Medical Asepsis Outline Kim Baily RN MSN PhD

- When MO invades the body either
  - Body’s defense mechanism destroys the MO
    - MO resides within body without causing disease
  - Colonization
  - Causes infection/disease
- Pathogen
  - Any MO capable of causing a disease
- Pathogens and Non-pathogens
  - If we are exposed to a pathogenic organism we may or may not become sick. It depends on the health of our immune system.
  - A non pathogenic organism may make us sick if it travels to an area of the body where it does not belong.
- Factors influencing whether infection develops
  - Type and number of MO
  - Characteristics of MO – (Virulence)
  - Ability to enter and survive in host
  - Person’s state of health
- Chain of Infection
  - Infectious Agent
    - Bacteria
    - Virus
    - Fungus
  - Common pathogens – Table 33-1
- Reservoir
  - A place where a pathogen can survive but may or may not multiply.
  - Must provide the right environment for the organism to survive.
    - Oxygen
    - PH
    - Food
    - Light
    - Water
    - Temperature
  - Reservoirs are found in:
    - Human body
    - Animals
    - Food
    - Water
    - Insects
- Portal of Exit
- Name the portals of exit in the human body.
- Portal of Exit
- Modes of Transmission
  - Direct contact – give examples?
  - Indirect contact – give examples?
  - Droplet nuclei – give examples?
  - Airborne – give examples?
  - Vector – give examples?
  - Vehicle – give examples?
• Historically Speaking……
  o 1800’s: Physicians performed autopsies on cadavers and then delivered babies. Mothers frequently died of “labor fever”. Dr. Semmelweis instituted handwashing.
  o Bubonic plague was a highly contagious fever caused by a bacillus.
    ▪ Yersinia Pestis was carried by infected rats and transmitted to man by fleas.
  o In the 1800’s cholera epidemics
    ▪ transported by rivers killed thousands in every city

• Today’s Menacing Microbes
  o IV drug abuse - HCV is the most common chronic blood borne infection in the United States.
  o Long nails, both natural and artificial can facilitate colonization of bacteria on hands by making handwashing less effective.
  o Mad Cow Disease (Bovine spongiform encephalopathy)
  o West Nile Virus is transmitted to people and animals by an infected mosquito.
  o Severe Acute Respiratory Syndrome (SARS) caused by a coronavirus. Caused by direct contact. Possibly caused by indirect contact or airborne or other means yet to be determined.
  o Nursing home residents whose teeth and gums are clean may be less likely to contract and die from pneumonia than residents who don’t get regular oral care.
  o Influenza
    ▪ Sudden onset
    ▪ 101-102 degree fever
    ▪ Muscle aches
    ▪ Severe headache
    ▪ Extreme exhaustion
  o Common Cold
    ▪ Gradual onset
    ▪ Fever rare
    ▪ Mild myalgia
    ▪ Rare headache
    ▪ Rare exhaustion

• Portal of Entry
• Give examples of infection preventing behavior for each link in the chain.
• Susceptible Host
  o These factors increase susceptibility to disease.
    ▪ Poor nutritional status
    ▪ Stress – increases interleukin-6 which increases C-Reactive Protein
    ▪ Heredity
    ▪ Some disease processes
    ▪ Some medical therapies
    ▪ Extremes of age
• Biological Defense Mechanisms
  o Skin and Mucous Membranes
  o Inflammatory Response
  o Immune Response
  o Mononuclear Phagocyte system
• Defense Mechanisms
  o Normal flora “guard their area” and protect from invasions by pathogens.
  o Skin and Mucous Membranes
    ▪ Skin
    ▪ Mouth
    ▪ Respiratory tract
    ▪ Urinary Tract
    ▪ Gastrointestinal tract
    ▪ Vagina

• Inflammatory Response
  o Occurs in response to
    ▪ Mechanical agents
    ▪ Trauma and burns
    ▪ Chemical agents
    ▪ Also heat and cold
    ▪ Ischemia
    ▪ Stroke or heart attack
    ▪ Microorganisms.
  o Classic signs of local inflammation
    ▪ Redness
    ▪ Warmth
    ▪ Swelling
    ▪ Pain
    ▪ If these signs exist, the area is inflamed, but not necessarily infected.
  o Systemic Inflammatory Response
    ▪ Fever…
      ▪ Pyrogens are released by macrophages.
      ▪ This causes an elevated temperature which combats viral replication and
        increases the mobility of leukocytes (enhancing their ability to
        phagocytize).
      ▪ ↑ WBCs
        ▪ Leukopoietins
        ▪ ↑ WBCs >10,000mm³

