"Dr. Brugman will text you now..."
Objectives

- Physiology of Aging
- Common Infections
- Myth or Fact?
Predisposition to Infection

- Major cause of mortality in 40% of those 65yo+.
- Older adults are often “sentinel” populations for:
  - New infections: ie. West Nile Virus.
  - Newly more virulent strains: ie. C. diff. colitis.
  - Return of annual epidemics: ie. Influenza.
- Immune senescence.
- Nutritional status: 11% of older adults are malnourished.
Predisposition to Infection

- Anatomic and functional changes.
  - Poorer skin integrity.
  - Impaired cough/gag reflexes
  - Increased gastric pH and decreased GI motility.

- Comorbid conditions.

- Cognitive impairment.

- Exposure to disease: ie. long-term care settings.
Presentation of Infection

- Atypical signs and symptoms, even in severe infection.
- Fever may be absent in 30-50% of frail older adults with serious infections.
- Fever in older nursing-home residents: >2° F over baseline or oral temp >99F or rectal temp >99.5F.
- Other signs and symptoms:
  - Confusion, falling, anorexia, decreased oral intake, exacerbation of underlying illness.
"If I keep bringing diseases home from school, maybe I shouldn't go to school."
Why not just give an antibiotic?

- Interaction with many medications can increase or decreased absorption.
- Drug concentrations can increase or decrease with concomitant medication administration.
- Development of resistant organisms.
- Adherence to prescribed regimens may be limited due to poor cognitive function, impaired hearing or vision, multiple medications, finances.
Common Infections in Older Adults

- Bacterial pneumonia
- Influenza
- Urinary tract infections
- Skin infections
  - Herpes zoster
  - MRSA (Methicillin-Resistant Staph aureus)
  - VRE (Vancomycin-Resistant Enterococcus)
Bacterial pneumonia

- People 65yo+ account for >50% of all cases.
- 2yr-risk for pneumonia for long-term care residents is 30%.
- Mortality is 3-5x higher than in young adults.
Bacterial pneumonia

- Risk factors for mortality from pneumonia:
  - Age > 85
  - Debility
  - Creatinine > 1.5 mg/dL.
  - Hypothermia (less than 36.1°C)
  - Hypotension (SBP < 90)
  - Tachycardia (> 110 beats per minute)
Bacterial pneumonia

- Streptococcus pneumonia
- Moraxella catarrhalis
- Klebsiella species
- Staphylococcus aureus
Bacterial pneumonia
Bacterial pneumonia: Prevention

- Pneumococcal vaccination once after age 65. Or if given before 65, five years after the dose given.
  - Pneumovax is a 23-valent vaccine.
  - Also recommended for adults 19-64yo who smoke cigarettes or have asthma.
- Side effects
  - 50% with minor swelling or soreness at injection site.
  - 1% with muscle pain, serious swelling, fever.
  - Other: Vomiting, headache, weakness.
Vaccination makes a difference

![Graph showing the difference between vaccinated and non-vaccinated individuals over time.](source: HIV Med © 2008 Blackwell Publishing)
Bacterial pneumonia

- Smoking cessation.
- Aggressive treatment of comorbidities.
- Infection control at nursing homes.
Questions?
How infections spread
Influenza

- Caused by:
  - Influenzavirus A
    - Transmission by wild aquatic birds to other species.
    - Subdivided into serotypes based on hemagglutinin and neuraminidase proteins (HxNx).
  - Influenzavirus B
    - Exclusive to humans, but seen in seals/ferrets.
    - Mutates 2-3x slower than type A.
    - Immunity usually acquired at young age.
  - Influenzavirus C
    - Infects humans, dog, pigs.
    - Less common, mild disease.
Influenza

- Peak prevalence in winter.
  - Why?
    - Less Vitamin D?
    - Staying indoors more.
    - Cold temps → dried air → dehydrates mucus → unable to expel virus particles.
    - Viruses live longer at colder temperatures.

