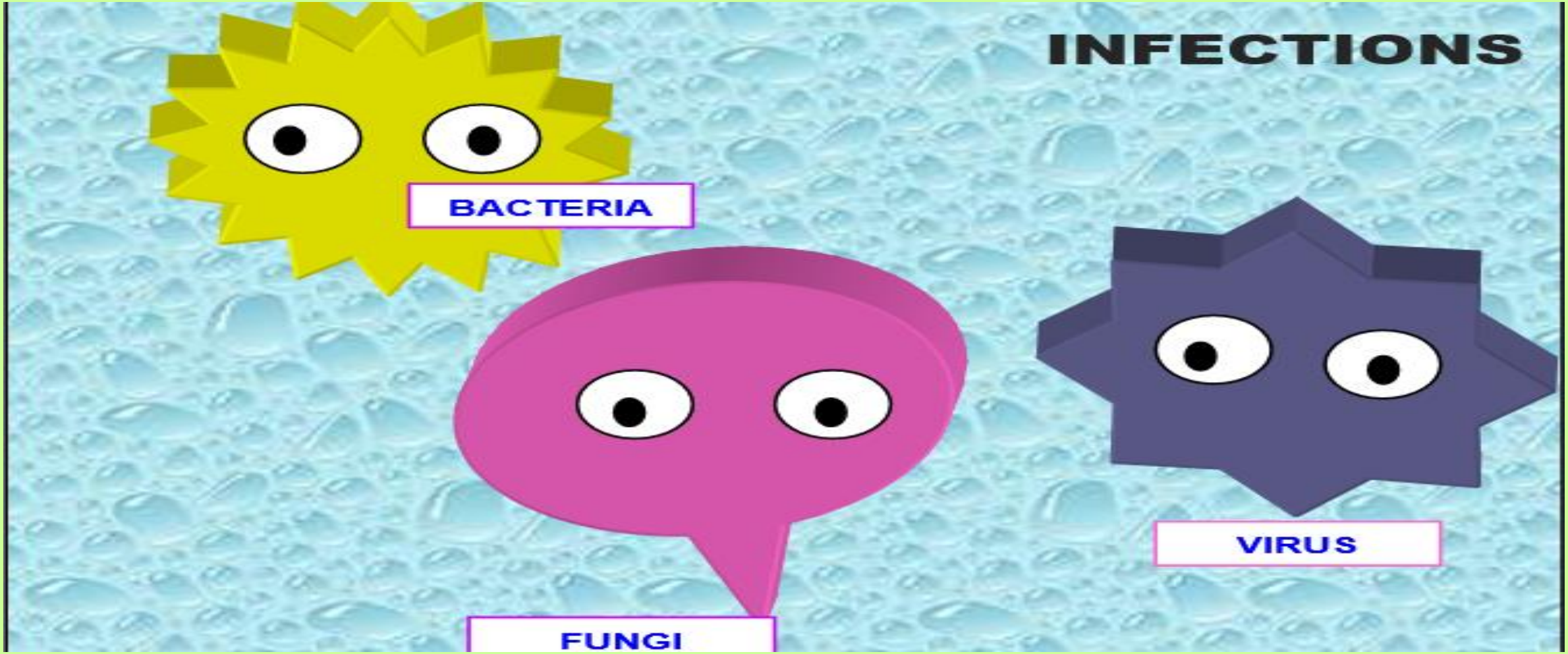
Nosocomial Infection & Hazards in Healthcare

Prof. Ashraf Zaghloul



Nosocomial Infection

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Nosocomial Infection (also called “hospital acquired infection”) can be defined as:

An infection **acquired in hospital by a patient who was admitted** for a reason other than that infection.

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**

Infection that first appears between 48 hours and four days after a patient is admitted to a hospital or other health-care facility

Patient care is provided in facilities which range from highly equipped clinics and technologically advanced university hospitals to front-line units with only basic facilities.

