The University of Toledo
Center for Successful Aging,
Department of Public Health & Preventive Medicine,
Center for Continuing Medical Education
& the Ohio Geriatric Medicine Society, (OGS)

Present the:

17TH ANNUAL
GERIATRIC MEDICINE
SYMPOSIUM:
Health, Wellness and Aging with Disabilities or Chronic Illness

Friday, March 1, 2013
8:00 a.m. - 4:15 p.m.

Hilton Garden Inn
Perrysburg, Ohio
ACKNOWLEDGEMENT
We gratefully acknowledge the following organizations for their support:

A Special “Thanks” to Kingston Residence for sponsoring the programs Continental Breakfast

Please be sure to visit the exhibitor booths.

Avanir Pharmaceuticals
Boehringer ~ Ingelheim Pharmaceuticals
Cubist Pharmaceuticals
Pfizer, Inc.
Sanofi Pharmaceuticals
Americare Health Services, LLC
Comfort Keepers
HCR ManorCare
HCF Management, Inc.
Heritage Health Care Services
Hospice of Northwestern Ohio/Alleva™
Interim Healthcare of Northwestern Ohio, Inc.
Ohioan HealthCare
Orchard Villa
Otterbein Portage Valley
Otterbein North Shore
ProMedica-St. Luke’s Hospital Geriatric Center & Geriatric Fellowship Program
Equality Toledo
Guardian Medical Monitoring, Inc.
HCR ManorCare ~ Heartland
Job1USA - Nursing
Odyssey Hospice ~ a Gentiva Company
Otterbein Skill Nursing and Rehab
The Ability Center of Greater Toledo
The Laurels of Toledo, LLC
The Waterford at Levis Commons
PLANNING COMMITTEE

A special thanks to the members of our planning committee listed below who contributed their time and effort to ensure the success of this program:

Victoria Steiner, Ph.D.
Symposium Director
Public Health and Preventive Medicine
Center for Successful Aging

Barbaranne J. Benjamin, Ph.D.
College of Health Sciences

Barbara Hicks, M.S.N., R.N.
UT Nursing Alumnus

Cletus Iwuagwu, M.D.
Geriatric Medicine

Lisa Keaton, M.S.W., L.S.W.
Neurology

Barbara Kopp Miller, Ph.D.
College of Health Sciences
Center for Successful Aging

Deborah Mattin, Ph.D, MBA, MSN, RN
College of Nursing

Michelle M. Masterson, P.T., Ph.D.
College of Health Sciences, Rehabilitation Sciences Department

Angele McGrady, Ph.D., M.Ed., L.P.C.C.
Psychiatry

A. John McSweeny, J.D., Ph.D., A.B.P.P. (CN)
Psychiatry & Neurology

Barbara J. Messinger-Rapport, M.D., Ph.D., F.A.C.P., C.M.D.
Cleveland Clinic Geriatric Medicine

Elizabeth Russell, B.S.
Continuing Medical Education

Gregory Siegel, J.D., R.Ph. C.G.P.
Pharmacy Services

Mark Weiner, D.O.
Family Medicine

Natalie L. Walkup, MPAS, PA-C
College of Medicine, Physician Assistant Department
GUEST FACULTY

Rick Black, P.T., D.P.T., M.S., G.C.S.
HCR ManorCare
Toledo, OH

Robert Brandt, Jr., M.D.
Wright State Physicians Family Practice
Dayton, OH

Thomas H. Gross, M.D.
Veterans Administration
Toledo, OH

Gregory Nemunaitis, M.D.
MetroHealth Medical Center
Cleveland, OH

Carl V. Tyler, M.D.
Cleveland Clinic Lerner College of Medicine
Cleveland, OH

THE UNIVERSITY OF TOLEDO FACULTY

Lynne Chapman, M.S., OTR/L, L.I.C.D.C.
Department of Rehabilitation Sciences
Toledo, OH

Alina R. Rais, M.D.
Department of Geriatric Psychiatry
Toledo, OH
PLANNING COMMITTEE DISCLOSURES

Lisa Keaton has disclosed that she is a consultant for ALS Association of Northern Ohio.

No other planning committee member has any financial interest or other relationships with any manufacturer of commercial products or service to disclose that would pose a conflict of interest with regards to the content of this activity.

FACULTY DISCLOSURES

Gregory Nemunaitis has disclosed that he is a consultant for Gradalis Corporation, Muscle Assessment in HIBM2 and the Mary Crowley Research Center

Carl V. Tyler has disclosed that he has a grant/research with CTSC at Case Western Reserve University

Rick Black has disclosed that he is a consultant with Guidepost Global

No other faculty member has any financial interest or other relationships with any manufacturer of commercial product or service to disclose that would pose a conflict of interest with regards to the content of this activity.
ACCREDITATION

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of The University of Toledo and the Ohio Geriatrics Society. The University of Toledo is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

The University of Toledo designates this live activity for a maximum of **6.5 AMA PRA Category 1 Credit(s)™**. Physicians should claim only credit commensurate with the extent of their participation in the activity.

This Live activity, 17th Annual Geriatric Medicine Symposium: Health, Wellness and Aging with Disabilities or Chronic Illness, with a beginning date of 03/01/2013, has been reviewed and is acceptable for up to 6.50 Prescribed credit(s) by the American Academy of Family Physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

The University of Toledo Medical Center is an approved provider of continuing education for pharmacists by the Ohio State Board of Pharmacy. This program has been designated for 0.650 CEU’s with identification number -----------. Each pharmacist should claim only those hours of credit that he/she actually spent in the educational activity.

The State of Ohio Counselor, Social Worker and Marriage & Family Therapist Board have approved this activity for 6.5 clock hours of Continuing Professional Education (CPE) for Counselor and Social Workers. Approval Number: MCS031303.

The University of Toledo, Psychiatry Department is approved by the Ohio Psychological Association - MCE Program to offer continuing education for psychologists. The University of Toledo, Psychiatry Department Provider No. 00P0-340967014, maintains responsibility for this program. This program has been approved for 6.50 credits.

This program has been approved by the State of Ohio Board of Examiners of Nursing Home Administrators for 6 course hours. Approval No: 070-C-13

This program has been approved by the Ohio Physical Therapy Association (OPTA) for 6.5 hours. Approval Number: 13S0618

This program has been approved by the Ohio Occupational Therapy, Physical Therapy, and Athletic Trainers Board for 6.5 contact hours. Approval Number: 130457.

The Ohio Board of Nursing will accept, at face value, the number of hours awarded for an educational activity that has been approved for CE, provided it was approved by a nationally accredited system of CE approval.

The AAPA accepts certificates of participation for educational activities certified for Category 1 credit from AOACCME, Prescribe credit from AAFP, and **AMA PRA Category 1 credit(s)™** from organizations accredited by ACCME or a recognized state medical society.
For information regarding The University of Toledo, CME Upcoming Events, be sure to visit our website:

cme.utoledo.edu

The UT CME Office is pleased to announce that we have received the ACCME "Accreditation with Commendation" good through 2016.
TO OBTAIN YOUR CME CREDIT

Your CME Program Evaluation and Certificate will be available on Friday, March 1, 2013, after 4 pm.

