Outline

• Definition of HIV
• Epidemiology
• Symptoms
• Complications
• Diagnosis
• Tests and Evaluations
• Treatments
• Medications
  – Effects of medications on exercise
• Exercise Effects
  – Disease ability to exercise
  – Of exercise training
• Exercise Testing
• Exercise Prescription
Definition of HIV/AIDS

• AIDS is a chronic disease caused by the human immunodeficiency virus (HIV). HIV damages the immune system and interferes with the body’s ability to fight infections and diseases. It is also defined when people have less than 200 CD4+ cells per microliter of blood.

• HIV causes AIDS by depleting CD4+ T helper lymphocytes. This weakens the immune system and allows infections in. T lymphocytes are crucial to the immune response and without these cells, the body can’t fight infections or cancerous cells.

http://www.youtube.com/watch?v=eOCKOcbr0Os&feature=related
## HIV/AIDS Stages

<table>
<thead>
<tr>
<th>Primary HIV Infection</th>
<th>Clinical Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td>Moderate unexplained weight loss</td>
</tr>
<tr>
<td>Acute retroviral syndrome</td>
<td>(&lt;10% of presumed or measured body weight)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical Stage 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
</tr>
<tr>
<td>Persistent generalized lymphadenopathy (PGL)-painless enlarged lymph nodes</td>
</tr>
<tr>
<td>Herpes zoster</td>
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<tr>
<td>Fungal nail infections of fingers</td>
</tr>
</tbody>
</table>
HIV/AIDS Stages

Clinical Stage 3
Severe weight loss
Chronic diarrhea for longer than 1 month
Persistent fever
Bacterial Infections
Unexplained anemia (<8 g/dl) for more than 1 month

Clinical Stage 4
HIV wasting syndrome
Pneumocytosis pneumonia
Chronic Herpes Simplex Infection
Lymphoma
AIDS
Epidemiology

• By the end of 2007, about 40 million people had HIV/AIDS worldwide.

• In less developed countries, AIDS epidemic has resulted in a drop in life expectancies from 60 years to just 40 years.

• 2/3 of the world’s AIDS population lives in Sub-Saharan Africa.

• In Washington, D.C., 1 in 30 adults are HIV infected.
Epidemiology

• In the United States, 1.2 million people live with HIV infection and 1 in 5 people are unaware of their infection.

• African Americans have some of the highest number of HIV in the world, particularly young males.

• In 2009, about 42,000 people were diagnosed with HIV in the 40 states with confidential name-based HIV infection reporting since 2006. In that same year, about 34,2000 people in the United States were diagnosed with AIDS. Since the epidemic began, about 1.1 million people in the United States have been diagnosed with AIDS.
Symptoms

- May be asymptomatic for anywhere from a few months to ten or more years during which CD4+ and T4 cells continue to be destroyed
- Flu-like symptoms (fever, headache, fatigue, enlarged lymph glands)
- Lack of energy and weight loss
- Frequent fevers and sweats
- Short-term memory loss
- Mouth, genital, or anal sores from herpes
- Seizures and lack of coordination
- Severe and persistent diarrhea
- Vision loss
- Coma
Complications

• Prone to develop cancers such as cervical cancer, Kaposi Sarcoma, and lymphomas- Kaposi Sarcoma causes round, brown, reddish, or purple spots that develop in the skin or mouth
• AIDS is complicated in itself because of how complex it is. The stages vary in each person and the symptoms are asymptomatic and symptomatic. One thing to remember is to focus on the individual and prescribing exercise based on their needs and abilities, not on the disease as a whole.
Lab Diagnosis

• HIV is diagnosed by the presence of circulating antibodies against HIV. Patients may or may not be asymptomatic.

