a variety of exogenous microorganisms (bacteria, viruses, fungi, and protozoa) from other patients, health care personnel, or visitors.



Cardiac monitor

Patient

IV line

Other patients

Right Bedrail

AIR

Visitors....

Left Bedrail

Bed table

STAFF

The term HAI covers a wide range of infections.



An infectious agent can be a bacterium, virus, fungus, or parasite. The majority of HAIs are caused by bacteria; viruses, viruses of hepatitis, Covid -19, HIV and fungi are occasionally involved, while parasites rarely cause HAIs. There are two major types of bacteria that cause HAIs, Gram positive (e.g., staphylococci, streptococci, C. diffile) and Gram negative (e.g., Acinetobacter, Pseudomonas, Enterobacter, Klebsiella). Many of these pathogens can survive on surfaces for a long period of time.

ظهور البكتريا العراقية المقاومة **acineto bummanni** خلال شهر الـ 12 في مدينة الصدر الطبية - ردهة الـ RCU وهنا يجدر الاشارة الى تسجيل سبع حالات اصابة ببكتريا الـ **Acineto bummanni** (بنفس الوقت ولنفس المريض) متزامنة مع اصابة ببكتريا الـ **Klebsiella pneumonia** حيث تكون البكتريا الاخيرة شديدة المقاومة ومقاومة كلية في اغلب الحالات وحسب الجدول المرفق لكم طيا وهذا يشير الى مدى خطورة التفشي وضرورة السيطرة عليه بجديّة تامة ..

جدول يوضح تفشي البكتريا المقاومة بشكل مزدوج في ردهة الـ RCU لشهر الاول عام 2024

ت	اسم المريض	المكان	العزلة	نوع البكتريا المتفشية	الملاحظات
1	عبد الحسين علي	RCU	SPUTUM	ACIN+KLEB	KLEB حساسة فقط للـ MINO
2	احسان حبيب	RCU	SPUTUM	ACIN+KLEB	
3	هدية صالح	RCU	SPUTUM	ACIN+KLEB	KLEB مقاومة لكل المضادات
4	عبد الزهرة ظافر	RCU	SPUTUM	ACIN+KLEB	KLEB حساسة للـ OFLOX
5	احسان حبيب 2	RCU	SPUTUM	E.COLI	ECOLI مقاومة لكل المضادات
6	عويد ريشان	RCU	SPUTUM	ACIN+KLEB	KLEB حساسة للـ GENT
7	هند سعيد	RCU	SWAB	ACIN+KLEB	KLEB مقاومة لكل المضادات

الملخص:

ظهور تفشي متزامن لكل من **ACINETO** و **KLEB** في ردهة الـ RCU وتنوع المقاومة لبكتريا **KLEB** وظهور حالات مقاومة تامة لها

