Chapter Fourteen

Hospital Acquired Infections

(Nosocomial Infections)

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Nosocomial infection

- Is an infection acquired either by patients while they are in hospital, or by members of hospital staff

Source of infection

- The source of the causative infecting organism may be:

Exogenous

1. From another patient or
2. From a member of hospital staff or
3. From the inanimate environment in the hospital

Source of infection

Endogenous

- From the patient's own flora which could be introduced into them by:

1. Surgical operation
2. Instrumental manipulation
3. Nursing procedures

Persons at risk

- Hospital-acquired infections may affect:

1. The discharged
2. In patients
3. Out patients
4. Hospital staff
5. It may also affect the community

Modes of spread

Various methods of spread of nosocomial infections are:-

1. Airborne
2. Contact
3. From food
4. From water
5. From hospital equipment
6. Infections by inoculation

Agents of infection

- Any pathogen present in the hospital environment can cause infection
- Organisms which can survive for long periods in hospital environment and in disinfectants
- The important pathogens capable of causing nosocomial inflection are listed in:-

Table 1: Organisms causing nosocomial infections

Gram positive bacteria	***Staphylococcus aureus***
	Streptococcus pyogenes
	Staphylococcus epidermides
	Streptococcus pneumoniae
	Clostridium difficile
	Clostridium perfringens
	Clostridium tetani
Gram negative bacteria	***Escherichia coli***
	Citrobacter
	Klebsiella
	Serratia
	Enterobacter
	Proteus
	Pseudomonas
	Legionella

Viruses	***Hepatitis B***
	Hepatitis C
	Hepatitis D
	HIV
	Herpes viruses
	Cytomegalovirus
	Influenza virus
	Enteroviruses
Fungi	***Aspegillus***
	Candida albicans
Parasites	***Toxoplasma gondii***
	Entamoeba histolytica
	Pneumocystis carinii
	Cryptosporidium

- ***Escherichia coli*** is one of the most frequently encountered bacteria in UTI
- ***Staphylococcus aureus*** is one of the most important organism in nosocomial infections
- ***Pseudomonas aeruginosa*** can grow in moist conditions with simple nutrients and is resistant to antibiotics
- **Viral infections** are important in neonatal and pediatric patients and immunocompromised patients
- **Fungal infections** are increasing in hospitals because the continues use of broad-spectrum antibiotics and use of immunosuppressive agents

Common types of hospital infections

- These include:-

1. Wound infections
2. Urinary tract infections
3. Respiratory infections
4. Skin infections
5. Bacteremia and Septicemia
6. Gastrointestinal infections

- Wound infections may be due to:
  - *Staphylococcus aureus*
  - *Streptococcus pyogenes*
  - *Pseudomonas aeruginosa*

- Burn is a richer and more persistent source of infection than surgical wound
- Most nosocomial infections of urinary tract are associated with urethral catheterization

- The source of colonizing organisms is generally thought to be the skin of the patient
- Hospital infections are particularly important in geriatric and long-stay facilities and neonatal units

Diagnosis of hospital infections

- Investigation of an outbreak of nosocomial infections require isolation and identification of isolates
- Environmental or employee survey are not recommended
- Monitoring of sterilization and periodical sampling of disinfected equipment is recommended
- Carriers should be detected and treated

Control and prevention

- It is necessary to remember that patients admitted with community acquired infection are relevant to the problem of nosocomial infection
- Various methods which can help in prevention of nosocomial infections are shown in table 2

Table 2: Prevention of nosocomial infections

1. Hand washing
2. Intelligent use of instrumentation
3. limitation of use of antibiotics
4. Prophylactic antibiotics in specific situations for short periods
5. limitations of transfusions
6. Barrier precautions
7. Surveillance
8. Frequent change of intravenous lines