• HIV becomes diagnosed as AIDS when the CD4+ T-cell counts are at or below 200 cells/mm$^3$ in addition to symptomatic manifestations (night sweats, extreme weight loss, cancers, wasting syndrome, recurrent fevers). Normal values are 800-1,000 cells/mm$^3$ in.
Tests

• HIV Test
  – Tests antibodies to HIV or genetic material of HIV in the blood. It determines whether the blood is HIV-positive.
  – ELISA (Enzyme-linked immunosorbent assay) is usually the first test used to find HIV infection. If antibodies to HIV are positive, the test will be repeated to confirm the diagnosis. If the results are negative, no other tests are usually needed. If a person is recently infected, this test has a high accuracy rate.
  – Western Blot is done after the ELISA to confirm the results of that test.
  – Polymerase Chain Reaction (PCR) finds HIV virus RNA or DNA in the white blood cells that are infected. It’s not as common as antibody tests because it requires technical skills and expensive equipment. It can be done a day after exposure up to a few weeks after exposure to the virus and is useful to find recent infections.

• Testing is often done at 6 weeks, 3 months, and 6 months after exposure to find out if a person is infected with HIV.
Tests Continued

• HIV Viral Load Test
  – Measures the amount of HIV virus in the blood (how quickly it’s spreading)
  – Patients with a higher viral load are more likely to get sick or die of AIDS than patients with a lower viral load.

• CD4 Cell Count
  – Gives the number of CD4 cells in the blood which assesses the healthiness of the immune system (lower the number, the less healthy the system is)
Evaluations

• HAT-QoL Instrument
  – HIV AIDS Targeted Quality of Life Instrument asks 2 types of questions
    • Questions about job/routine daily activities
    • Questions that ask about doctor

• HIV/AIDS Evaluation
  – Different areas of wellness that patients fill in with their responses
Treatment

• Drugs from three or more of the categories listed is known as the highly active antiretroviral therapy (HAART)
• Combine drug treatment with an exercise regimen and nutritional interventions for the most effective results
Medications

• Protease Inhibitors inhibit viral protease
  – Ritonavir

• Nucleotide Reverse transcriptase Inhibitors (NRTI) and Non- Nucleotide Reverse transcriptase Inhibitors (non-NRTIs) work at different stages of the retroviral replication process to inhibit the conversion of HIV RNA to DNA
  – NRTIs- Tenofovir
  – Non-NRTIs- Nevirapine and Delavirdine
Medications

• Fusion Inhibitors inhibit HIV virus from attaching to targeted cells, which inhibit infection
  – T20 (Fuzeon) comes as a powder that must be mixed with sterile water. It’s injected twice a day subcutaneously.

• Integrase inhibitors that prevent HIV from integrating its genetic material into the infected cell’s DNA
  – Raltegravir
## Medication Side Effects

<table>
<thead>
<tr>
<th>Medication</th>
<th>What It Does</th>
<th>Side Effects (Exercise Response)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saquinavir (Often used with Ritonavir)</td>
<td>Inhibit viral protease</td>
<td>Diarrhea, nausea, vomiting, stomach pain, and fatigue; Body fat in upper back and stomach may increase and decrease in the arms and legs</td>
</tr>
<tr>
<td>Tenofovir</td>
<td>Helps to decrease the amount of HIV in the body and assist the immune system to work better</td>
<td>Liver problems, lactic acidosis, vomiting, weakness, cold skin, and muscle pain (occur more in women and obese patients)</td>
</tr>
<tr>
<td>T20 (Fuzeon)</td>
<td>Block’s HIV’s ability to infect healthy immune cells</td>
<td>Pain, redness, itching, bruising, hardened skin, or bumps at the injection site. These may last up to 7 days.</td>
</tr>
<tr>
<td>Raltegravir (first approved integrase inhibitor in 2007)</td>
<td>Inhibits HIV from integrating genetic material into the infected cell’s DNA. usually prescribed to patients who have tried other medications that didn’t work well</td>
<td>Headaches</td>
</tr>
</tbody>
</table>
General Medication Side Effects

• HAART therapies can cause all of the following:
  – Hyperglycemia
  – Diabetes
  – Hyperlipidemia
  – Lipodystrophy
Effects of Exercise: On Ability To Exercise

• GXTs are typically shorter (poor functional capacity) because fatigue and exhaustion end them

