Infections in the Elderly
Christine Nutty, Infection Advice Inc
A Webber Training Teleclass

Hosted by Jim Gauthier
www.webbertraining.com

Objectives
Upon completion of this presentation, the participant will:
• Name 3 common infections seen in the elderly
• Describe 3 changes associated with aging which cause the elderly to be more prone to infection
• List 3 symptoms the elderly person may exhibit which may indicate a potential infection

Overview on Elderly Infections
• Aging process – how organs and systems change
• Immunity of the elderly
• Symptoms of infection in elderly
• Common infections
• Risk factors for infection in elderly
• Life expectancy around the world
• Predictions for the future

Biology of Aging: Senescence

The Aging Process

Body changes
• Cardiovascular
• Endocrine
• Gastrointestinal
• Hematopoietic
• Eye
• Immunological
• Kinesthetic Sense
• Musculoskeletal
• Neurological
• Pulmonary
• Skin
• Smell and Taste
• Urinary

Cardiovascular:
• Heart valves and blood vessels become thick and rigid
• Aerobic capacity - decreased oxygen delivery
• Infarcted areas: decreased tolerance for physical activity
• Heart rhythm: arrhythmias, rapid, bundle branch blocks
• Hypertension: hypertrophy, CVAs
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The Aging Process

- **Endocrine**
  - Decreased hormones
  - Decreased efficacy of hormones on target tissues
  - Decreased insulin response to glucose
  - Lack of glucose control affects cellular healing and repair

- **Gastrointestinal**
  - Digestive enzymes
  - Intestinal motility
  - Normal intestinal flora
  - Mucous production
  - Swallowing disorders
  - Scarring from surgeries
  - Dietary changes
  - Constipation

- **Hematopoietic**
  - Decreasing marrow activity
  - Decreasing formation of red blood cells
  - Anemia

- **Eye**
  - Decreased tears
  - Decreased lysozymes
  - Decreased blink reflexes (e.g., CVA, Bell’s Palsey)
  - Scarring from injury or surgeries
  - Diseases – syphilis, cataracts, glaucoma

- **Kinesthetic Senses**
  - Receptors in joints/muscles lose ability to function and control balance
  - Falls occur more frequently

- **Musculoskeletal**
  - Decreasing muscle mass
  - Energy and endurance
  - Bone density
  - Thickness and resiliency of cartilage
  - Erosion on articular surfaces (osteoarthritis)
  - Scars from surgery or trauma
  - Stress from obesity or malnutrition
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The Role of Muscles in Infection

“Reservoirs of metabolic fuels”
- Glycogen Depleted
- Amino acids are released – required for
  - New white cells
  - Antimicrobial proteins
  - Immune proteins (cytokines)
  - Immunoglobulins (antibodies)
  - Molecules for tissue healing
  - Antioxidant molecules to handle free radical stress (glutathione)

M. Schmidt (2009); Beyond Antibiotics: Strategies for Living in a World ...

Muscle Facts

- Loss of 10% lean body mass results in decreased immune function - strongly linked to survival
- Contain toll-like receptors – recognize bacteria and release cytokines that shut down muscle protein synthesis

M. Schmidt (2009); Beyond Antibiotics: Strategies for Living in a World ...

Muscle Facts

- 50% of women over 65 who break a hip never walk again
- Muscle mass of young healthy male = 77-110 lbs (35-50 kg.)
- Elderly female less than 30 lbs (14 kg.)
- Muscle represents 40% of body weight but 50-75% of all body protein

M. Schmidt (2009); Beyond Antibiotics: Strategies for Living in a World ...

The Aging Process

- Neurological
  - Gradual loss of neurons – cognitive impairment
  - Cerebral Vascular Accidents:
    - Thromboembolic
    - Hemorrhagic
    - Residual damage
  - Dementia (50% have inf.)
  - Parkinson’s
  - Alzheimer’s
  - Depression, psychological disorders