Despite progress in public health and hospital care, infections continue to develop in **hospitalized patients**, and **may also affect hospital staff.**

Many factors promote infection among hospitalized patients:

- **decreased immunity** among patients;
- the **increasing variety of medical procedures and invasive techniques** creating potential routes of infection; and
- the transmission of **drug-resistant bacteria** among crowded hospital populations, where poor infection control practices may facilitate transmission.

Epidemiology of hospital acquired infections

Nosocomial infections occur worldwide and affect both developed and resource-poor countries.

Infections acquired in health care settings are among the major causes of death and increased morbidity among hospitalized patients. They are a significant burden both for the patient and for public health.

A prevalence survey conducted under the auspices of W.H.O in 55 hospitals of 14 countries representing 4 W.H.O Regions shows that the highest prevalence of nosocomial infections occurs in

Intensive care units and in acute surgical and orthopaedic wards

Infection rates are higher among patients with increased susceptibility because of

-old age,

- underlying disease, or chemotherapy.

Impact of nosocomial infections

Hospital-acquired infections **add to functional disability and emotional stress of the patient** and may, in some cases, lead to disabling conditions that reduce the quality of life.

- Nosocomial infections are also one of the leading causes of death.

- The economic costs are considerable.

(Increased length of stay for infected patients is the greatest contributor to cost)

Impact of nosocomial infections

Prolonged stay not only increases direct costs to patients or payers but also indirect costs due to lost work.

The increased use of drugs, the need for isolation, and the use of additional laboratory and other diagnostic studies also contribute to costs.

Hospital-acquired infections add to the **imbalance between resource allocation** for primary and secondary health care by diverting scarce funds to the management of potentially preventable conditions.

The advancing age of patients admitted to health care settings, the greater prevalence of chronic diseases among admitted patients, and the increased use of diagnostic and therapeutic procedures which affect the host defences will provide continuing pressure on nosocomial infections in the future.

Organisms causing nosocomial infections can be **transmitted to the community** through discharged patients, staff, and visitors. If organisms are multi-resistant, they may cause significant disease in the community.

Factors influencing the development of nosocomial infections

1- The microbial agent

The patient is exposed to a variety of microorganisms during hospitalization. Contact between the patient and a microorganism does not by itself necessarily result in the development of clinical disease - other factors influence the nature and frequency of nosocomial infections.

The likelihood of exposure leading to infection depends partly on the characteristics of the microorganisms, including resistance to antimicrobial agents, intrinsic virulence, and amount (inoculum) of infective material.

Many different **bacteria, viruses, fungi and parasites** may cause nosocomial infections. Infections may be caused by a microorganism acquired from another person in the hospital (cross-infection) or may be caused by the patient's own flora (endogenous infection).

Some organisms may be acquired from an inanimate object or substances recently contaminated from another human source (environmental infection).

Before the introduction of basic hygienic practices and antibiotics into medical practice, most hospital infections were due to pathogens of external origin (foodborne and airborne diseases, gas gangrene, tetanus, etc.) or were caused by microorganisms not present in the normal flora of the patients (e.g. diphtheria, tuberculosis).

Progress in the antibiotic treatment of bacterial infections has considerably reduced mortality from many infectious diseases. Most infections acquired in hospital today are caused by microorganisms which are common in the general population, in whom they cause no or milder disease than among hospital patients (Staphylococcus aureus, coagulase-negative staphylococci, enterococci, Enterobacteriaceae).

2- Patient susceptibility

Important patient factors influencing acquisition of infection include age, immune status, underlying disease, and diagnostic and therapeutic interventions.

The extremes of life — infancy and old age — are associated with a decreased resistance to infection.

Patients with chronic disease such as malignant tumours, leukaemia, diabetes mellitus, renal failure, or the acquired immunodeficiency syndrome (AIDS) have an increased susceptibility to infections with opportunistic pathogens.