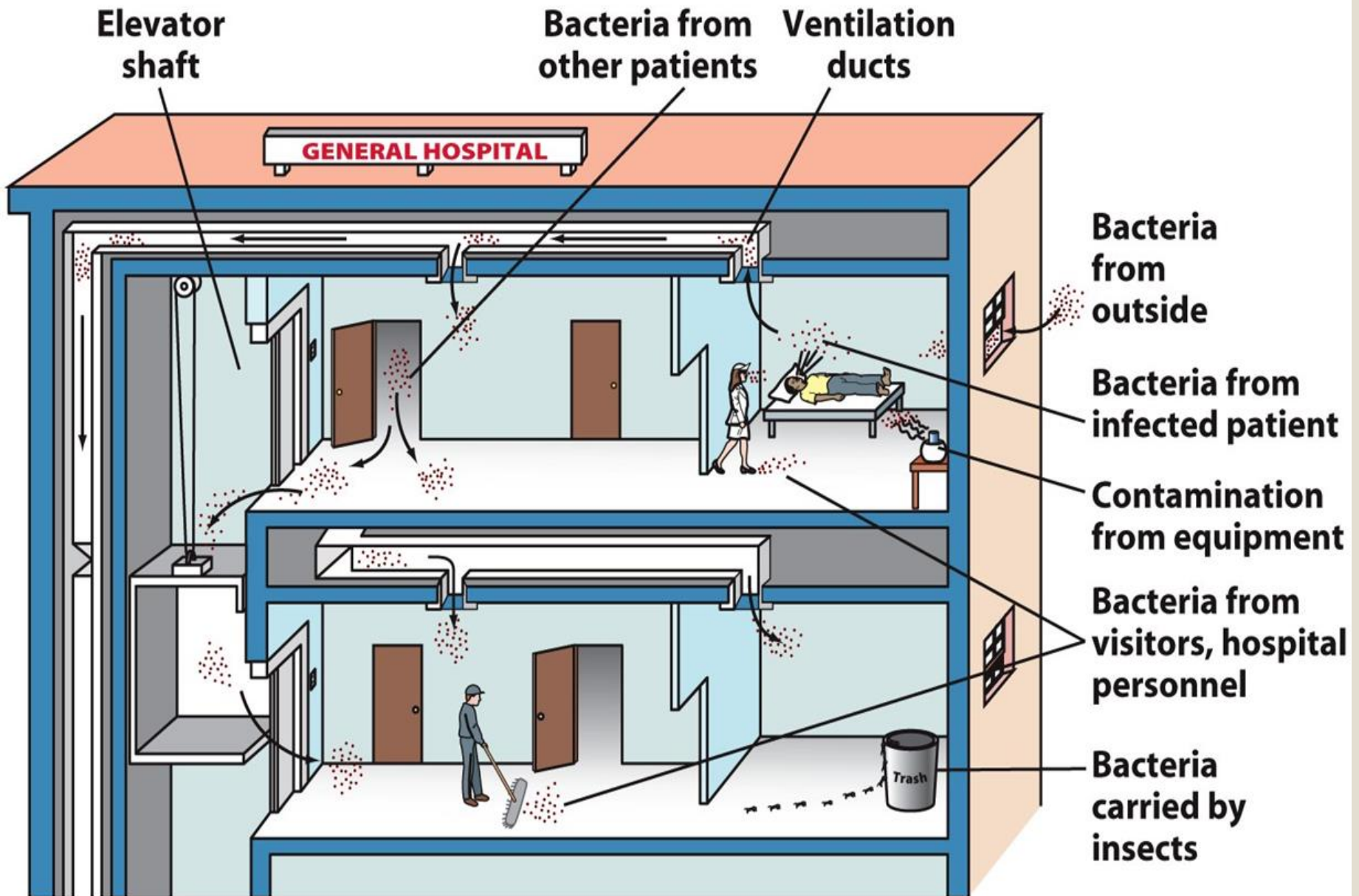
الالتوصيات:

1- متابعة اي حالات تفشي جديدة خلال الاشهر القادمة لاتخاذ كافة الاجراءات اللازمة للسيطرة على التفشي

2- قيام باعلام الادارة بهذه المستجدات ونشر تحليل بيانات لكافة الاستشاريات والوحدات العلاجية والالتزام بكافة التعليمات الخاصة للسيطرة على التلوث

3- توعية كافة الكوادر الطبية والصحية بخطورة الموقف لاختذ الموضوع بين الاعتبار والحذية اللازمة لمواجهة هذا الخطر. واعتماد اختبار الـ **culture and sensitivity** في وصف المضادات الميكروبية قبل الدخول للردهة كنوع من التقصي حول هذا التزامن قد استجد من