Image: Encyclopedia Britannica 2006

The Aging Process

- Pulmonary
  - Weakening intercostal muscles
  - Decreasing PO2
  - Decrease mucous and foreign material clearance due to decreases in ciliary transport system
  - Decreased gag reflex – increased aspiration
  - Increased esophageal reflux
  - Underlying diseases-seizure, CV, malignancy, or Cardiopulmonary

Image: Cancer.About.com

The Aging Process

- Skin
  - Thinning of layers – decreased barrier protection from injury
  - Fewer sweat glands/ thermoregulation of heat
  - Decreased sebaceous glands
  - Decreased elasticity
  - Impaired cell-mediated immune response

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The Aging Process

- Smell and Taste
  - Decreased senses making food less appealing, decreased appetite, weight loss
  - Loss of taste buds:
    - sweet and salty tastes first
    - bitter and sour remain longer

- Urinary
  - Decreased renal function
  - Loss of muscle strength necessary for urination
  - Bladder obstructions
    - Benign Prostatic Hypertrophy
    - Prostate Cancer
    - Bladder tumors
    - Lack of sphincter control

The Aging Process

- Immunological
  - Atrophy of thymus affects T cell lymphocyte function
  - Decreased antibody production caused by activity of:
    - T cell helper
    - B cell function

Characteristics: Immunity of the Elderly

Diseases – no vaccination or not immune
- Diphtheria
- Tetanus
- Poliomyelitis
- Hepatitis A
- Hepatitis B
- Influenza
- TB

Elderly more at risk for Malaria,
Elderly should not receive Yellow fever vaccine

Characteristics: symptoms of infection

<table>
<thead>
<tr>
<th>Normal</th>
<th>Elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Poor temperature response</td>
</tr>
<tr>
<td>Chills</td>
<td>Confusion</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Decreased appetite</td>
</tr>
<tr>
<td>Leukocytosis</td>
<td>Incontinence</td>
</tr>
<tr>
<td></td>
<td>Change in ability to perform AODL</td>
</tr>
<tr>
<td></td>
<td>Pain description altered</td>
</tr>
<tr>
<td></td>
<td>Increased Resp. rate</td>
</tr>
<tr>
<td></td>
<td>Falls</td>
</tr>
<tr>
<td></td>
<td>Weight loss</td>
</tr>
</tbody>
</table>

Effect of Fever

- Elderly fever response may be lacking or inappropriate
- Low grade or moderate fevers (up to 101°F or 38°C)
  may have beneficial effect
- High fevers may be sign of overwhelming infection
  (over 101°F or 38°C)
- Hypothermia associated with higher rates of surgical site infections

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Cascade of Effects

Common Infections of the Elderly
Infectious diseases account for 1/3 of all deaths in people 65 years and older.
- Pneumonia
- Influenza, RSV
- Skin – Zoster, MRSA, VRE
- Urinary Tract Infections
- Sepsis
- Death due to seasonal flu – 80-90% are elderly

Risk Factors for Infections in Elderly
- Implantable devices – invasive devices
- Multiple medications
- Mental changes
- Healthcare contacts
- Long term care stays — 15% have infections at any time
- Comorbid diseases
- Lack of febrile responses
- Decreased mobility

Risk Factors for Infections in Elderly
- Altered Pharmacokinetics of antimicrobials
- Atypical presentation leading to delayed diagnosis & treatment
- Environment/Trauma
- Genetics
- Malnutrition
- Reduced immune response

Life Expectancy Around the World
To understand the elderly around the world:
- Life expectancy
- Health care
- Common diseases
- Living conditions

Percent of Population Over 65
Regions with % over 65 years of age:
- Australia 13.5%
- Asia 2 - 9% (Japan 22%)
- Russia 14%
- Middle East 2.5 - 10%
- North Atlantic 13 - 20% (Ger & It 20%)
- North Am. 13 - 15%
- Central Am. 4 - 11%
- South Am 4 - 11%
- Africa 0.9 – 5% (UAE 0.9%)

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Life Expectancy
- Australia
- Asia
- Russia
- Middle East
- North Atlantic
- North America
- Central America
- South America
- Africa