1. Go to cme.utoledo.edu. (Omit the www/http://)
2. Click on DIRECT LINK TO LOGIN
3. Login:
   Username: lastnamefirstname (no commas, no spaces)
   Password: zip code
   (Your password is your zip code unless you specified another password in your profile)
4. An online forms inbox will appear with your program evaluation to complete.
5. Complete your online evaluation; be sure to answer all questions.
6. Click the submit tab.
7. You will be directed to print your certificate.
17th Annual Geriatric Medicine Symposium:
HEALTH, WELLNESS, AND AGING WITH DISABILITIES OR CHRONIC ILLNESS
Friday, March 1, 2013
Hilton Garden Inn
Perrysburg, OH

7:30 am  Registration & Continental Breakfast - View Exhibits

8:00-8:15  Welcome/Overview
Victoria Steiner, Ph.D.

8:15-9:00  Aging after a Spinal Cord Injury
Gregory Nemunaitis, M.D.

9:00-9:45  Promoting Neuroplasticity following Brain Injury with Age
Lynne Chapman, M.S., OTR/L, L.I.C.D.C.

9:45-10:05  Panel Discussion

10:05-10:20  Break/View Exhibits

Moderator: Barbaranne J. Benjamin, Ph.D.

10:20-11:05  The Aged Patient with Chronic Mental Illness
Alina R. Rais, M.D.

11:05-11:50  Aging with Chronic Illness
Thomas H. Gross, M.D.

11:50-12:10  Panel Discussion

12:10-1:15 pm  Luncheon
17th Annual Geriatric Medicine Symposium:
HEALTH, WELLNESS, AND AGING WITH DISABILITIES OR
CHRONIC ILLNESS
Friday, March 1, 2013
Hilton Garden Inn
Perrysburg, OH

Moderator: A. John McSweeney, J.D., Ph.D., ABPP (CN)

1:15-2:00  Not Just Any Old Person:
Improving the Health & Healthcare of Older Adults with Intellectual
and Other Developmental Disabilities.
Carl V. Tyler, M.D.

2:00-2:45  The Role of Exercise in Healthy Aging with Diabetes
Rick Black, P.T., D.P.T., M.S., G.C.S.

2:45-3:00  Break/View Exhibits

3:00-3:45  HIV & Aging “Growing Old with HIV”
Robert L. Brandt, Jr., M.D., FAAFP, AAHIVS

3:45-4:15  Panel Discussion

4:15 pm  Adjourn
Objectives:

1. Discuss the interaction of aging and spinal cord injury (SCI) on morbidity.

2. Identify the interaction of aging and SCI on mortality.


4. Promote health maintenance and wellness for persons with SCI.
Aging after Spinal Cord Injury

Greg Nemunaitis, MD

Learning Objectives

Upon completion of this program, participants will be able to:

- Discuss the interaction of aging and SCI on mortality
- Identify the interaction of aging and spinal cord injury (SCI) on morbidity
- Identify risk for Secondary Health Conditions
- Promote health maintenance and wellness for persons with SCI

Outline

- Demographics of Aging
- Mortality
- Morbidity
- Specific Health Conditions
  - Cardiovascular
  - Respiratory
  - Gastrointestinal
  - Genitourinary
  - Musculoskeletal
  - Neurological
  - Skin
- FES Systems
Aging in the U.S.

Number of Americans 65 Years of Age and Older: 1980-2050

Age over Time in SCI (SCISC 2003)

Trends in the Distribution of Mean Age for Individuals with acute SCI (Groah 2012)
Etiology of SCI over Time (SCISC 2003)

Age and Etiology (SCIMS 2012)

Trends in Life Expectancy in SCI (Shock 1984, Groah 2012)
Life expectancy for persons that survive the first 24 hours (NSCISC 2012)

<table>
<thead>
<tr>
<th>Age at Injury</th>
<th>No SCI</th>
<th>Motor Functional at any Level</th>
<th>Para</th>
<th>Low Tetra (C5-8)</th>
<th>High Tetra (C1-4)</th>
<th>Ventilator Dependent at any Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 yrs</td>
<td>58.8</td>
<td>52.1</td>
<td>44.8</td>
<td>39.6</td>
<td>35.3</td>
<td>16.8</td>
</tr>
<tr>
<td>40 yrs</td>
<td>39.9</td>
<td>33.8</td>
<td>27.4</td>
<td>23.2</td>
<td>19.7</td>
<td>7.5</td>
</tr>
<tr>
<td>60 yrs</td>
<td>22.5</td>
<td>17.5</td>
<td>12.8</td>
<td>10.0</td>
<td>7.8</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Life expectancy for persons who survive 1 year post injury (NSCISC 2012)

<table>
<thead>
<tr>
<th>Age at Injury</th>
<th>No SCI</th>
<th>Motor Functional at any Level</th>
<th>Para</th>
<th>Low Tetra (C5-8)</th>
<th>High Tetra (C1-4)</th>
<th>Ventilator Dependent at any Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 yrs</td>
<td>58.8</td>
<td>52.5</td>
<td>45.4</td>
<td>40.5</td>
<td>36.9</td>
<td>24.8</td>
</tr>
<tr>
<td>40 yrs</td>
<td>39.9</td>
<td>34.1</td>
<td>27.9</td>
<td>23.9</td>
<td>21.0</td>
<td>12.3</td>
</tr>
<tr>
<td>60 yrs</td>
<td>22.5</td>
<td>17.7</td>
<td>13.2</td>
<td>10.4</td>
<td>8.6</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Aging with SCI in the U.S.

- Mean age at Injury is higher
- Life expectancy is improved
- Life expectancy is affected by
  - Level of injury
  - Severity of injury
  - Age of injury
  - Time since injury
  - Decade of injury
How do People die following SCI

- Etiology of death in all people
  - Cancer
  - Ischemic Heart Disease
  - Non-ischemic Heart Disease

- Etiology of deaths in people with SCI
  - Pneumonia
  - Non-ischemic Heart Disease
  - Septicemia

- Unique causes of death in people with SCI obtained from the SMR: SCI/All People
  - Septicemia
  - Pulmonary Emboli
  - Pneumonia

Etiology of Death in the General Population versus SCI (Clinical Outcomes from the Model System 1995)

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Death (All people)</th>
<th>Death (SCI)</th>
<th>SMR (SCI/All people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>82</td>
<td>71</td>
<td>0.9</td>
</tr>
<tr>
<td>Ischemic Heart Disease</td>
<td>78.4</td>
<td>91</td>
<td>1.2</td>
</tr>
<tr>
<td>Non-ischemic Heart Disease</td>
<td>26.7</td>
<td>171</td>
<td>6.4</td>
</tr>
<tr>
<td>Disease of Urinary System</td>
<td>17.8</td>
<td>67</td>
<td>3.8</td>
</tr>
<tr>
<td>Suicide</td>
<td>16.6</td>
<td>80</td>
<td>4.8</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>6.4</td>
<td>228</td>
<td>35.6</td>
</tr>
<tr>
<td>Disease of The Digestive System</td>
<td>4.5</td>
<td>49</td>
<td>10.9</td>
</tr>
<tr>
<td>Pulmonary Emboli</td>
<td>2.4</td>
<td>113</td>
<td>47.1</td>
</tr>
<tr>
<td>Septicemia</td>
<td>1.9</td>
<td>122</td>
<td>64.2</td>
</tr>
</tbody>
</table>