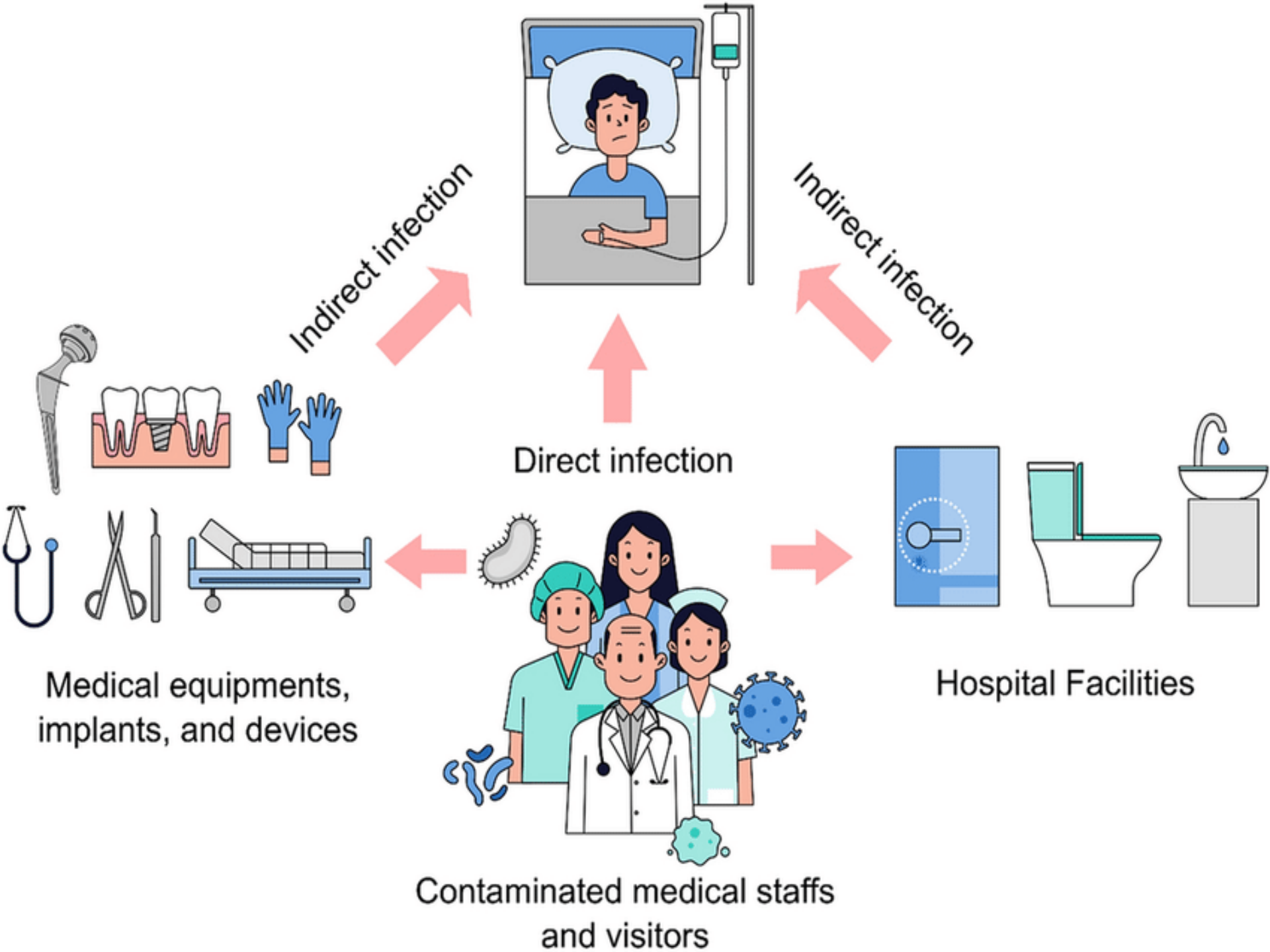
S No	Types of Infections	Organism
1.	Surgical wounds	Staphylococcus aureus, Escherichia coli, Staphylococcus fecalis
2.	Pneumonia	Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus, Escherichia coli, Enterbacter Spp
3.	Intravenous catheter	Staphylococcus aureus, Staphylococcus fecalis, Staphylococcus epidermis, Candida Spp
4.	Urinary catheter	Klebsiella Spp, Pseudomonas aeruginosa, Steptococcus faecalis, Escherichia coli



Means of Transmission

Among patients and health care personnel, microorganisms are spread to others through four common routes of transmission:

- **Contact (direct and indirect)**
- **Respiratory droplets**
- **Airborne spread**
- **Common vehicle**



Contact transmission

This is the most important and frequent mode of transmission in the health care setting.

Organisms are transferred through direct contact between an infected or colonized patient and a susceptible health care worker or another person.

