Bureau of Microbial Hazards

BMH BDM

Bureau des dangers microbiens

Hospital-acquired Infections…aka…

Nosocomials

Health Canada Santé Canada

Canada

Introduction

Will never be able to eliminate, only minimize

- A hospital-acquired infection is an infection which was not present (or incubating) at the time of admission
- Common in up to 25% of patients administered to hospital
- Most common infections?
  - urinary tract
  - respiratory
  - wound
  - skin
  - soft tissue
  - septicaemia

Preventable versus Non-preventable?

- Preventable = medical or nursing or surgical mishaps
  - bad hand washing, leaving stuff inside patient, coughing all over…
- Non-preventable = stuff you can't control
  - immunodeficient patient, surgeries where organs are seriously damaged, gunshot / stabbing to GI-tract

Where do these things come from?

- Sources for hospital-acquired infections include
  - environment
  - person-2-person (endogenous versus exogenous?)
  - food supply
  - air supply
  - fomites
  - vector Almost anything can carry pathogens
  - water supply

Its hard to tell whether an illness is a nosocomial illness or if the patient had already been infected prior to going to the hospital (because of incubation periods)

Obvious problems…

- While a hospital is supposed to help, medical activities can cause problems
  - intravenous access
  - urinary catheters
  - surgeries

- Three factors play a role in the transmission of a nosocomial infection

Nosocomial infections:

THE CHAIN OF INFECTION

Focus on first two, hard to control third

- **Source**
  - location where microorganisms replicate and disseminate

    There are nurses who just search for pathogen hotspots
- **Route of infection**
  - way by which microorganisms leave source to get to host (us)
- **Host**
  - how susceptible are you? Age? Immune status? Etc…

Control over nosocomials

- Chain of infection (source to host) must be prevented or avoided
- Hospital infection control plans are in place to
  - render source non-infectious
  - prevent microorganisms from leaving source
  - interfere with dissemination routes
  - prevent microorganisms from entering host
- The most efficient step is the identification and detection of the source of infection

Control over nosocomials

- Source
  - what can we do?
- Route
  - what can be done?
- Host
  - what should you do?

Hospital infection control team

- Everyone involved!!!
- Activities include, but are not limited to
  - good clinical practices (separation of infected/non-infected patients)
  - wound and enteric isolation (toilet facilities, basins)
  - respiratory isolation (facemasks, SARS)
  - strict isolation (enclosed isolation units, air systems)
  - protective isolation (patients highly susceptible to infection)
  - typing (serology, phage, molecular)

Be focussed when working!!!!

Universal precaution

- Infection control techniques recommended following the AIDS outbreak in the 1980's
- Every patient is treated as if they are infected and therefore precautions are taken to minimize risk
- Universal precautions are good hygiene habits, such as hand washing and the use of gloves and other barriers, correct sharps handling, and aseptic techniques.

Universal precaution

- Additional precautions are used in addition to universal precautions:
  - Prion diseases (e.g., Creutzfeldt-Jakob disease)
  - Diseases with air-borne transmission (e.g., tuberculosis)
  - Diseases with droplet transmission (e.g., mumps, rubella, influenza, pertussis)
  - Transmission by direct or indirect contact with dried skin (e.g., colonisation with MRSA) or contaminated surfaces

- Universal precautions are recommended not only for doctors, nurses and patients, but for health care support workers. Some support workers, most notably laundry and housekeeping staff, may be required to come into contact with patients or bodily fluids.

Did you notice that,

universal precaution $\not\equiv$ isolation of patient

Infection control in communities

- Social and environmental factors
- Health education
- Food safety
- Vector control
- Immunization (immunoglobulins, vaccination)
- Chemoprophylaxis (e.g., rifampicin/ciprofloxacin for meningococcal contacts)
- Outbreak investigations
- National and international agencies

Cleaning, Sterilization and Disinfection

These terms cannot be used interchangeably!!

Cleaning, Sterilization and Disinfection

- What do we mean by clean?
  - your room?
  - wash your hands?
  - apply some ethanol-based liquid and rub hands until dry?

"Clean" is very subjective

- How clean is clean?
  - removal of soil and dirt visible to the naked eye?

Sterilization is an absolute. There must be no pathogens present for it to be sterile

Cleaning, Sterilization and Disinfection

- There are physical and chemical exist to achieve our objectives

- Physical (three approaches currently used):
  - heat — Most practicle — Time and heat are inversely proportional for steralizing
    - dry (150-200ºC) — Useful when the item cannot get wet. Put it in an oven.
    - moist (pasteurization, boiling, autoclaving, microwaves)
      - Pasteurization is not sterilizing it (does not kill spores) it removes 90-95% of bacteria
      - If it's non-spore forming then boiling would sterilize it, same with microwaves
    - incineration (1000ºC!)
  - radiation
    - gamma (ionizing radiation)
    - ultraviolet (non-ionizing radiation)

Cleaning, Sterilization and Disinfection

- Physical
  - filtration
    Need very small pour size in filters, takes a very long time (not feasible to use if filtering large amount)
    Most useful for air filtration in hospital
- Chemical

What affects a particular disinfectant?

- In order for a disinfectant to be effective, the following must be thought about…
  - concentration of germicide?
  - what is the target?
  - what is the contact time?
  - what is the temperature that I should use product at?
  - load? Organic? Inorganic?
  - miscellaneous factors…

Clean it first then sterilize it?

Who is strongest against disinfectants?

- Interestingly, the resistance against a disinfectant is not necessarily related to how dangerous a microorganism is ☺

Spores/cysts

Mycobacteria

Fungi

Vegetative bacteria

Enveloped viruses

Decreasing order of resistance

To rub or not to rub … that is the question!

- Antiseptics
  - used to inactivate and remove flora (transient, resident) from hands prior to surgical procedures
  - used to inactivate transient and resident flora from site of operation
  - used for treatment and/or prevention of infection on skin surfaces or mucous membranes
- Hand rubs
  - removes transient flora only
  - usually contains 60-70% ethanol…plus emollient(s)

DO YOU KNOW HOW TO WASH YOUR HANDS?