• WBC with Differential

<table>
<thead>
<tr>
<th>WBC</th>
<th>Can double within hours if needed</th>
<th>Neutrophils</th>
<th>Monocytes</th>
<th>Lymphocytes</th>
<th>Eosinophils</th>
<th>Basophils</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>First responder. Phagocytosis. Lives six hours. Primary component of pus.</td>
<td>55% -70%</td>
<td>2% - 8%</td>
<td>Help produce antibodies for immune response.</td>
<td>1% - 4%</td>
</tr>
<tr>
<td>Neutrophils</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monocytes</td>
<td></td>
<td>2% - 8%</td>
<td></td>
<td></td>
<td>Help produce antibodies for immune response.</td>
<td>20% - 40%</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td></td>
<td>20% - 40%</td>
<td></td>
<td>Help produce antibodies for immune response.</td>
<td>1% - 4%</td>
<td></td>
</tr>
<tr>
<td>Eosinophils</td>
<td>Later stages of inflammation and allergic reaction. Found in skin and airways.</td>
<td>1% - 4%</td>
<td></td>
<td></td>
<td>1% - 4%</td>
<td></td>
</tr>
<tr>
<td>Basophils</td>
<td>Releases heparin to help WBC’s circulate. Increases vessel size and prevents clotting.</td>
<td>0.5% - 1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• **Erythrocyte Sedimentation Rate**
  o Checks how fast the RBC’s settle out of solution.
  o Elevated in the inflammatory process.
    - Men 15 mm/hr
    - Women 20 mm/hr

• **Immune Response**
  o An organism invades...
    - Monocytes migrate from blood to tissues and become macrophages.
    - Macrophages engulf foreign material and process it and present the antigen from the foreign material to the lymphocytes.
      - T lymphocytes effective against virus, protozoa, fungus, cancer and transplanted cells.
      - B lymphocytes effective against bacteria and virus.
  o Antibodies (Immunoglobulins) – proteins produced in response to invasion by a foreign agent (antigen). Antibodies bind to a specific antigen and destroy it.
    - Immunoglobulin M
    - Develops early in course of an infection. Indicates a new infection.
    - Immunoglobulin G
    - Abundant in blood, crosses placenta and creates passive immunity in newborn.

• **Culture and Sensitivity Tests**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Diarrhea</th>
<th>Purulence in the wound</th>
<th>Sore throat</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>12,000</td>
<td>22,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>80%</td>
<td>80%</td>
<td>60%</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>10%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Monocytes</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Basophils</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>ESR</td>
<td>25 mm/hr</td>
<td>25 mm/hr</td>
<td>15 mm/hr</td>
</tr>
<tr>
<td>Stool culture</td>
<td>Psuedomonas</td>
<td>Staph Aureus 4+</td>
<td>Normal Flora only</td>
</tr>
<tr>
<td>Yes/No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• **Medical Asepsis**
  o Procedures which reduce the numbers of organisms and prevent their spread

• **Surgical Asepsis**
  o Procedures which eliminate microorganisms and their spores.

• **Definitions:**
  o Disinfection
  o Immunization
  o Sterilization
  o Antiseptic
  o Germicidal
  o Bacteriostatic
  o Bacteriocidal
• Standard Precautions - Also called Universal Precautions
  o Center for Disease Control (CDC) instituted these in 1988 to decrease health care workers exposure to body fluids.
  o Used for ALL patients.
    ▪ Handwashing and protective barriers are used (as needed).

• Transmission Based Precautions
  o Three categories are delineated by the CDC
    ▪ Airborne Precautions
    ▪ Droplet Precautions
    ▪ Contact
  o Review Borton article
  o Hospitals are slow to change and adopt new wording….. So you will see other older titles.
    ▪ Respiratory isolation
    ▪ Strict
    ▪ Drainage
    ▪ Enteric Isolation

• Leukopenic Precautions - Also called neutropenic precautions.
  o Used for patients who are severely immunocompromised.
  o Usually involves strict handwashing
  o (5 minutes and with betadine in some facilities.)