- World Health Organization makes recommendations for two difference vaccine formulations in Northern and Southern hemispheres.
Influenza Epidemiology

- 250,000 – 500,000 deaths/yr worldwide.
- Oftentimes new strains spread to humans from animals.

<table>
<thead>
<tr>
<th>Pandemic</th>
<th>Date</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian Flu</td>
<td>1889-1890</td>
<td>1 million</td>
</tr>
<tr>
<td>Spanish Flu (H1N1)</td>
<td>1918-1920</td>
<td>50 million</td>
</tr>
<tr>
<td>Asian Flu (H2N2)</td>
<td>1957-1958</td>
<td>1.5 – 2 million</td>
</tr>
<tr>
<td>Hong Kong Flu (H3N2)</td>
<td>1968-1969</td>
<td>1 million</td>
</tr>
<tr>
<td>Swine Flu (H1N1)</td>
<td>2009-2010</td>
<td>Over 18,209.</td>
</tr>
<tr>
<td>SYMPTOM</td>
<td>COLD</td>
<td>SEASONAL FLU</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>FEVER</td>
<td>Fever is <em>rare.</em></td>
<td>Fever is <em>common.</em></td>
</tr>
<tr>
<td>COUGHING</td>
<td>A hacking, <em>productive</em> (mucus-producing) cough is often present.</td>
<td>A <em>non-productive</em> (dry and hacking/non-mucus producing) cough is often present.</td>
</tr>
<tr>
<td>ACHES</td>
<td>Slight body aches and pains can be present.</td>
<td><em>Moderate</em> body aches are common.</td>
</tr>
<tr>
<td>STUFFY NOSE</td>
<td>Stuffy nose is <em>commonly present</em> with a cold. Typically resolve spontaneously within a week.</td>
<td>A <em>runny nose</em> is <em>commonly present</em>.</td>
</tr>
<tr>
<td>CHILLS</td>
<td>Chills are <em>NOT</em> common.</td>
<td>Chills are <em>mild to moderate.</em></td>
</tr>
<tr>
<td>TIREDNESS</td>
<td>Tiredness tends to be fairly <em>mild.</em></td>
<td>Tiredness is <em>moderate</em> and more likely referred to as a lack of energy.</td>
</tr>
<tr>
<td>SNEEZING</td>
<td>Sneezing is <em>commonly present.</em></td>
<td>Sneezing is <em>commonly present.</em></td>
</tr>
<tr>
<td>SYMPTOM ONSET</td>
<td>Cold symptoms tend to develop over a few days.</td>
<td>Symptoms tend to develop over a few days. Include flushed face, loss of appetite, dizziness and/or vomiting/nausea. Symptoms usually last 4-7 days, depending on the individual. Diarrhea is also common.</td>
</tr>
<tr>
<td>HEADACHE</td>
<td>A headache is <em>NOT</em> common.</td>
<td>A headache is fairly <em>common.</em></td>
</tr>
<tr>
<td>SORE THROAT</td>
<td>Sore throat is <em>commonly present.</em></td>
<td>Sore throat is <em>commonly present.</em></td>
</tr>
<tr>
<td>CHEST DISCOMFORT</td>
<td>Chest discomfort is <em>mild</em> to moderate.</td>
<td>Chest discomfort is <em>moderate.</em> <em>If it turns severe, seek immediate medical attention!</em></td>
</tr>
</tbody>
</table>
Could it be allergies?

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Cold</th>
<th>Flu</th>
<th>Allergies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aches &amp; Pains</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cough</td>
<td>Yes</td>
<td>Yes</td>
<td>Maybe</td>
</tr>
<tr>
<td>Exhaustion</td>
<td>No</td>
<td>Yes</td>
<td>Maybe</td>
</tr>
<tr>
<td>Fatigue, Weakness</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Fever</td>
<td>Maybe</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Headache</td>
<td>No</td>
<td>Yes</td>
<td>Maybe</td>
</tr>
<tr>
<td>Itchy watery eyes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Rash</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sneezing</td>
<td>Yes</td>
<td>Maybe</td>
<td>Yes</td>
</tr>
<tr>
<td>Sore Throat</td>
<td>Yes</td>
<td>Maybe</td>
<td>Maybe</td>
</tr>
<tr>
<td>Stuffy Nose</td>
<td>Yes</td>
<td>Maybe</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Influenza treatment