Patient organisms can be transiently transferred to the intact skin of a health care worker (not causing infection) and then transferred to a susceptible patient who develops an infection from that organism—this demonstrates an indirect contact route of transmission from one patient to another.

Microorganisms that can be spread by contact include those associated with impetigo, abscess, diarrheal diseases, scabies, and antibiotic-resistant organisms (e.g., methicillin-resistant *Staphylococcus aureus* [MRSA])

Respiratory droplets

Droplet-size body fluids containing microorganisms can be generated during coughing, sneezing, talking, suctioning, and bronchoscopy.

They are pushed a short distance before settling quickly on to a surface.

They can cause infection by being deposited directly into a susceptible person's mucosal surface (e.g., conjunctivae, mouth, or nose) or into nearby environmental surfaces, which can then be touched by a susceptible person who auto inoculates their own mucosal surface.

Examples of diseases where microorganisms can be spread by droplet transmission are pharyngitis, meningitis, and pneumonia.

Airborne spread

When small-particle-size microorganisms (e.g., tubercle bacilli, varicella, and rubeola virus) remain suspended in the air for long periods of time, they can spread to other people.

Common Vehicle

Common vehicle (common source) transmission applies when multiple people are exposed to and become ill from a common non-living vehicle of contaminated food, water, medications, solutions, devices, or equipment.

Bacteria can multiply in a common vehicle but viral replication can not occur.

Microorganisms are transmitted to susceptible hosts from common items:

Food

Water

Medications

Devices/ equipment

Examples include :improperly processed food items that become contaminated with bacteria, waterborne shigellosis.

Bacteremia resulting from use of intravenous fluids contaminated with a gram-negative organism.

Contaminated multi-dose medication vials, or contaminated bronchoscopes.

HOST SUSCEPTIBILITY

All people admitted to hospital are at some risk of contracting an HAI. If patients are very sick or have had surgery, they have an increased risk. Some people are more vulnerable than others, including:

- **premature babies**
- **very sick children**
- **elderly people**
- **weak people**
- **people with certain medical conditions, such as diabetes**
- **people with low immunity – such as people with diseases that compromise their immune system or people who are being treated with chemotherapy or steroids.**

MAJOR INFECTIOUS RISKS FOR HEALTHCARE WORKERS

Blood borne pathogens

Via percutaneous or mucosal exposure

Major risks: HBV, HCV, HIV

Airborne or droplet transmitted diseases

Varicella, measles, pertussis, meningococcal infection, influenza, other respiratory viruses (e.g., RSV, SARS) and COVID-19.

Contact transmitted diseases (direct, indirect)

***C. difficile*, MRSA, herpes simplex, adenovirus (keratoconjunctivitis)**

VISITORS

Visitors may acquire a communicable disease or serve as a source of infection

Visitors as a source of infection:

Influenza, RSV, measles, varicella, pertussis, SARS, Covid-19

Gaining of colonization/infection by visitors

SARS, MRSA

Visitors may act a vector for transferring infection

What is the impact of health care-associated infections?

As is the case for many other patient safety issues, health care-associated infections create additional suffering and come at a high cost for patients and their families.

- **Infections prolong hospital stays**
- **Increase resistance to antimicrobials**
- **Represent a massive additional financial burden for health systems**
- **Generate high costs for patients and their family**
- **Cause unnecessary deaths.**

Why do Health care Associated Infections Arise?

1-Inadequate environmental hygienic conditions and waste disposal

2-Poor infrastructure

Poor design and planning of hospitals

3-Insufficient equipment

4-Understaffing

5-Overcrowding

6-Poor knowledge and application of basic infection control measures

7-Lack of Aseptic procedure

8-Lack of knowledge of injection and blood transfusion safety

9-Absence of local and national guidelines and policies for the prevention and control of HAIs.

10-A false sense of security about the effectiveness of antibiotics with the corresponding neglect of Aseptic Techniques.

11-Admissions of carriers for unrelated medical conditions

12-Transfer to ,or from specialized hospitals or units with a high usage of antibiotics (e.g. ICU patients or oncology patients).

Such patients carry bacteria that are often resistant to antibiotics combat infection.