Death in Paraplegia vs Tetraplegia (Thietje 2011)

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Para (n=50)</th>
<th>Tetra (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal failure</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease</td>
<td>Ischemic</td>
<td>9</td>
</tr>
<tr>
<td>Non-ischemic</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Gastrointestinal Tract</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Neoplasm</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>CVA</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>PE</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Sepsis</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Suicide</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>
Morbidity

- Survival with SCI is associated with many chronic health conditions
- Readmission following D/C from Acute
  - Number
  - Length of Stay
- Self reported health conditions
  - Paraplegic
  - Tetraplegic
- Occurrence rates of health conditions

Patterns of Morbidity and Rehospitalization following SCI (Middleton 2004)

<table>
<thead>
<tr>
<th>Organ System</th>
<th>Readmissions (%)</th>
<th>Persons (%)</th>
<th>Total Bed-days</th>
<th>ALOS (median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genitourinary</td>
<td>235 (24.1)</td>
<td>125 (28.9)</td>
<td>2248</td>
<td>9.6 (3)</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>107 (11.0)</td>
<td>69 (16.0)</td>
<td>589</td>
<td>5.5 (1)</td>
</tr>
<tr>
<td>Skin</td>
<td>87 (8.9)</td>
<td>40 (9.3)</td>
<td>4432</td>
<td>50.9 (28)</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>84 (8.6)</td>
<td>60 (13.9)</td>
<td>860</td>
<td>10.2 (4)</td>
</tr>
<tr>
<td>Neurological</td>
<td>30 (3.1)</td>
<td>18 (4.2)</td>
<td>775</td>
<td>25.8 (8)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>44 (4.5)</td>
<td>28 (6.5)</td>
<td>632</td>
<td>14.4 (7)</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>47 (4.8)</td>
<td>40 (9.3)</td>
<td>879</td>
<td>18.7 (6)</td>
</tr>
<tr>
<td>Endocrine</td>
<td>7 (0.7)</td>
<td>5 (1.2)</td>
<td>68</td>
<td>9.7 (8)</td>
</tr>
<tr>
<td>Psychiatric</td>
<td>66 (6.8)</td>
<td>37 (8.6)</td>
<td>802</td>
<td>12.2 (4)</td>
</tr>
<tr>
<td>Other</td>
<td>270 (27.6)</td>
<td>96 (22.2)</td>
<td>3830</td>
<td>14.2 (5)</td>
</tr>
<tr>
<td>Total</td>
<td>977 (100)</td>
<td>253 (58.6)</td>
<td>15127</td>
<td>15.5 (5)</td>
</tr>
</tbody>
</table>

Overall causes of Rehospitalization (N=4675) (SCIMS Annual Report 2010)
### Top 6 Causes (N=4675) of Rehospitalization by Post-injury Year (SCIMS Annual Report 2010)

![Graph showing top 6 causes of rehospitalization over time](image)

<table>
<thead>
<tr>
<th>Health Complication</th>
<th>Total (n=4675)</th>
<th>&gt; 30%</th>
<th>&lt; 30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spasticity</td>
<td>713</td>
<td>88.3</td>
<td>62.9</td>
</tr>
<tr>
<td>Shoulder Pain</td>
<td>58.6</td>
<td>68.9</td>
<td>46.3</td>
</tr>
<tr>
<td>Chronic Pain</td>
<td>58.0</td>
<td>57.3</td>
<td>53.3</td>
</tr>
<tr>
<td>Bladder Infections</td>
<td>56.5</td>
<td>53.3</td>
<td>61.7</td>
</tr>
<tr>
<td>Arthritis/joint Pain</td>
<td>53.4</td>
<td>46.6</td>
<td>52.9</td>
</tr>
<tr>
<td>Bowel</td>
<td>42.9</td>
<td>34.0</td>
<td>34.1</td>
</tr>
</tbody>
</table>

### Self-reported Prevalence of Secondary Health Complications by Impairment (Hitzig 2008)

<table>
<thead>
<tr>
<th>Health Complication</th>
<th>Total (n=781)</th>
<th>CT (n=103)</th>
<th>IT (n=255)</th>
<th>CP (n=167)</th>
<th>IP (n=256)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spasticity</td>
<td>71.3</td>
<td>88.3</td>
<td>77.3</td>
<td>62.9</td>
<td>64.1</td>
</tr>
<tr>
<td>Shoulder Pain</td>
<td>58.6</td>
<td>68.9</td>
<td>56.1</td>
<td>67.1</td>
<td>51.6</td>
</tr>
<tr>
<td>Chronic Pain</td>
<td>58.0</td>
<td>57.3</td>
<td>53.3</td>
<td>61.7</td>
<td>60.5</td>
</tr>
<tr>
<td>Bladder Infections</td>
<td>56.5</td>
<td>70.9</td>
<td>46.3</td>
<td>71.3</td>
<td>51.2</td>
</tr>
<tr>
<td>Arthritis/joint Pain</td>
<td>53.4</td>
<td>46.6</td>
<td>52.9</td>
<td>53.3</td>
<td>56.6</td>
</tr>
<tr>
<td>Bowel</td>
<td>42.9</td>
<td>34.0</td>
<td>40.0</td>
<td>44.3</td>
<td>48.4</td>
</tr>
<tr>
<td>Depression</td>
<td>34.6</td>
<td>34.0</td>
<td>34.1</td>
<td>34.1</td>
<td>35.5</td>
</tr>
<tr>
<td>Psychological Distress</td>
<td>33.0</td>
<td>35.0</td>
<td>30.2</td>
<td>33.5</td>
<td>34.8</td>
</tr>
</tbody>
</table>
### Self-reported Prevalence of Secondary Health Complications by Impairment (< 30%) (Hitzig 2008)