• Asymptomatic
  – Possibly reduced exercise capacity due to sedentary lifestyle

• Symptomatic
  – Less time on treadmill and bike, reduced VO$_{2peak}$ and ventilatory threshold
Ability to Exercise: AIDS

• AIDS
  – Dramatically reduced time on the treadmill or bike and VO2peak.
  – Possible failure to reach ventilatory threshold
  – Potential abnormal neuroendocrine responses at moderate- and high intensity test stages
Effects of Exercise Training

• Acute
  – Enhanced immune function

• Chronic
  – Increased CD4 + T-cell count
  – Enhanced immune function (particularly in asymptomatic patients)
  – Enhanced functional capacity, cardiovascular and muscular endurance, and general well-being
  – Progressive resistance training programs increase lean tissue mass and improve strength in both patients with and without muscle wasting
  – Increased cardiopulmonary fitness and improved psychological health
Exercise Testing

• Does not differ much from testing for apparently healthy populations

• Cardiorespiratory Testing
  – Most test either peak or VO$_{2\text{max}}$ at a submaximal level
  – Modified Bruce protocol, submaximal cycle ergometer test (YMCA), 1.5 mile run, all work for these patients

• Muscular Fitness Testing
  – 3 RM, 6RM, or 10 RM tests more appropriate than 1RM tests
  – May need to test on multiple occasions because of general deconditioning and inexperience of patients
Exercise Prescription

• All HIV-infected individuals should get medical clearance before starting an exercise program.

• Continually monitor the general health of the HIV infected exercise participant. Report increased feelings of tiredness or exhaustion, changes in lower GI function, shortness of breath, or increased effort in daily activities.
Exercise Prescription Continued

• The initial recommendations are lower than the ACSM recommendations, but the goal is to meet the ACSM recommendations for aerobic and resistance exercise.
• Aerobic should start at lower volumes and progress at slow rates. Resistance programs should take into the account the disease and medication limitations but should adhere to the ACSM guidelines.
• Participants should choose resistance exercises that are comfortable and provide pain-free ROM and progression.
# Exercise Prescription

<table>
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<tr>
<th>Modes</th>
<th>Goals</th>
<th>Intensity/Frequency/Duration</th>
<th>Progression</th>
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<tbody>
<tr>
<td><strong>Aerobic</strong></td>
<td>Increase/maintain cardiovascular function</td>
<td>• 40-60% VO$_2$R or HRR&lt;br&gt;• 3-4 days/week&lt;br&gt;• 30-60 min/session</td>
<td>• Increasing frequency, duration, intensity.&lt;br&gt;• Severe HIV/AIDS and presence of comorbidities may require restriction on intensity range.</td>
</tr>
<tr>
<td>Cycling</td>
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<tr>
<td>Walking/jogging</td>
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<td>Swimming</td>
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<td>Rowing</td>
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<tr>
<td><strong>Strength</strong></td>
<td></td>
<td>• 2-3 days/week&lt;br&gt;• 2 sets of 8-10 reps&lt;br&gt;• 10-12 separate exercises targeting major muscles groups&lt;br&gt;~60% 1RM</td>
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<tr>
<td>Free Weights</td>
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<tr>
<td>Isotonic Machines</td>
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<tr>
<td><strong>Flexibility</strong></td>
<td>Increase/maintain ROM</td>
<td>• Perform after each session&lt;br&gt;• Hold 15-30 seconds, stretch to point of tightness, avoid discomfort</td>
<td>ROM will increase over time.</td>
</tr>
</tbody>
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Summary

• HIV/AIDS is a complex chronic disease that has many stages and symptoms.
• HIV can be asymptomatic and symptomatic.
• HIV is diagnosed as AIDS when the CD4+ T-cell counts are at or below 200 cells/mm$^3$ in addition to symptomatic manifestations.
• There are many tests a patient can get done to be tested for HIV.
• HAART is a medical therapy used on HIV patients that is a combination of drugs.
• HIV patients can be tested similarly to the general public depending on the patient.
• Exercise Prescription for HIV patients should focus on aerobic, strength, and flexibility exercises.
References

- Healthsquare.com