Infectious Disease Hospital

hospitalized cases may acquire another form of infection on the top of that they have. It is known as "hospital cross – infection".

Specifics of hospital cross – infection:

Together with the same general characteristics of hospital infection, cross hospital infections have the following particulars:

1- personnel going in-between wards of different infectious diseases may transmit infection from one ward to the other through 3rd person role, when preventive precautions are not taken.

2- undiagnosed cases may be admitted to the ward of suspected disease, and who then proven to have some other disease , with the risk of exposing the other cases to infection.

3- more than one infectious disease may be admitted to one ward where vacant beds are available.

How are healthcare-associated infections (HAIs) treated?

- **HAIs can cause illnesses ranging from mild to extremely serious and life-threatening.**
- **Treatment of HAIs depends on the infection involved.**
- **Some respond to carefully chosen antibiotic treatments.**
- **However, some HAIs can be extremely difficult to treat because of their resistance to antibiotics. Because of this, the best treatment for HAIs is **prevention**.**

Prevention of Health Care Associated Infections

Goals for prevention and control of HAIs are

1-Protect the patients.

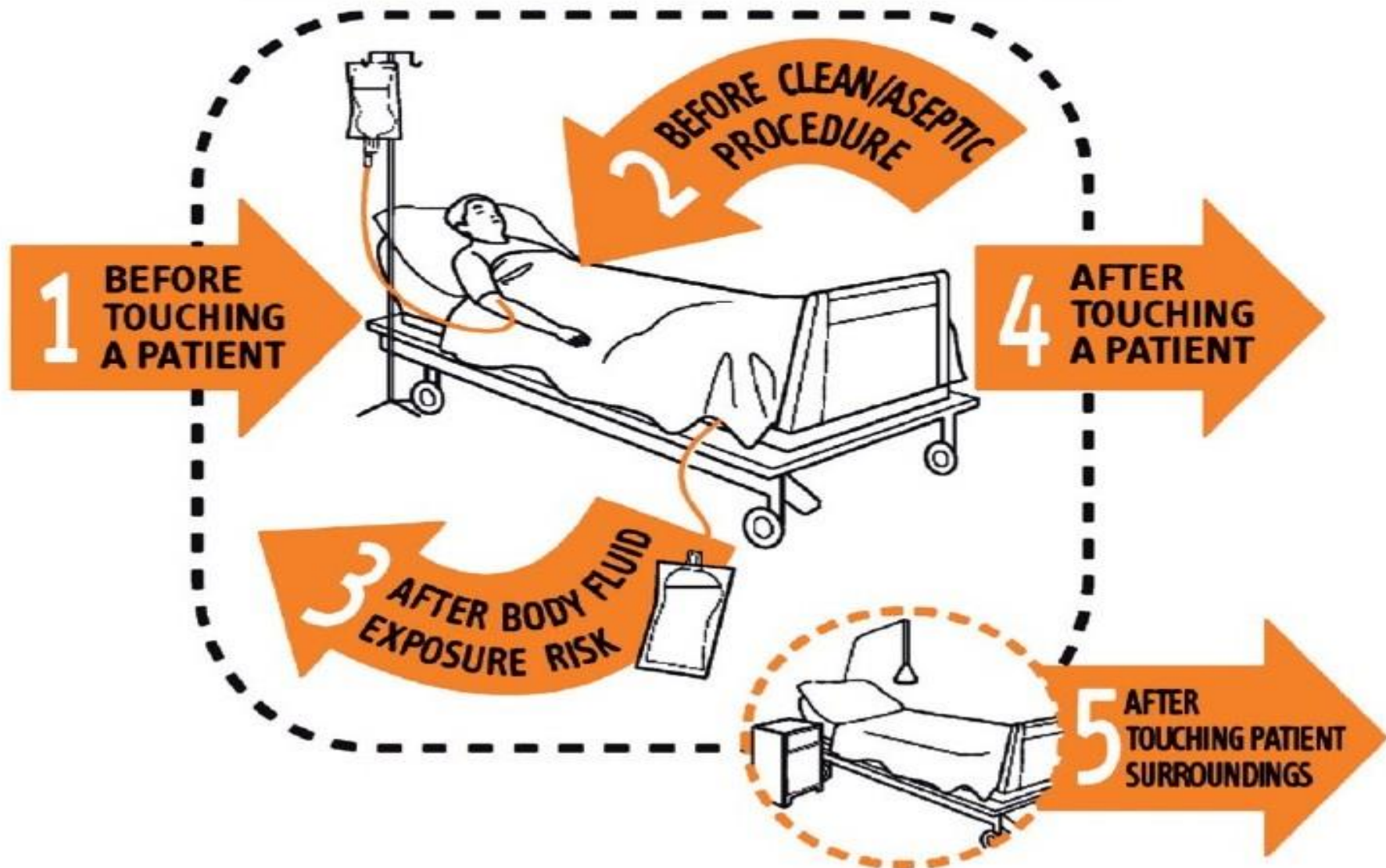
**2-Protect the health care workers ,visitors and,
Others in the health care environment.**