● Antivirals
  ● Neuraminidase inhibitors
    ● Oseltamivir (Tamiflu), Zanamivir (Relenza)
    ● May be effective against Influenza A and B.
    ● Reduces illness by one day if used within 48hrs of symptom onset.
  ● M2 protein inhibitors
    ● Amantadine and rimantadine.
    ● Sometimes effective against Influenza A.
    ● Resistance increased to 91% in 2005 in recent strains.

● Conservative treatment
Influenza prevention

- Per CDC: All persons 6 months and older should be vaccinated annually in the fall (Sept-October).
  - Seasonal influenza vaccine contains 2 influenza A strains and 1 influenza B strain.
  - Takes two weeks for immunity to develop.
- 3/1/12: FluMist Quadrivalent vaccine approved by FDA.
- Good personal health and hygiene. Wash hands!
- Reduce exposure.
Questions?
The Urinary Tract
Asymptomatic bacteruria

- 15% of women in community and 40% of women in nursing homes have asymptomatic bacteruria.
- Men = approx half the incidence.
- Use of catheters: 87-100% incidence.
- No treatment needed.
Urinary tract infection

- Lower tract: Dysuria, frequency, urgency.
- Upper tract: Fever (but 30-40% lack this!), chills, nausea, flank pain, as well as above symptoms.
- Other symptoms: malodorous or bloody urine, confusion, delirium, fatigue.
- Prophylactic antibiotics NOT recommended due to high incidence of resistant organisms.
- For men, same symptoms and antibiotic use for treatment, but treatment duration is longer.
Urinary tract infection prevention

- Intravaginal or system estrogen replacement to change vaginal flora.
- Decrease fluids that irritate the bladder such as alcohol and caffeine.
- Increase water intake.
- Wear cloth undergarments.
- Cranberry juice—some benefit.
Questions?
What is this?
Herpes zoster (Shingles)

- Painful rash resulting from the reactivation of the chicken pox virus (varicella zoster).
- Lays dormant in a nerve root.
- Risk factors: age, immunosuppression, intrauterine exposure to chickenpox, outbreak of chicken pox younger than 18mos of age.
- Contagious to those who have not had varicella or have not yet received the varicella vaccine.
Herpes zoster (Shingles)

- Approximately 500,000 cases per year.
- Nearly 50% of those who live to age 85 will have shingles at some point in their lives.

Symptoms:
- Fever, fatigue, headache may precede eruption by several days.
- Preherpetic neuralgia: Burning, itching, hypersensitivity or severe pain in a localized dermatome.
Later in life, the virus awakens

Its awakening brings on a migration of the virus to the skin causing shingles. There are about 500,000 cases each year, primarily in the elderly.

**Stage 1**: When the virus awakens, it multiplies and travels toward the skin.

**Stage 2**: The nerve swells as the virus travels through.

**Stage 3**: Bumps form as the virus spreads to the surface.

**Stage 4**: The blistery rash/scabs and heals and the skin clears. In most cases the pain soon subsides.

**Stage 5**: Nerve damage and inflammation can cause a long-lasting painful condition called postherpetic neuralgia.

**Initial Symptoms**
- Flu-like symptoms
- Numbness, tingling, or itchiness followed by a rash
- Pain defined as burning, aching, piercing. The light touch of clothing can be unbearable

**Varicella-zoster virus**

Scarring can result from blistersing.
Herpes zoster (Shingles)

- Most common complication (20%): Postherpetic neuralgia.
  - Pain along the skin (cutaneous nerves) persisting more than 30 days after the lesions have healed.
  - Can become secondarily infected.
  - Incidence of postherpetic neuralgia:

<table>
<thead>
<tr>
<th>Age</th>
<th>At 1 month</th>
<th>At 3 mos</th>
<th>At 1 yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;60yo</td>
<td>8.8%</td>
<td>2%</td>
<td>0.6%</td>
</tr>
<tr>
<td>&gt;60yo</td>
<td>40.8%</td>
<td>13%</td>
<td>7.8%</td>
</tr>
</tbody>
</table>

- Other complications: Paralysis, encephalitis.
Schematic demarcation of dermatomes shown as distinct segments. There is actually considerable overlap between any two adjacent dermatomes.