3- Environmental factors

Health care settings are an environment where both infected persons and persons at increased risk of infection congregate. **Patients with infections or carriers** of pathogenic microorganisms admitted to hospital are potential sources of infection for patients and staff. **Patients who become infected** in the hospital are a further **source** of infection. **Crowded conditions** within the hospital, **frequent transfers** of patients from one unit to another, and **concentration of patients** highly susceptible to infection in one area (e.g. newborn infants, burn patients, intensive care) all contribute to the development of nosocomial infections.

Microbial flora may contaminate objects, devices, and materials which subsequently contact susceptible body sites of patients.

In addition, new infections associated with bacteria such as waterborne bacteria (atypical mycobacteria) and/or viruses and parasites continue to be identified.

4- Bacterial resistance

Many patients receive antimicrobial drugs. Through selection and exchange of genetic resistance elements, antibiotics promote the emergence of multi-drug resistant strains of bacteria; microorganisms in the normal human flora sensitive to the given drug are suppressed, while resistant strains persist and may become endemic in the hospital.

The widespread use of antimicrobials for therapy or prophylaxis (including topical) is the major determinant of resistance.

Antimicrobial agents are, in some cases, becoming less effective because of resistance.

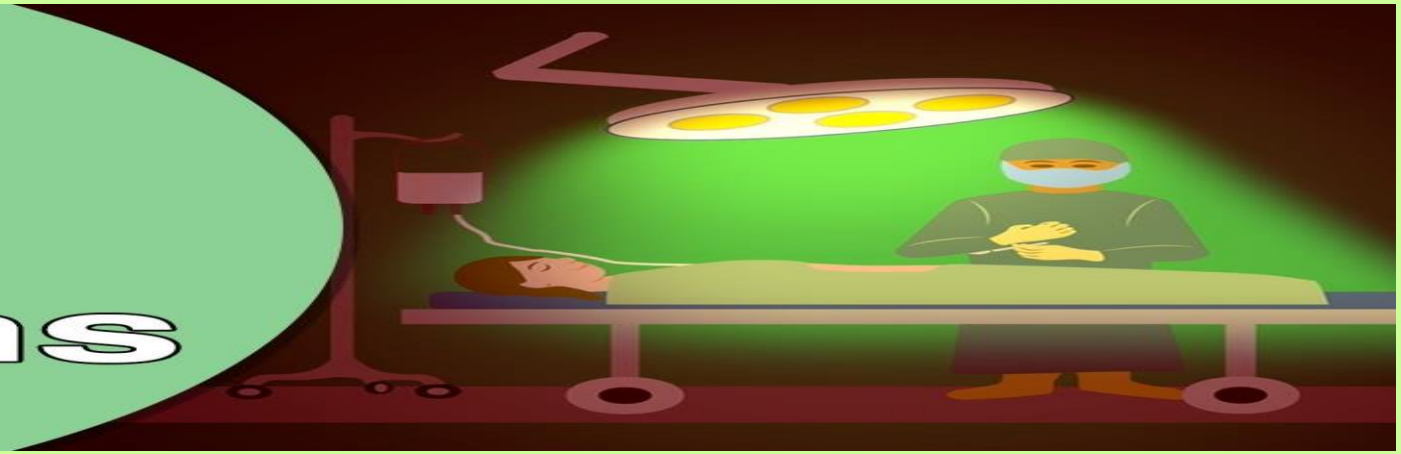
As an antimicrobial agent becomes widely used, bacteria resistant to this drug eventually emerge and may spread in the health care setting. Many strains of pneumococci, staphylococci, enterococci, and tuberculosis are currently resistant to most or all antimicrobials which were once effective.