<table>
<thead>
<tr>
<th>Health Complication</th>
<th>Total (n=781)</th>
<th>CT (n=163)</th>
<th>IT (n=255)</th>
<th>CP (n=167)</th>
<th>IP (n=256)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Ulcers</td>
<td>28.7</td>
<td>42.7</td>
<td>20.4</td>
<td>44.9</td>
<td>20.7</td>
</tr>
<tr>
<td>High BP</td>
<td>22.8</td>
<td>11.7</td>
<td>20.0</td>
<td>21.6</td>
<td>30.9</td>
</tr>
<tr>
<td>Autonomic Dysreflexia</td>
<td>20.1</td>
<td>48.5</td>
<td>20.4</td>
<td>18.0</td>
<td>9.8</td>
</tr>
<tr>
<td>Respiratory</td>
<td>15.6</td>
<td>15.5</td>
<td>17.3</td>
<td>13.2</td>
<td>15.6</td>
</tr>
<tr>
<td>Bladder/kidney</td>
<td>13.4</td>
<td>17.5</td>
<td>12.9</td>
<td>12.0</td>
<td>13.3</td>
</tr>
<tr>
<td>Neurological Deterioration</td>
<td>13.1</td>
<td>10.7</td>
<td>13.3</td>
<td>10.2</td>
<td>15.6</td>
</tr>
<tr>
<td>Cardiac</td>
<td>7.2</td>
<td>6.8</td>
<td>5.1</td>
<td>9.6</td>
<td>7.8</td>
</tr>
<tr>
<td>Fractures</td>
<td>6.9</td>
<td>5.8</td>
<td>4.7</td>
<td>11.4</td>
<td>6.6</td>
</tr>
<tr>
<td>Heterotopic Ossification</td>
<td>5.8</td>
<td>3.9</td>
<td>6.7</td>
<td>8.4</td>
<td>3.9</td>
</tr>
</tbody>
</table>

### Rates of Secondary Medical Conditions (NSCISC 1995)

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>20th year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Ulcers</td>
<td>15%</td>
<td>26%</td>
</tr>
<tr>
<td>UTI</td>
<td>62%</td>
<td>95%</td>
</tr>
<tr>
<td>DVT</td>
<td>12-20%</td>
<td>&lt; 3%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>12-20%</td>
<td>&lt; 3%</td>
</tr>
<tr>
<td>Atelectasis</td>
<td>12-20%</td>
<td>&lt; 3%</td>
</tr>
</tbody>
</table>

### Medical Problems of Aging by years since injury (Krause 2000)

<table>
<thead>
<tr>
<th></th>
<th>&lt;10 years</th>
<th>30+ years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney or Bladder Stones</td>
<td>15%</td>
<td>59%</td>
</tr>
<tr>
<td>Infection other than UTI</td>
<td>24%</td>
<td>50%</td>
</tr>
<tr>
<td>Scoliosis</td>
<td>30%</td>
<td>55%</td>
</tr>
<tr>
<td>Fracture</td>
<td>19%</td>
<td>41%</td>
</tr>
<tr>
<td>Contractures</td>
<td>14%</td>
<td>32%</td>
</tr>
<tr>
<td>Rectal bleeding</td>
<td>49%</td>
<td>39%</td>
</tr>
<tr>
<td>Drug Abuse</td>
<td>9%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Medical Problems of Aging by onset year of injury (Krause 2000)

<table>
<thead>
<tr>
<th>Medical Problem</th>
<th>&lt;18</th>
<th>18-25</th>
<th>26-39</th>
<th>40+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart problems</td>
<td>5%</td>
<td>11%</td>
<td>7%</td>
<td>23%</td>
</tr>
<tr>
<td>Bowel obstruction</td>
<td>13%</td>
<td>30%</td>
<td>31%</td>
<td>40%</td>
</tr>
<tr>
<td>Kidney/bladder stones</td>
<td>63%</td>
<td>37%</td>
<td>24%</td>
<td>5%</td>
</tr>
<tr>
<td>Burns</td>
<td>59%</td>
<td>66%</td>
<td>48%</td>
<td>40%</td>
</tr>
<tr>
<td>Skin sores</td>
<td>50%</td>
<td>54%</td>
<td>51%</td>
<td>26%</td>
</tr>
<tr>
<td>Sweats or chills</td>
<td>76%</td>
<td>78%</td>
<td>73%</td>
<td>52%</td>
</tr>
<tr>
<td>Scoliosis</td>
<td>56%</td>
<td>45%</td>
<td>39%</td>
<td>26%</td>
</tr>
<tr>
<td>Rectal bleeding</td>
<td>40%</td>
<td>59%</td>
<td>48%</td>
<td>40%</td>
</tr>
<tr>
<td>Calcium deposits</td>
<td>25%</td>
<td>24%</td>
<td>37%</td>
<td>10%</td>
</tr>
<tr>
<td>Headaches</td>
<td>53%</td>
<td>63%</td>
<td>63%</td>
<td>33%</td>
</tr>
<tr>
<td>Stress</td>
<td>85%</td>
<td>76%</td>
<td>68%</td>
<td>56%</td>
</tr>
</tbody>
</table>

Organ System effects of aging with SCI

- Cardiovascular
- Respiratory
- Gastrointestinal
- Genitourinary
- Musculoskeletal
- Neurological
- Skin

Spinal cord
Spinalthalamic tract
Posterior columns

Spinal cord and nerve roots

Autonomic nervous system
Organ System effects of aging with SCI

- Cardiovascular
- Respiratory
- Gastrointestinal
- Genitourinary
- Musculoskeletal
- Neurological
- Skin

Cardiovascular

- 2nd leading causes of death in SCI.
- Risk factors in SCI
  - Diabetes: 30% ↑ incidence of glucose intolerance and diabetes (Bauman 1994)
  - Obesity: ↓ lean muscle mass and ↑ fat mass (Bauman 1999)
  - Inactivity: ↓ Activity level
  - Lipid Disorders: Insufficient evidence that adults with SCI are at greater risk of carbohydrate and lipid disorders
  - Lipid: low HDL, total cholesterol and LDL are not different from controls (Wilt 2008)
Filter placement is not a substitute for DVT prophylaxis.

Furthermore, filter placement may increase the risk for future development of DVT.

### Incidence of PE following DVT (Decousus1998)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Evaluation Day 12</th>
<th>Evaluation Day 720</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVC Filter</td>
<td>200</td>
<td>1.1 % PE</td>
<td>20.8 % DVT</td>
</tr>
<tr>
<td>No IVC Filter</td>
<td>200</td>
<td>4.8 % PE</td>
<td>11.6 % DVT</td>
</tr>
</tbody>
</table>

### Chronic Cardiovascular Complications

(NISCISC 2006)

### Autonomic Dysreflexia

- This is a disorder of autonomic homeostasis as a result of a disconnection of the brain with the spinal cord.
- Due to loss of supraspinal control and exaggerated sympathetic nervous system reflex activity.
- Triggered by noxious stimuli below the level of injury (significant above T6 SCI Level)
- Can lead to dangerously high blood pressures.
Management of Autonomic Dysreflexia

- **Symptoms:** pounding headache, flushed skin & sweating above level of injury, blurred vision, nasal stuffiness, goose bumps, nausea, and BP.
- **Causes:** Any painful stimulus below level of injury. Full bladder, blocked foley, UTI, or bowel impaction, skin ulcers, trauma, tight clothing, tests & procedures, ingrown toe nails.

**Treatment:**
1. Sit patient up.
2. Eliminate the cause!
3. Treat elevated systolic blood pressure (>150)
5. Treat symptomatic hypotension by laying down the individual and elevating the legs.
6. Monitor symptoms and BP for at least 2 hrs after the resolution of an AD episode.
7. Admit the patient if response to treatment is poor or cause has not been identified. A D can lead to seizures, stroke or death.