• Penicillin: The First Miracle Drug
  o In 1928, Alexander Fleming, a Scottish scientist discovered the first antibiotic penicillin

• Superbugs
  o MO resistant to traditional ABO
  o Causes of Antibiotic Resistance
    ▪ Misuse or overuse of antibiotics in humans, animals and agriculture.
    ▪ Demand for antibiotics when antibiotics are not called for.
    ▪ Failure to finish and antibiotic prescription.
    ▪ Availability of antibiotics in some countries without a prescription.
  o MRSA
    ▪ Enters hospital through an infected or colonized patient or a colonized health care worker.
    ▪ Transmission is by direct contact mainly on health care workers hands.
    ▪ Most institutions keep colonized or infected patients isolated until cultures are negative.
    ▪ To break the chain……
      • WASH HANDS before and after care even of gloves are worn.
      • Wash with chlorohexadine soap.
      • MD may order for patient to be washed with chlorohexadine soap.
      • Topical mupirocin used for nasal colonization.
      • Vancomycin used for MRSA infection.
      • Contact isolation instituted in patient room or patients cohorted.
      • Gloves when in room. Gown for direct patient contact.
      • Dedicated equipment.
VRE
- Enters hospital through an infected or colonized patient or a colonized health care worker.
- Transmission is by direct or indirect contact.
- Capable of living for weeks on surfaces.
- Most institutions keep colonized or infected patients isolated until cultures are negative.
- To break the chain:.....
  - WASH HANDS before and after care even if gloves are worn.
  - Wash with chlorohexadine soap.
  - MD may order for patient to be washed with chlorohexadine soap.
  - Weekly surveillance cultures for at risk patients.
  - Contact isolation instituted in patient room or patients cohorted.
  - Gloves when in room. Gown for direct patient contact.
  - Dedicated equipment.
  - Stop all antibiotics and wait for normal flora to repopulate or other antibiotics may be tried.

Clostridium Difficile
- Gram positive spore forming bacteria
- Anaerobic
- Major cause of nosocomial diarrhea
- Clients are at risk whose normal intestinal flora has been disrupted by antibiotic therapy
- Highly resistant to disinfection measures (10% bleach solution is most effective)
- Spread by fecal-oral route by “human vectors”
- Contact with contaminated environment
- Fighting the Infection
  - Alcohol rubs do not kills spores of clostridium difficile. Soap and water is needed.
  - Educate health care workers about how it is spread
  - Gowns and gloves for all contact with colonized or infected patients

Antibiotics
- Antibiotics are prescribed for infections caused by bacteria.
- The common cold and influenza are caused by viruses; thus antibiotics are ineffective.

Other Superbugs
- Streptococcus pneumoniae
- Vancomycin-intermediate/resistant S. Aureus
- Neisseria gonorrhoeae
- E Coli
- Mycobacterium tuberculosis
• Bloom’s Taxonomy (Levels of Questions)
  o Knowledge Question
    ▪ Name the four chambers in the heart.
  o Comprehension Question
    ▪ Identify the flow of blood in a normal heart.
  o Application Question
    ▪ Demonstrate where to place the stethoscope when listening to the mitral valve.
  o Analysis Question
    ▪ Compare and contrast listening to the heart with the bell and with the diaphragm of the stethoscope.
  o Synthesis Question
    ▪ Propose a plan for decreasing nosocomical infection rates in the hospital.
  o Evaluation Question
    ▪ Evaluate the effectiveness of handwashing on nosocomical infection rates in the hospital.

• Sample Test Question

• A nursing intervention that reduces a reservoir in a client is:
  o A. Nurse covering the mouth and nose when coughing
  o B. Nurse wearing disposable gloves
  o C. Nurse isolating the client's personal belongings
  o D. Nurse changing soiled dressings

• Mr. M. has been placed in contact isolation for VRE in a wound. Which of the following measures should be observed when entering the room?
  o A. mask, gown and gloves by all entering the room
  o B. door to the room must remain closed at all times
  o C. gloves worn at all times by all entering the room
  o D. instruct visitors to wear gown, mask and gloves