Preventing healthcare associated infections

Healthcare workers use various well established procedures to help prevent infections, including:

- **Infection control procedures and policies**
- **Correct and frequent hand hygiene measures by all staff and patients**
- 🌐 **Hand washing, according to the WHO is the single most important means of preventing the spread of infection.**

My 5 moments for HAND HYGIENE



- **keeping the healthcare environment and equipment clean**
- **complying with standard sterile techniques when performing surgery, caring for wounds or inserting and caring for medical devices such as intravenous cannulas and urinary catheters**
- **using antibiotics appropriately to prevent and treat infections.**
- **Hospitals will also participate in surveillance programs to monitor infection rates and measure the impact of infection prevention practices.**



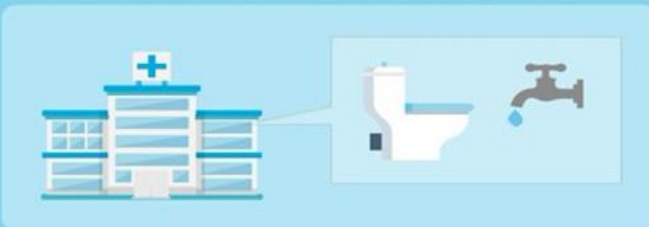
The main ways to prevent **infection** are:

1 Practicing the 5 Moments for hand hygiene



↓ 50% INFECTION

5 Safe water and sanitation



2 A clean, well-functioning environment and equipment



3 Infection prevention and control programmes and teams



↓ 30% INFECTION

4 Infection prevention measures



Medical Care Providers

Health care workers may also be infected, therefore prevention & control measures increase safety for them, as well as for patients.

Many infection prevention and control measures, such as appropriate hand hygiene and the correct application of basic precautions during invasive procedures, are simple and low-cost, but require staff accountability and behavioral change.

- **Free of infection: pre-employment and periodic examination, including the bacteriological {nose and throat swabbing are particularly important}.**
- **Preventive measures such as vaccination of the staff against i.e. hepatitis B, or other diseases .**
- **Proper health behavior & clean habits**
- **Use of personal protective equipment aprons, face shields, gloves, and effective post-exposure management or treatment must be practiced in all health care facilities.**



Prevention of Hospital Cross- infection

- 1. Special hospital design, to prevent spread of infection in-between wards.**
- 2. Separate isolation ward (s) for each infectious disease and it not allowed admitting cases of any other disease.**
- 3. Availability of a suitable number of "isolation cubicles", for separate individual isolation of undiagnosed cases.**

Precautions for Personnel:

- 1- Must have basic knowledge, of infection, & how to prevent.**
- 2-Application of specific protection by immunization, chemoprophylaxis, according to potentially expected exposure.**
- 3-Providing facilities of personal cleanliness.**

4- Nursing and service personnel; must be responsible for cases of one disease only, and not to go into other wards & units.

5- During the daily round of personnel in hospital, it is necessary to use clean gown & shoes [and also mask & gloves when necessary], to be changed and hands thoroughly washed in-between wards and units, to prevent third – person transfer of infection.

ANY QUESTION ?



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