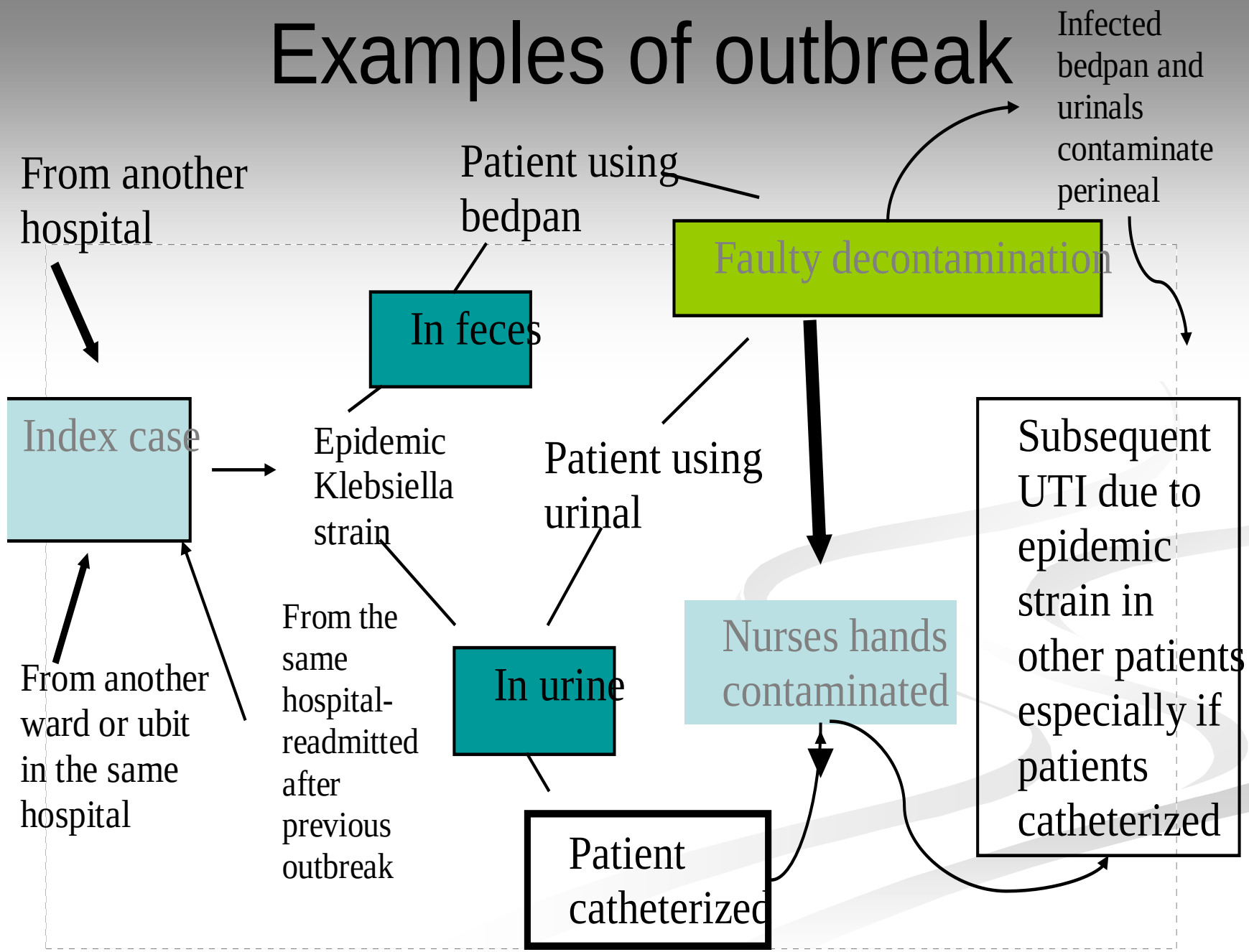
Emerging Pathogens

- Healthcare-associated
  - Methicillin-resistant *Staphylococcus aureus* (MRSA)
  - Methicillin-resistant *Staphylococcus epidermidis* (MRSE)
  - Vancomycin-resistant enterococci (VRE)
  - Vancomycin-intermediate *Staphylococcus aureus* (VISA)
  - Extended-spectrum beta-lactamase (ESBL)-producing Gram-negative organisms
  - Multidrug-resistant *Acinetobacter spp.*
  - Multidrug-resistant TB
- Community
  - HIV
  - Foodborne diseases (e.g., Salmonella spp., Shigella spp., Helicobacter, ?VRE?)
  - Malaria
  - Drug-resistant *Streptococcus pneumoniae*
  - Hepatitis B and C
  - Escherichia coli O157:H7
  - Lyme disease
  - Legionnaires' disease
  - Pathogens of Bioterrorism (e.g., Anthrax, Botulism, Brucellosis)