Modification of Risk Factors

- Identify and treat AD
- Identify HTN
- Promote exercise
- Weight management
- Healthy diet (lipid profile, HgBA1c)
- Avoid Narcotics
- Stop smoking
- Reduce alcohol intake

Respiratory System

- Pneumonia: (leading cause of death in SCI)
- Mucous Plugging
- Aspiration
- Respiratory Arrest
- Hypoventilation
- Sleep Apnea
Secondary Medical Complications - Annual Report for the Model SCI Care Systems, SCI Statistical Center 2006

<table>
<thead>
<tr>
<th>Complication</th>
<th>Paraplegia Implant</th>
<th>Paraplegia Complete</th>
<th>Tetraplegia Implant</th>
<th>Tetraplegia Complete</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>308</td>
<td>66</td>
<td>648</td>
<td>767</td>
<td>2,312</td>
</tr>
<tr>
<td>Pressure ulcers</td>
<td>129</td>
<td>32</td>
<td>267</td>
<td>277</td>
<td>893</td>
</tr>
<tr>
<td>Deep vein thrombosis</td>
<td>201</td>
<td>36</td>
<td>250</td>
<td>208</td>
<td>925</td>
</tr>
<tr>
<td>Pulmonary Embolism</td>
<td>13</td>
<td>16</td>
<td>11</td>
<td>16</td>
<td>56</td>
</tr>
<tr>
<td>Post-op Wound Infection</td>
<td>55</td>
<td>59</td>
<td>36</td>
<td>29</td>
<td>179</td>
</tr>
<tr>
<td>Dehydration</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Infection</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Aspiration</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Level and completeness of Injury</td>
<td>3.6</td>
<td>3.3</td>
<td>1.6</td>
<td>2.3</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Table 45. Number of patients developing secondary medical complications during system by neurologic impairment for persons admitted to the system within 24 hours of injury. | n = 6,909; 20.5% had none of the listed medical complications.

Mucous Plug

Respiratory System

- Risk Factors
  - ↑ Body weight
  - ↓ Muscle tone (narcotics)
  - ↓ Pulmonary compliance (elasticity)
  - Dehydration
  - Infection
  - Aspiration
  - Level and completeness of Injury
Modification of Risk Factors

- Monitor vital capacity
- Immunization – Pneumovax, flu shot
- Weight loss
- Stop smoking and reduce alcohol
- Maintenance of pulmonary therapies
  - Inhalers, aerosols, ezPAP
  - Chest percussion/vest
  - Suctioning
  - Assisted cough
  - Coughulator
  - Hydration
- Pulmonary Rehabilitation

Respiratory System

- Sleep Apnea
  - Incidence: 40% in SCI
  - Increases with age
  - Pulmonary hypertension can lead to non-ischemic heart disease (2nd leading cause of death)

Modification of Risk Factors

- Weight loss
- Restrict alcohol and tobacco
- Avoid narcotics
- Overnight sleep oximetry
- Polysomnography
- CPAP
- BiPAP
Gastrointestinal
- 2nd leading cause of readmission
- Continues to be a problem with aging
- Less efficiency of bowel program
  - ↓ Peristalsis
  - ↑ Constipation
  - ↑ Hemorrhoids

Modification of Risk Factors
- Bowel Program: attention to details
  - Diet
  - Medications (avoid narcotics)
  - Hydration
  - Activity
  - Bedside commode
  - Colostomy

Genitourinary
- Urinary tract complications:
  - Formerly leading cause of death in people with SCI
  - As one ages it continues to be a problem
  - Currently #1 cause of readmission following SCI
Genitourinary

- Infections
  - Cystitis
  - Pyelonephritis
- Kidney/Bladder Stones
  - 36% of SCI survivors develop calculi within 8 years following injury
- Renal Failure
  - Today only 3.8-5.4%
- Bladder cancer
  - Foley or suprapubic catheter
  - Cancer latency 20 years.

Modification of Risk Factors

- Adequate hydration
- Avoid high volume bladders
- Surveillance
  - Cystometrogram
  - Bladder/Kidney Ultrasound
  - Cystoscopy

Musculoskeletal

- Pain
- Osteoporosis: below level
- Osteoarthritis
- Disuse muscle atrophy
- Tendon/ligament
  - Contractures
  - Injuries (RTC)
Musculoskeletal

- Pain is the #1 Self-reported secondary health complications
- Progresses with age
- Types
  - Neuropathic
  - Nociceptive

Bryce/Ragnarsson Classification of Pain 2001

<table>
<thead>
<tr>
<th>Location</th>
<th>Type</th>
<th>Etiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above - level</td>
<td>Nociceptive 1</td>
<td>Mechanical/Musculoskeletal</td>
</tr>
<tr>
<td>(3 levels or more above the neurologic level of SCI)</td>
<td>2 A.D. Headache</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 Other</td>
<td>Compressive Neuropathy</td>
</tr>
<tr>
<td></td>
<td>4 Neuropathic</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td>5 Other</td>
<td>Compressive Neuropathy</td>
</tr>
<tr>
<td>At - level</td>
<td>Nociceptive 6</td>
<td>Mechanical/Musculoskeletal</td>
</tr>
<tr>
<td>(2 levels above or below the neurologic level of SCI)</td>
<td>7 Visceral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 Neuropathic</td>
<td>Central</td>
</tr>
<tr>
<td></td>
<td>9 Radicular</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 Other</td>
<td>Central</td>
</tr>
<tr>
<td></td>
<td>11 Neuropathic</td>
<td>Central</td>
</tr>
<tr>
<td></td>
<td>12 Other (incl SCI or pain within ZPP)</td>
<td>13 Visceral</td>
</tr>
<tr>
<td>Below - level</td>
<td>Nociceptive 12</td>
<td>Complex Regional Pain Syndrome</td>
</tr>
<tr>
<td>(3 levels or more below the neurologic level of SCI)</td>
<td>13 Visceral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 Neuropathic</td>
<td>Central</td>
</tr>
<tr>
<td></td>
<td>15 Other (incl SCI or pain within ZPP)</td>
<td></td>
</tr>
</tbody>
</table>

Neuropathic Pain

- Pain is located in a region of impaired sensation
- Described as shooting, electric or burning
- Worse at night or with inactivity
- Better during the day
- Exacerbated by stress, sleep dysfunction, depression, and inactivity
- Treatment: Neurontin/Elavil
**Nociceptive Pain**

- Pain is located in a region of preserved sensation
- Described as dull and aching and worse with activity.
- 50-70% (shoulder>wrist)
- Tendon/ligament injury/arthritus
- Causes: Overuse, transfers, pressure relief, wheelchair propulsion, wheelchair fit, maneuvers, abnormal posture.