Australia & New Zealand
- Life expectancy 80-82 years
- Infectious disease risk low

ASIA
- Life Expectancy 45-86 years
  - Shortest: Afghanistan 45 yrs.
  - Longest: Israel females 83 years.
  - Japan females 86 years
- Infectious Disease Risk: High to Very High
  - Food/Water-Bact diarrhea, Hep A & E, Typhoid fever, Leptospirosis
  - Vector-Dengue fever, Chikungunya, Malaria, Japanese encephalitis

Russia
- Life Expectancy:
  - Males 60 years
  - Females 73 years
- Infectious Diseases Risk
  - Intermed:
    - F/W-Bacterial diarrhea
    - V-Tickborne encephalitis

Middle East
- Life Expect: 70-81 years
- Infectious Diseases Risk
  - Low – Intermed (Iran & Iraq only)
  - F/W-Bacterial diarrhea, Hep A,
    Typhoid fever
  - V-Crimean Congo hemorrhagic
    fever (Iran), Malaria (Iran)

North Atlantic Countries
- Life Expectancy: 73 – 81 years
- Infectious Diseases Risk
  - Low-Intermed:
    - F/W-Bact diarrhea, Hep A
    - V-Tickborne encephalitis

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North America

Life Expectancy 78-81 years
Infectious Disease Risk Low

Central America

Life Expectancy 70-71 years
Infectious Disease Risk: Intermed with High in Guatemala
Infectious Diseases: F/W-Bacterial diarrhea, Hep A, Typhoid fever, Leptospirosis V-Dengue fever, Malaria

South America

Life Expectancy 67-77 years
Major infectious disease risk = Intermed to Very High
F/W Bacterial diarrhea, Hep A, Typhoid fever, Leptospirosis V Dengue fever, Malaria, Yellow fever

AFRICA

Infectious Diseases Risk: Intermed to Very High
F/W-Bacterial & Protoz. diarrhea, Hep A & E, Typhoid fever, Schistosomiasis V-Malaria, Dengue fever, Plague, African trypanosomiasis, Yellow fever, Rift Valley fever, Chikungunya Animal-Rabies Resp-Meningococcal Meningitis, TB

Life Expectancy 38-76 years

Countries with Highest HIV/AIDS Risk

Highest HIV Prevalence:
- Botswana 23.9%
- South Africa 18%
- Zimbabwe 15.3%
- Zambia 15.2%

People Living With AIDS
- South Africa 5.7 Mil, 49 Million
- Nigeria 2.6 Mil, 149 Million

Deaths due to AIDS

- South Africa 350,000
- India 310,000
- Nigeria 170,000
- Kenya 150,000
- Zimbabwe 140,000
- Congo 100,000
- Tanzania 96,000
- Ethiopia 67,000
- Zambia 56,000

- Russia 40,000
- China 39,000
- Cameroon 39,000
- Thailand 30,000
- Burma 25,000
- Sudan 25,000
- Vietnam 24,000
- US 22,000
- Ukraine 19,000
- Brazil 15,000

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Future Predictions and Implications

Speculated Population Growth in Persons Over 60

<table>
<thead>
<tr>
<th>Major area</th>
<th>Population in Millions ≥60</th>
<th>% over 60</th>
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<tbody>
<tr>
<td>Year</td>
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<td>2000</td>
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<tr>
<td>World</td>
<td>205</td>
<td>606</td>
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<tr>
<td>Developed regions</td>
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<td>Europe</td>
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<td>147</td>
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<tr>
<td>Latin Am/Carib</td>
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<td>41</td>
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<td>N. America</td>
<td>21</td>
<td>51</td>
</tr>
<tr>
<td>Oceania</td>
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</tbody>
</table>