<table>
<thead>
<tr>
<th>Levels of principal dermatomes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>Clavicles</td>
</tr>
<tr>
<td>C5, 6, 7</td>
<td>Lateral parts of upper limbs</td>
</tr>
<tr>
<td>C8, T1</td>
<td>Medial sides of upper limbs</td>
</tr>
<tr>
<td>C6</td>
<td>Thumb</td>
</tr>
<tr>
<td>C6, 7, 8</td>
<td>Hand</td>
</tr>
<tr>
<td>C8</td>
<td>Ring and little fingers</td>
</tr>
<tr>
<td>T4</td>
<td>Level of nipples</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Levels of principal dermatomes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>T10</td>
<td>Level of umbilicus</td>
</tr>
<tr>
<td>T12</td>
<td>Inguinal or groin regions</td>
</tr>
<tr>
<td>L1, 2, 3, 4</td>
<td>Anterior and inner surfaces of lower limbs</td>
</tr>
<tr>
<td>L1, 2, 3, S1</td>
<td>Foot</td>
</tr>
<tr>
<td>L4</td>
<td>Medial side of great toe</td>
</tr>
<tr>
<td>S1, 2, L5</td>
<td>Posterior and outer surfaces of lower limbs</td>
</tr>
<tr>
<td>S1</td>
<td>Lateral margin of foot and little toe</td>
</tr>
<tr>
<td>S2, 3, 4</td>
<td>Perineum</td>
</tr>
</tbody>
</table>
Herpes zoster (Shingles)

Treatment:

- Antivirals:
  - Acyclovir, famciclovir, valacyclovir.
  - Current studies only see efficacy when given at <72hrs from symptom onset.
  - Efficacy: Hasten healing by 1-2 days.

- Minimal benefit with steroids.
Prevention

- Herpes zoster:
  - Herpes zoster vaccine (Zostavax, 2006):
    - ACIP recommends single dose be given to immunocompetent people 60yo and older.
    - Not all insurance companies pay for it.
    - Shingles Prevention Study: Vaccination reduced incidence of shingles by 51%.
    - 14 times stronger than varicella vaccine.
Prevention

- **Herpes zoster:**
  - Varicella zoster vaccine.
    - No studies known to date if there is a decrease in zoster incidence.

- **Postherpetic neuralgia:**
  - 7-10 days of acyclovir reduces incidence of pain at 1-3 months.
  - Steroids do not prevent postherpetic neuralgia.
  - Amytriptyline initiated within 48hrs of rash onset and continued for 90 days showed 50% decrease in pain prevalence at 6 months.
Questions?
Methicillin-Resistant Staph aureus (MRSA)

- A bacterial strain of Staphylococcus aureus.
- Resistant to penicillins and cephalosporins.
- Not more virulent than Staph aureus strains that have no antibiotic resistance, but it is more difficult to treat.
- Most commonly in the nostrils.
- Also found in respiratory tract, open wounds, catheters, urinary tract.
• Initial presentation: small red bumps that look like pimples, spider bites, boils → become larger and more painful, pus-filled.

• Sometimes accompanied by fever, rash.

• 75% of cases localized to skin and soft tissue.