**Modification of Risk Factors**

- Proper Wheelchair
- Proper Wheelchair fit
- Proper Wheelchair Propulsion technique
- Balanced shoulder strengthening
- Weight reduction

**Generation of Forces on various Obstacles using the SmartWheel**

**Measures**
- Push Forces
- Push Frequency
- Push Length
- Speed

**Wheelchair Skills Test**
- 10m tile
- 10m carpet
- Soft surface
- 5° incline
- 10° incline
- 2cm curb
- 5cm curb
- 15cm curb
Forces Generated Smart Wheel (Nagy, Nemunaitis 2011)

Forces Generated Smart Wheel: BMI (Mejia, Nemunaitis 2012)

Forces Generated Smart Wheel: Rigid versus Folding (Winslow, Nemunaitis 2012)
Modifications of Risk Factors

- Identify problems early
- Control pain
- Evaluation by PT and OT
- Therapy program
- Activity modification
- Wheelchair and vehicle modification
- Assist devices
- Sleep
- Lose Weight
- Eat a proper diet
- Conserve Energy
- Increased personal care assistance
- Surgery?

Musculoskeletal

- Osteoporosis:
  - Present in 60-90% of patients confined to a wheelchair.
  - Increases with age.
  - Stable 16 months after SCI w/ 33% bone loss.
  - Fractures

Modification of Risk Factors - Osteoporosis

- Follow DEXA
- Stop Smoking
- Avoid alcohol
- Vitamin D, 25 OH levels
- Standing and walking
- FES
- Bisphosphonates
Loss of BMD over time (Garland 2005)

Risk of Fracture in SCI (Lazo 2001)

Vitamin D Level (Nemunaitis 2009)
Neurogenic muscle atrophy:
- Age related loss of Ant Horn Cells (10%/decade after age 60 (Tomlinson)
- Compressive neuropathies
  - Median Nerve: Carpal tunnel syndrome 60% (Bonninger 2009)
  - Ulnar Nerve: Ulnar Neuropathy 20% (Burnham 1993)
- Syringomyelia
  - Incidence 60% but progressive 3% (Biyani 1996)

Neurogenic Muscle Atrophy

Modification of Risk Factors
- Treatment:
  - activity modification
  - night splints
  - Wheelchair change
    - Power
    - power-assist w/c
  - Low impact exercises
  - Water Therapy
  - Surgery
    - Tendon transfers
Nervous System

- Syringomyelia
  - ↑ pain
  - ↑ spasticity
  - ↑ pain/temperature
  - ↓ weakness
  - ↑ autonomic dysreflexia

- Treatment:
  - Monitoring
  - Surgical intervention

Skin: Pressure Ulcers

- #1 Cost-related etiology of readmission following SCI (Middleton 2004)
- Physiological Changes
  - Decreased collagen production
  - Decreased elastin production
  - Decreased vascularity
- Consequences (SCIMS 1995)
  - Pressure ulcers at Yr-1 = 15% and Yr-20 = 30%
  - Pressure ulcers in tetraplegics at Yr-20 = 40%
  - Risk of infection & Osteomyelitis

Secondary Medical Complications - Annual Report for the Model SCI Care Systems, SCI Statistical Center 2006

<table>
<thead>
<tr>
<th>Complication</th>
<th>Paraplegia Incomplete</th>
<th>Complete</th>
<th>Tetraplegia Incomplete</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>308</td>
<td>605</td>
<td>648</td>
<td>751</td>
</tr>
<tr>
<td>Pressure ulcers</td>
<td>293</td>
<td>71</td>
<td>657</td>
<td>674</td>
</tr>
<tr>
<td>Deep vein thrombosis</td>
<td>276</td>
<td>82</td>
<td>353</td>
<td>508</td>
</tr>
<tr>
<td>Pulmonary Embolism</td>
<td>42</td>
<td>71</td>
<td>67</td>
<td>66</td>
</tr>
<tr>
<td>Post-op Wound Infection</td>
<td>55</td>
<td>59</td>
<td>16</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 41. Number of patients developing secondary medical complications during system by neurologic impairment for persons admitted to the system within 24 hours of injury [n = 6,928]. 20.5% had none of the listed medical complications.
Skin: Locations of Pressure Ulcers

- Lying in Bed
  - Back of Head
  - Shoulder Blade
  - Sacrum
  - Greater Trochanter
  - Heel (back)

- Sitting
  - Ischium
  - Toes
  - Heel (bottom)

Pressure sensitive areas
Skin: Modification of risk factors

- Monitor cushion (type, placement and inflation)
- Daily skin inspection.
- Taking immediate action if skin breakdown develops.
- Changes when necessary (manual→power chairs, bed-type, home health aides, etc.)

Sacral Interface Pressures with Gurney Backrest Elevation (Atluri, Nemunaitis 2011)

Leg Position and Seated Interface Pressures (Sidhu, Nemunaitis 2009)
Neuroprosthetics


Rank the following functional recovery in order of importance to you, 1 being most important and 7 being least important:

A) arm/hand function
B) upper body/trunk strength and balance
C) bladder/bowel function, elimination of Dysreflexia
D) sexual function
E) elimination of chronic pain
F) normal sensation
G) walking movement


Highest Priority to Quad’s

Highest Priority to Para’s
UE System: 2nd Generation – 12 Channel

Trunk System: FES Components
Walking System: FES Components

**Internal components**
- 8-Channel Implantable Receiver-Stimulator
- Epimysial & IM Electrodes

**External components**
- Wearable External Control Unit (ECU), Command Ring & Transmitting Coils

**Components**
- Target Muscles: Customized for each individual
- Electrodes
- Implantable Receiver Stimulator
- In-Line Connectors
- Coupling Coil
- External Control Unit
- Implant Components
- Clinical Interface
Case presentation - CH

- 26 year old male
- C6 ASIA C Tetraplegia
  - C6 sensory (86); C7 motor (55)
- 30 mpi at entry (12/05)
- Non-ambulator
- 12 weeks robotic assisted BWSTT gait training

Pre and Post implanted FES - CH

- No FES
- FES

Cough System: FES Components

- The electrodes are positioned on the dorsal epidural surface of the spinal cord at the T9, T11, and L1 levels.
References

Promoting Neuroplasticity Following Brain Injury with Age

*Lynne Chapman, M.S., OTR/L, L.I.C.D.C.*

**Objectives:**

1. Identify the effects of occupation on Neuroplasticity with age following brain injury.

2. Identify the principals underlying Neuroplasticity.

3. Apply the principals of Neuroplasticity to engagement in occupation in aging persons.
Promoting Neuroplasticity Following Brain Injury with Age

Lynne Chapman, MS, OTR/L
Clinical Asst. Professor, Dept Rehabilitation Sciences
Senior Clinician, Dept. of Rehabilitation Services
The University of Toledo

Overview

- The principles that affect neuroplasticity following brain injury (BI) with age:
  - Neuroplasticity
  - Novel learning
  - Enriched environments
  - Occupation
  - Principles of Learning for Skill Performance

Brain Injury

- Damage to the brain that results in degenerative changes in brain cells.
- Approaches to improving function after BI fall into 2 categories:
  - efforts to reorganize the brain to restore function that has been compromised or lost (restorative) &
  - efforts to minimize continued loss of function (maintenance).
New Synapses

• When a region of the brain loses its connections, the remaining neural connections have the potential to produce new connections referred to as synapses.
• This alteration in the excitability of neurons provides an opportunity for neuroplasticity.