Most common hospital acquired infections **for surveillance**

1- Surgical site infection

Any purulent discharge, abscess, or spreading cellulitis at the surgical site during the month after the operation

Surgical site infections



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2- Urinary infection

Positive urine culture (1 or 2 species) with at least 105 bacteria/ml, with or without clinical symptoms

3- Respiratory infection (nosocomial pneumonia)

Respiratory symptoms with at least two of the following signs appearing during hospitalization:

— cough

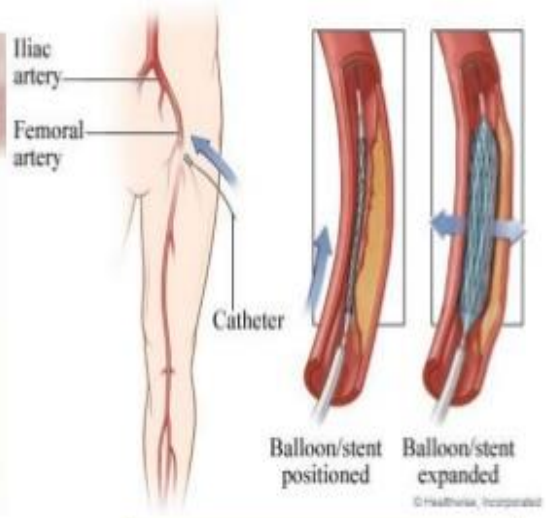
— purulent sputum

— new infiltrate on chest radiograph consistent with infection

4- Vascular catheter infection

Inflammation, lymphangitis or purulent discharge at the insertion site of the catheter

Peripheral venous catheter



Peripheral arterial catheter

5- Septicaemia

Fever or rigours and at least one positive blood culture

Other nosocomial infections

Skin and soft tissue infections:

Open sores (ulcers, burns and bedsores) encourage bacterial colonization and may lead to systemic infection.

Gastroenteritis

The most common nosocomial infection in children, where rotavirus is a chief pathogen: **Clostridium difficile** is the major cause of nosocomial gastroenteritis in adults in developed countries.

Sinusitis

and other enteric infections, infections of the eye and conjunctiva.

Endometritis

and other infections of the reproductive organs following childbirth.

Hazards for Healthcare Professionals

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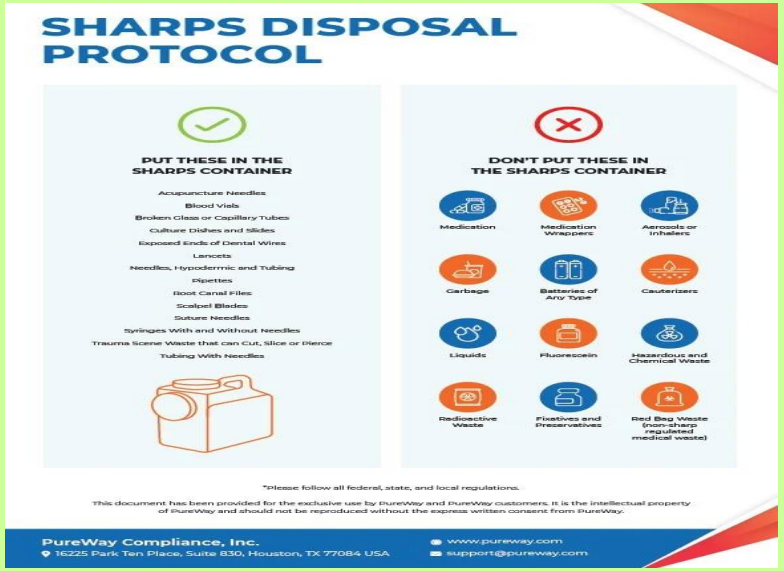
1 Occupational Infections

- **Needlestick injuries** contribute to 39%, 37% and 4.4% of **hepatitis C, hepatitis B and HIV infections respectively**.
- The prevalence of **acute hepatitis B** infection among health workers globally is 5.3%.
- About 54% of health workers in low- and middle-income countries have latent **TB infection**.