United Nations 2003

Numbers of Elderly

<table>
<thead>
<tr>
<th>Population in Millions of Elderly ≥80</th>
<th>1950</th>
<th>2000</th>
<th>2050</th>
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</thead>
<tbody>
<tr>
<td>World</td>
<td>14</td>
<td>69</td>
<td>377</td>
</tr>
<tr>
<td>Developed regions</td>
<td>9</td>
<td>37</td>
<td>113</td>
</tr>
<tr>
<td>Less developed regions</td>
<td>5</td>
<td>32</td>
<td>265</td>
</tr>
<tr>
<td>Africa</td>
<td>1</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Asia</td>
<td>6</td>
<td>29</td>
<td>224</td>
</tr>
<tr>
<td>Europe</td>
<td>6</td>
<td>21</td>
<td>60</td>
</tr>
<tr>
<td>Latin Am/Carib</td>
<td>1</td>
<td>5</td>
<td>38</td>
</tr>
<tr>
<td>N. America</td>
<td>2</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>Oceania</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

United Nations 2003

Characteristics: Elderly Well-being

**UN report showed:**
1. Co-residence with children [over 25]... was associated with relatively high levels of material well-being in most developing countries.

2. In the poorest countries, older persons living alone tend to constitute an especially disadvantaged group—the poorest of the poor.


Characteristics of Elderly: Elderly persons who live alone:

Less Developed Regions
- Alone
- With children/grand
- Other relatives
- With spouse

Developed Regions
- Alone
- With children/grand
- Other relatives
- With spouse


Characteristics of Elderly Who Live Alone


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Elderly Alone

- 1 out of every 7 elderly – live alone
  - 60 Mil are women
  - 30 Mil are men
- 19% of older women live alone
- 8% of older men live alone

So What Does All This Mean?

The elderly population have special risks related to infectious diseases.
The elderly population is going to increase in proportion to other age groups.
More and more will be alone or homeless.

Living Arrangements of Older Persons Around the World
(2005) United Nations

Homeless and Elderly

This is Lou—His teeth look like the jagged remnants of an old cemetery. His nose, he says, has been broken so badly and so often that the nasal passages have collapsed. He runs a bony finger from his nose’s bridge to the tip. It serves only decorative purposes now, he says.

What should we do next?

- Look at our own countries and those less developed.
- Analyze risk issues related to the elderly
- Make sure that your actions and decisions take into account the special needs of the elderly.
- Think about the future
  - Shelter
  - Food
  - Safety
  - Healthcare & Medicine

San Francisco Chronicle Sept 3, 2004

Thank you!

THE NEXT FEW TELECLASSES

<table>
<thead>
<tr>
<th>Date</th>
<th>Title</th>
<th>Speaker/Institution</th>
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<tbody>
<tr>
<td>01 Apr 10</td>
<td>Microbial Control of Electronic Medical Equipment</td>
<td>Dr. Charles John Palecek, Indiana University School of Dentistry</td>
</tr>
<tr>
<td>08 Apr 10</td>
<td>Simple Precautions – Simplifying Infection Control</td>
<td>Dr. Jim Hutchinson, Health Care Corporation of St. John's</td>
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<tr>
<td>13 Apr 10</td>
<td>Improvement in Healthcare Settings Around the World and the “SAVE LIVES: Clean Your Hands” Iniative</td>
<td>Dr. Claire Kilpatrick, World Health Organization</td>
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<tr>
<td>15 Apr 10</td>
<td>HPV Infection and Newer Vaccines: An Update</td>
<td>Dr. Sotiris Tsiodras, University of Athens Medical School, Greece</td>
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<tr>
<td>20 Apr 10</td>
<td>Voices of the IPS</td>
<td>Dr. Infection Prevention Society Board Members &amp; Guests</td>
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<tr>
<td>21 Apr 10</td>
<td>(South Pacific Teleclass) MRSA – The Patient Experience</td>
<td>Dr. Ruth Barnett, New Zealand</td>
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<tr>
<td>22 Apr 10</td>
<td>Influenza in the Hospital – Who Gets it From Whom</td>
<td>Dr. Ruth Barnett, North Shore Long Island Hospital Systems</td>
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</tbody>
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