• Small percentage can spread to organs leading to sepsis, toxic shock syndrome, pneumonia, death.
MRSA

• Risk factors:
  • People with weak immune systems (HIV/AIDS, lupus, cancer patients, transplant recipients, severe asthmatics, etc.)
  • Diabetics
  • IV drug users
  • User of quinolone antibiotics
  • Young children
  • Elderly
  • College students
  • Health care workers
  • Hospital patients
  • Prison inmates.
Treatment

- Sulfa drugs (ie. Bactrim).
- Tetracyclines (ie. Doxycycline).
- Clindamycin
- Vancomycin
Vancomycin-Resistant Enterococcus (VRE)

- Bacterial strains of the genus Enterococcus that are resistant to the antibiotic vancomycin.
- First isolated in Europe in the 1980s.
- Can affect skin, blood, urine, intestines.
- Associated with hospitals.
Prevention

- Screening programs upon hospital admission.
- Sanitation with alcohol.
- Hand washing.
- Surgical masks.
- Proper disposal of gowns, equipment.
- Restricting antibiotic use.
Questions?
Myth or Fact?

DON’T TALK TO ANYONE.
DON’T TOUCH ANYONE.

KATE WINSLET
CONTAGION
COMING SOON
Everyone should take a multivitamin.
Multivitamin Myth

- Should ONLY be considered in people with vitamin deficiency.
  - Alcoholism
  - Malabsorption
  - Vegan diet
  - History of gastric bypass surgery
  - Genetic inborn errors of metabolism
  - Patients on hemodialysis
Multivitamin Myth

- February 2009: Women’s Health Initiative
  - 161,808 postmenopausal women
  - 8yrs after followup.
  - Conclusion: Multivitamin use has little or no influence on the risk of common cancers, cardiovascular disease, or total mortality.

- U.S. Office of Dietary Supplements (2012): “Most research shows that healthy people who take a multivitamin do not have a lower chance of getting any disease…It’s not possible to recommend for or against the use of multivitamins to stay healthier longer.”
Vitamin A

- Vitamin A = Vitamin B (retinol) + carotenoids.
- Two large studies (1994, 1996) showed increased risk of lung cancer with beta-carotene use.
- The excess risk resolved over time when supplement was stopped (2003).
- Nurses’ Health Study (2002): Increase risk of fractures in postmenopausal woman on vitamin A.
Vitamin C

- Seven trials found vitamin C did not affect cold duration or severity.
- 29 studies with 11,000 total participants randomly assigned to take prophylactic vitamin C or placebo. No benefit in preventing upper respiratory infection.
Vitamin E

- Does not prevent respiratory infections. One study (2002) showed longer total illness duration, more symptoms, and higher frequency of fever in elderly people.

- SELECT trial following 35,533 men showed vitamin E supplementation increased risk of prostate cancer. Other trials found no effect.

- No benefit for the prevention of dementia, strokes, macular degeneration, or cataracts.
What IS recommended?

- Vitamin D: 800 units daily.
  - Decreases fracture rate and osteoporosis.
  - Decreases falls by as much as 20%.

- Calcium: 1200mg daily.
  - Calcium citrate, instead of calcium carbonate.

- Vitamin B12: 1000mcg daily.
  - Only if level is low-normal range (<350pg/mL).
Probiotics help your digestive tract stay healthy.
Prebiotics

- Complex sugars (lactulose, lactitol, inulin).
- Fuel for bacteria in the gut to stimulate growth and activity, suppressive growth and activity of harmful organisms.
- Compete with harmful bacteria
- Produce substances that inhibit their growth, ie. Ammonia.
Probiotics

- Live microorganisms “friendly bacteria” in the gut.
- Normal human digestive tract contains 400 types of probiotic bacteria.
- Largest group: lactic acid bacteria, ie. Lactobacillus
- Other foods with probiotics: yogurt, fermented and unfermented milk, miso, tempeh, some juices (black currant juice with probiotic cultures), and soy beverages.
## Indications for Use