Reorganization of the Brain

• The most common consequence of BI & is the development of compensatory strategies that allow persons to perform everyday tasks in the presence of lost function.
• These compensatory skills can be precursors to the restructuring & growth of neurons.
• These skill changes can be adaptive & contribute to improvements in functional outcomes.

Reserve Theory

• There are protective factors against a decline in function, referred to as the "reserve theory."
  • Passive Factors
    • Fixed (e.g. genetics, anatomy, IQ, etc.)
  • Active Factors
    • Have the capacity to enhance reserve through novel experiences.
• Active factors enhance reserve through the use of interventions that incorporate new learning.
Neuroplasticity

- *Neuroplasticity (neural plasticity)* is defined as "the process by which the brain encodes new experiences to enable improved skill performance."
- Following BI, the brain has the potential to reorganize its neural circuitry by forming new neural connections in order to relearn previously learned skills or learn new skills.

Novel Learning

- Learning s/p BI regenerates neurons & neural connections by increasing the excitability of the neurons.
- Learning causes changes in synapses, neurons & neuronal networks within the injured brain.

Experience-Dependent Neuroplasticity

- The change in the nervous system that results from new learning is a process referred to as *experience-dependent neuroplasticity*.
- Experience-dependent plasticity increases the number of synapses & synaptic activity.
Experience-Dependent Neuroplasticity
• Neuroplasticity is enhanced through participation in new experiences that challenge both cognitive and motor skills.
• These experiences can reorganize healthy brain tissue as well, thereby further promoting the reorganization of tissue in the injured brain.

The Just Right Challenge
• New learning that provides sensory input from the primary sensory systems that include vestibular, proprioceptive & tactile input have the greatest potential for impacting neuroplasticity when providing a “just right challenge.”
• If the new task is overly challenging, the person will become overstimulated & will not be successful in mastering the skill.
• Similarly, neuroplasticity will not occur if the new task does not provide enough of a challenge.

Enriched Environments
• Task performance should take place in naturalistic environments when feasible.
• Contexts that provide opportunities for new learning are referred to in the literature as enriched environments.
• Enriched environments have proven to be effective in remodeling the structure of the brain both following injury & during the process of aging.
• Interventions based upon these principles of experience-dependent neuroplasticity & enriched environments is a growing focus of research in both BI & aging.
Enriched Environments

- Enriched environments provide opportunities for participation in everyday situations within the naturalistic environment of home & community that encourage:
  - role maintenance
  - purpose in life
  - cognitive health through lifelong learning & engagement in novel problem solving
  - social participation &
  - physical health

Engagement in Occupation

- Occupation means to engage in everyday tasks that have meaning & purpose.
- Occupational therapists design & implement occupations that are meaningful & purposeful to the person in an effort to promote physical, cognitive & mental health to enhance function, overcome disability or achieve a higher quality of life.

Occupation

- Occupations can be preparatory, purposeful or occupation-based
  - Preparatory occupations
    - active engagement may be limited
  - Purposeful occupations
    - facilitate development of performance skills &
  - Occupation-based
    - involve engagement in tasks that support & promote the person's values, needs, wants & interests & that are contextually relevant.
    - Neuroplasticity is at its peak when persons have mastered the performance skills & are engaged in “doing” the occupation.
**Person-Centered Approach**

- The therapist & individual collaborate to select & design occupations that have relevance to the person.
- Engagement in occupations that are person-centered is central to this approach, with the persons participation in occupation being the outcome.

**Teaching Learning Process**

- Neuroplasticity is enhanced through a person-centered teaching learning process.
- The therapist & the person collaborate through the use of mutual problem-solving to design strategies & select adaptive devices that may prove beneficial.

**Skill Mastery & Retention**

- Teaching novel skills should be followed up by actual practice.
- Feedback on performance enhances skill mastery & retention of newly learned skills.
- Re-adjustments based upon feedback improves performance.
- Renewed practice of re-adjustments helps to further master skills.
**Principles for Introducing New Experiences to Improve Performance Skills & Engagement in Occupation**

- Use It or Lose It
- Use It & Improve It
- Specificity
- Repetition Matters
- Intensity Matters
- Time Matters
- Salience Matters
- Age Matters
- Transference
- Interference

**Principle 1: Use It or Lose It**

- Learning changes the brain.
- Neural circuits not actively engaged in task performance for an extended period to time begin to degrade.
- Failing to engage a brain leads to further decline in function.
- *Functional recovery* can be supported by targeting residual areas of the brain bordering the damage & in regions connected to the site of the injury.

**Principle 1: Use It or Lose It**

- Experiences that provide novel learning protect neurons & networks that would otherwise be lost after BI & with age.
- This loss of neurons & networks can be minimized & *functional reorganization* promoted through engagement in occupation.
Principle 2: Use It & Improve It

- Plasticity can be induced within specific regions of the brain through engagement in newly learned or relearned occupations.
- Improvements in sensory & motor performance resultant in engagement in occupation are accompanied by plasticity within the cerebral cortex.
- Occupations that provide novel learning or relearning can be selected & designed to optimize restorative plasticity.

Principle 2: Use It & Improve It

- The match between the person's abilities & the occupation should include a collaboration between the person & the therapist to allow for the development, practice & integration of behavioral strategies.
- The match between the person's abilities & the environment should include a collaboration between the person & the therapist to allow for modifications to the home & or environment.

Principle 3: Specificity

- Skill acquisition through engagement in novel occupations that are both physical and/or cognitive in nature produce changes in patterns of neural connectivity.
- Both motor & cognitive skill acquisition are correlated with changes in the growth of dendrites, addition of synapses & neuronal activity in the brain.
- The literature suggests that engagement in occupations that target newly learned motor & cognitive skills are more effective in enhancing neuroplasticity than either one alone.
Principle 3: Specificity

- Changes in the activation of the motor cortex associated with skill acquisition are revealed using functional magnetic resonance imaging (fMRI) & in movement representations using transcranial magnetic stimulation (TMS).
- Occupations that require skilled movements & novel cognitive challenges enhance cortical excitability.
- Learning-induced brain changes show regional specificity.

Principle 3: Specificity

- Neuroplasticity & subsequent functional changes are dependent upon occupations specifically designed for the person based upon their injury & their self-identified goals.
- The implication for persons after BI with age are that specific types of occupations target & change a subset of neural circuitry.
- Occupations designed for specificity can target the region of the brain that borders the damage & the regions connected to the site of the injury.

Principle 4: Repetition Matters

- Repetition of newly learned (or relearned) skills is required to induce lasting neural changes.
- Plasticity requires not only the acquisition of a skill, but the continued performance of that skill over time.
- The plasticity brought about through repetition makes the acquired skill resistant to decline in the absence of engagement in occupation.
**Principle 4: Repetition Matters**

- Repetition of newly learned skills is critical to the stimulation of brain plasticity required for retention of newly acquired skills.
- Practice, feedback, re-adjustment & repeated practice stimulates the reorganization of the brain to allow persons to continue to utilize their functional skills outside of therapy & to continue to make functional gains.