Needle Stick
Injury


DROP: DON'T FORCE SHARPS INTO CONTAINER. FORCING, COMPRESSION OR OVERFILLING CAN CAUSE CONTAINER PUNCTURE AND RESULT IN INJURY.
SHARPS
INFECTIOUS WASTE
SINGLE USE ONLY


SHARPS DISPOSAL PROTOCOL
PUT THESE IN THE SHARPS CONTAINER
Acupuncture Needles
Blood Vials
Broken Glass or Capillary Tubes
Culture Dishes and Slides
Exposed Ends of Dental Wires
Lancets
Needles, Hypodermic and Tubing
Pipettes
Root Canal Files
Scalpel Blades
Suture Needles
Syringes With and Without Needles
Trauma Scene Waste that can Cut, Slice or Pierce
Tubing With Needles
DON'T PUT THESE IN THE SHARPS CONTAINER
Medication
Medication Wrappers
Aerosols or Inhalers
Garbage
Batteries of Any Type
Cauterizers
Liquids
Fluorescein
Hazardous and Chemical Waste
Radioactive Waste
Fixatives and Preservatives
Red Bag Waste (non-sharp regulated medical waste)
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2 Exposure to Hazardous Chemicals

- **Disinfectants**, cleaning products, sterilants, anaesthetic gases, mercury, hazardous drugs and pesticides used in health-care settings may be harmful to health workers.

- **Cleaning agents** and disinfectants have been associated with a 67% increased risk of new-onset **asthma** in nurses.

- **Bleach and glutaraldehydes** have been associated with double the risk of **asthma** in nurses.

SAFER Sanitizers and Disinfectants

IN THE AGE OF COVID-19/CORONAVIRUS

Fight the coronavirus with common sense prevention and safer disinfection products. Avoid products that increase vulnerability to respiratory and immune system problems.

BEYOND PESTICIDES

3 Unsafe Patient Handling

Lifting, transferring, repositioning and moving patients without using proper techniques or handing equipment can cause musculoskeletal injury (e.g., back injury and chronic back pain).

Up to 72% of nurses are suffering from non-specific chronic low back pain.

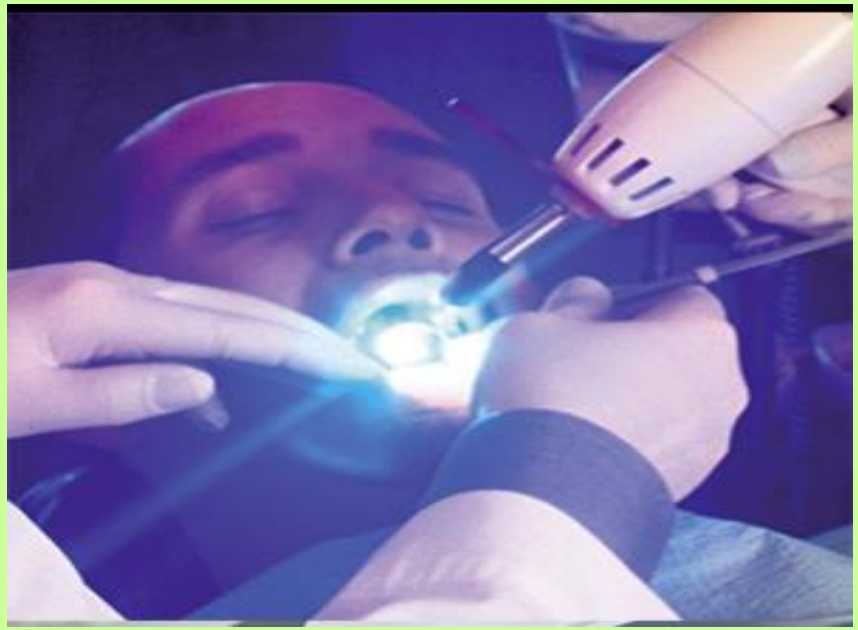
Low back pain is associated with health workers' absenteeism, reduced efficiency, increased economic burden, decreased quality of life, and burnout.