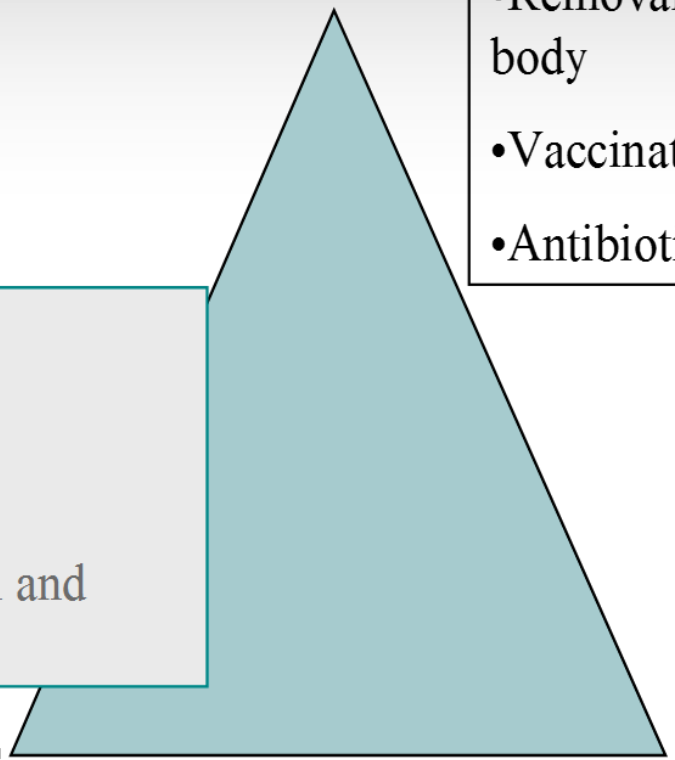
HIP Hospital Infection Program

CDC

Examples of outbreak



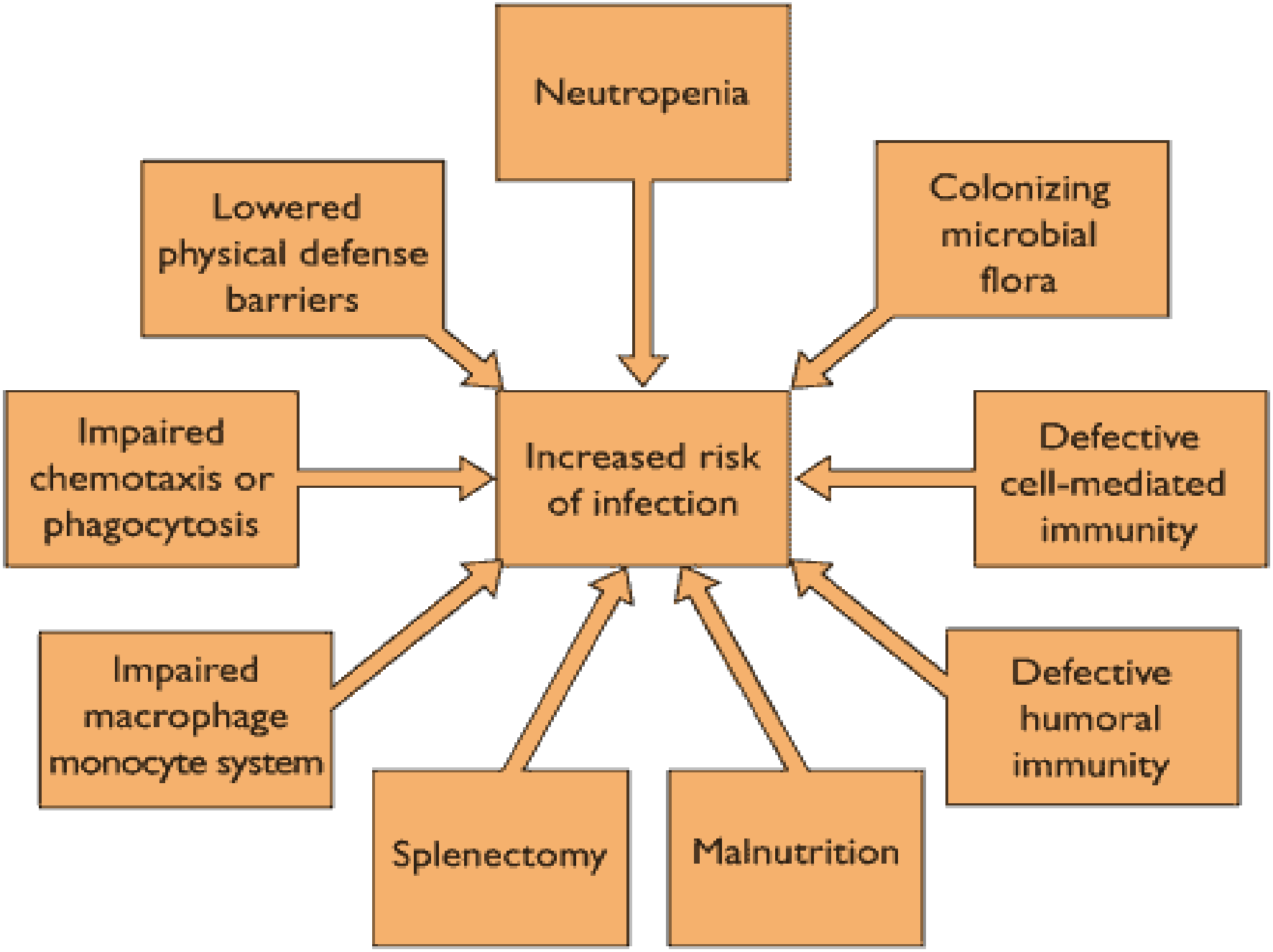
Principles of control of infection



- •Careful handling of tissues
- •Removal of slough and foreign body
- •Vaccination
- •Antibiotic prophylaxis

- •Remove the organisms
- •Treatment
- •Sterelization and disinfection

- •Block the transfer
- •Isolation
- •Aseptic operations
- •No touch dressings
- •handwashings


Neutropenia
Lowered physical defense barriers
Colonizing microbial flora
Impaired chemotaxis or phagocytosis
Increased risk of infection
Defective cell-mediated immunity
Impaired macrophage monocyte system
Splenectomy
Malnutrition
Defective humoral immunity

Thank You

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