<table>
<thead>
<tr>
<th>Indication</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute diarrhea</td>
<td>A (Strong scientific evidence)</td>
</tr>
<tr>
<td>Atopic dermatitis</td>
<td>A</td>
</tr>
<tr>
<td>Cirrhosis</td>
<td>B (Good scientific evidence)</td>
</tr>
<tr>
<td>Dental caries</td>
<td>B</td>
</tr>
<tr>
<td>Growth</td>
<td>B</td>
</tr>
<tr>
<td>Immune enhancement</td>
<td>B</td>
</tr>
<tr>
<td>Irritable bowel syndrome</td>
<td>B</td>
</tr>
<tr>
<td>Acute pancreatitis</td>
<td>B</td>
</tr>
<tr>
<td>Sinusitis</td>
<td>B</td>
</tr>
</tbody>
</table>
Other Uses

- Allergies
- Colon cancer
- Bacterial vaginosis
- Constipation
- Pneumonia
- Ear infections
- Cardiovascular disease
- Urinary tract infection
- Amoebiasis
Regular soap is just as good as alcohol-based disinfectant.
Hand hygiene

• The primary problem is laxity of practice, not a paucity of good products.

• CDC advises use of plain nonantimicrobial soap with water for routine hand washing.

• Alcohol-based hand disinfection is easier to perform and faster than hand washing with soap and water (20 sec vs. 40-80sec).
  • But this does not reduce the incidence of Clostridium difficile colitis (ie. Spore-forming bacteria).
Hand-hygiene technique

When decontaminating hands with an alcohol-based hand rub, apply product to palm of one hand and rub hands together, covering all surfaces of hands and fingers, until hands are dry. Follow the manufacturer’s recommendations regarding the volume of product to use.

When washing hands with soap and water, wet hands first with water, apply an amount of product recommended by the manufacturer to hands, and rub hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers. Rinse hands with water and dry thoroughly with a disposable towel. Use towel to turn off the faucet.

Liquid, bar, leaflet or powdered forms of plain soap are acceptable when washing hands with soap and water. When bar soap is used, small bars of soap and soap racks that facilitate drainage should be used.

Multiple-use cloth towels of the hanging or roll type are not recommended for use in health-care settings.

Cold medicines helps you recover faster.
Cold medicine conundrum

- Antihistamines such as can cause confusion, dry mouth, constipation.

- Moderate to high quality evidence that people over age 65 should avoid the following:
  - Chlorpheniramine (Diabetic tussin, Triaminic, Robitussin)
  - Cyproheptadine
  - Diphenhydramine (Benadryl)
  - Doxylamine (Unisom, Nyquil)
  - Promethazine (Phenergan)
Cold medicine conundrum

- Dextromethorphan can cause confusion, excitement, irritability, nervousness.
- Guaifenesin can cause drowsiness, dizziness, headache, skin rash, diarrhea.
- Avoid combination products.
- Per the American Academy of Family Physicians, a cough does not require treatment and it will self-resolve. Consider only if your cough keeps you up at night or interferes with your daily activities.
Organic foods are healthier for you.
Organic Overload

- **1920s**: Dr. Max Gerson instructed his cancer patients to eat organic fruits and vegetables.
- **1960s**: Several pesticides and fertilizers were found to be toxic.
- **1970s**: Organic certification instituted by some.
- **1990s**: Congress passed the Organic Foods Production Act (OFPA) which required USDA to develop national standards for organic products.
- **2002**: USDA finalized organic definition and inspection program- most stringent in the world.
Organic Overload

- **Organic foods**: Grown without antibiotics, growth hormones, pesticides, synthetic or sewage sludge-based fertilizers. GMO or bioengineered animals and crops NOT included.

- USDA does NOT claim these foods are safer or more nutritious than conventionally produced food. More studies needed.

- “Natural,” “pesticide-free,” “naturally grown,” “free-range,” “hormone-free” are NOT necessarily organic.
In summary

- Practice good hygiene and wash hands thoroughly.
- If you are in the hospital or clinic, be sure all your health care professionals wash their hands.
- Know that antibiotics can help treat bacterial infections, but they do not cure viral infections.
- If you are given an antibiotic, complete the full course to prevent antibiotic-resistant bacteria to develop.
- Eat a well-balanced diet and maintain a routine exercise regimen as much as possible.
And above all...

Stay informed and be an active participant in your healthcare.