4 Exposure to Radiation

- Ionizing (x-rays, radionuclides) and non-ionizing radiation (UV, lasers) exposure may occur in health-care settings and pose specific risk to the health and safety of health workers.

- The probability of radiation adverse health effects is proportional to the dose received, but **no level of radiation exposure is completely safe.**

- **Exposure to ultraviolet (UV) radiation** can cause skin cancer, skin burn and cataract, while lasers can cause tissue burns, eye damage, fire and explosion and system failures.



5 Psycho-social risks and mental health

Intrinsic demands of the job, individual susceptibility, and poor work organization contributes to increased stress in health workers.

Prolonged job stress may cause **burnout, chronic fatigue**, absenteeism, high staff turnover, reduced patient satisfaction, and increased **diagnosis and treatment errors**.


Is your staff
experiencing
burnout?

6 Violence and Harassment

These are incidents involving work-related abuse, threats or assaults among health workers including **physical**, **sexual**, **verbal** and **psychological abuse** and **workplace harassment**.

Violence and harassment affect all health worker groups and work settings in the health sector.

Up to 62% of health workers have experienced workplace **violence**.

Verbal abuse اساءة (58%) is the most common form of non-physical violence, followed by **threats** تهديد (33%) and **sexual harassment** تحرش (12%).


NO EXCUSE
FOR ABUSE

7 Latex Allergies

Latex is a common component of many medical and dental supplies.

These include disposable gloves, dental dams, airway and intravenous tubing, syringes, stethoscopes, catheters, dressings and bandages.

Latex allergy may cause itchy skin and hives or even anaphylaxis, a potentially life-threatening condition that can cause throat swelling and severe difficulty breathing.

Study results on latex allergy (2016)

The prevalence rates of Latex allergy were:

Healthcare workers – 9.7%

Susceptible patients – 7.2%

General population – 4.3%


LATEX ALLERGY

Security in Health Facilities

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Hospital Emergency Alerts

Hospital Emergency Codes are used in hospitals worldwide to alert staff to various emergencies

The use of codes is intended to **convey essential information** **quickly** and **with minimal misunderstanding** to staff, while preventing stress and panic among visitors to the hospital

Hospital Emergency Alerts

Different codes are present at different health facilities, that's why there are ongoing efforts to unify emergency codes universally.

Adopting code uniformity enables the numerous individuals who work across multiple facilities to respond appropriately to specific emergencies

Hospital Emergency Alerts

These codes may be **posted on placards throughout the hospital**, or printed on employee identification badges for ready reference

خزانة

Hospital Emergency Alerts

Facility Alerts:

- Provide for the safety and security of patients, employees and visitors at all times.

Security Alerts:

- Protect employees, patients and visitors from any situation or person posing a threat to the safety of any individual(s) within the hospital.

Hospital Emergency Alerts

Medical Alerts:

- Provide medical care and support to patients and incident victims while maintaining care and safety of patients, employees and visitors within a health care facility during an emergency event or incident.

Code RED

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Code RED

Staff and personnel should proceed and help patients visitors as **previously trained during drills**

Code BLUE

Adult medical emergency (Cardio-pulmonary arrest)

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Code PINK

Code PURPLE

Infant / Child Abduction

Code PINK

Code BLACK

Bomb / Bomb threat

Code ORANGE

Hazardous materials spill/ Hazmat

CodeZEBRA

Bioterrorism

Code GREY

Violence/Security Alert (Combative Person with no weapon)

Code SILVER

Violence/Security Alert (Combative Person with a weapon)

Code GREEN

Emergency Operations Plan Activation

This code applies to any incident (e.g., **natural disaster**, **mass casualty incident**) emergency operations plan is activated

Code GREEN

Code GREEN

Code YELLOW

Missing Person

Thank You