**Principle 5: Intensity Matters**

- Occupations that require more intense skills increase the number of synapses over a longer length of time.
- Occupations that require novel learning of more intense skills & that include a motor component are most effective in inducing plasticity.

**Principle 6: Time Matters**

- Neuroplasticity associated with new skill acquisition is a process.
- Certain forms of plasticity precede & depend upon others.
- The ability to maintain change is negatively impacted by a lapse in time following engagement in the novel occupation.
- Enhanced synaptic responses are more susceptible during early phases of recovery than later.
**Principle 6: Time Matters**

- Consolidation of memories requires time.
- Given the dynamic changes in the neural environment that occur with BI & age, time is critical.
- Major cascades of neuronal reactions to BI & aging occur.
- The timing of engagement determines whether it is protective by sparing neurons & loss of neural connections or whether it stimulates reorganization of remaining connections.

**Principle 6: Time Matters**

- Neurons that form new synaptic connections receive more signals.
- Neurons that form new synaptic connections vary in their sensitivity.
- Early engagement in novel occupations is most effective immediately following the BI however the effects of continued engagement can continue to improve function.

**Principle 7: Salience Matters**

- Synaptic responses that stimulate the reward pathway (ventral tegmental area) provides reinforcement for continued engagement in the occupation.
- The strength of the emotions associated with the occupation plays an important role in modulating memory consolidation.
- The weight of importance of an occupation is another correlate with recovery of function, with motivation playing an essential role.
**Principle 8: Age Matters**

- Neuroplastic responses are altered with the process of aging.
- Experience-dependent synaptic potentiation, neural connections by remaining inputs & cortical map reorganization all reduce with age.
- Aging is associated with neuronal & synaptic atrophy & physiological decline.

**Principle 8: Age Matters**

- Plasticity is the mechanism by which the brain compensates for the effects of aging.
- Cognitive decline reflects the progressive failure of plasticity in compensating for impairments related to aging.
- The aging brain is responsive to engagement in occupation although the changes are less profound & occur more slowly.

**Principle 8: Age Matters**

- The process of aging can slow with novel experiences.
- The process of aging is minimized in persons who engage in occupations that require newly learned motor and/or cognitive skills.
Principle 9: Transference

- Transference refers to the ability of plasticity within one set of neural circuits to promote concurrent plasticity.
- Plasticity in response to engagement in occupation can enhance the acquisition of skills necessary for engagement in other occupations.

Principle 9: Transference

- Occupations that require specific motor skills increase the excitability of the neurons & expand the representation in the primary motor cortex.
- Occupations that require novel learning promote the formation of synaptic connections following BI with age.
- Newly learned motor & cognitive skills promote a fertile environment to support these connections & promotes neuronal growth & survival of vulnerable neurons.

Principle 10: Interference

- Interference refers to the ability of plasticity to impede the induction of new or expression of existing plasticity within the same circuitry which, in turn, impairs learning.
- Persons with BI who are aging can develop & utilize strategies that prevent brain plasticity but that make it easier to perform occupations.
- These compensatory strategies are adopted early & are reinforced with repetition & interfere with the acquisition of newly learned motor & cognitive skills.
Conclusion

- An understanding of the principles of experience-dependent neuroplasticity & enriched environments can provide a sound theoretical model for practicing clinicians in developing interventions for this population.
- Evidence-based practice suggests that exposure to environmental enrichment enhances functional outcomes.
- In addition to aiding functional recovery, environmental enrichment increases neuroplasticity following BI & with age.

References

Objectives:

1. Discuss the trends in mental illness over the age spectrum.

2. Identify risks related to chronic mental illness in the aging population.
THE AGED PATIENT WITH CHRONIC MENTAL ILLNESS

Alina Rais, MD, Associate Professor of Psychiatry
Nicholas Eilbeck, MD, Psychiatry Resident
Geriatric Medicine Symposium

Mental Illness In Numbers

- 26.2% (1 in 4) or 57.7 million age 18 and older suffer from mental illness in any given year
- 6% (1 in 7) suffer from serious mental illness
- 45% of those with mental illness will meet the criteria for having 2 or more disorders

Estimated Number of People with Psychiatric Disorders in USA

Jeste et al., Arch Gen Psychiatry, 1999
Prevalence of Mental Illness Varies by Age

<table>
<thead>
<tr>
<th>Adults 18-54</th>
<th>Older Adults 65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Disorder</td>
<td>Any Disorder</td>
</tr>
<tr>
<td>21%</td>
<td>19.8%</td>
</tr>
<tr>
<td>Any Anxiety Disorder</td>
<td>Any Anxiety Disorder</td>
</tr>
<tr>
<td>16.4%</td>
<td>11.4%</td>
</tr>
<tr>
<td>Any Mood Disorder</td>
<td>Any Mood Disorder</td>
</tr>
<tr>
<td>7.1%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>Schizophrenia</td>
</tr>
<tr>
<td>1.3%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Severe Cognitive Impairment</td>
<td>Severe Cognitive Impairment (Primarily Dementia)</td>
</tr>
<tr>
<td>1.2%</td>
<td>6.6%</td>
</tr>
<tr>
<td>Anti-Social Personality</td>
<td>Anti-Social Personality</td>
</tr>
<tr>
<td>2.1%</td>
<td></td>
</tr>
</tbody>
</table>

Prevalence

- 12-month Prevalence: 20.2% of U.S. adult population
- Severe: 20.7% of these cases (e.g., 5.6% U.S. adult population) are classified as “severe”

Demographics (for lifetime prevalence)

- Sex: Women are no more or less likely than men to experience any disorder over their lifetime
- Race: Non-Hispanic whites are 36% less likely than non-Hispanic whites to experience any disorder during their lifetime
- Age:

Service Use/Treatment Among U.S. Adults with Depression by Sex and Age

- Prevalence with Depression
  - Female
  - Male
  - 18-25
  - 26-49
  - 50+

Data courtesy of SAMHSA.
Lifespan perspective is important in understanding the psychopathology.

Krepein made the distinction between dementia, precox, and manic depressive psychosis by observing their pattern over a very long period of time.

Personality Disorders

- A rigid, pervasive pattern of behaviors and experiences that deviates from cultural standards.
- Personality is not fixed, and can change across the life span.
- 3 groups:
  - cluster A: paranoid, schizotypal, schizoid: odd and eccentric.
  - cluster B: antisocial, histrionic, borderline and narcissistic: dramatic, erratic
  - cluster C: avoidant dependent, obsessive-compulsive and personality disorder nos [passive aggressive, depressive]: anxious, fearful.
- Prevalence is from 0.5-2.5% of the general population.

Personality Disorders

- Personality disorder may attenuate, re-emerge or appear de novo.
- Costa and Mccrane conducted a cross sectional and longitudinal with NEO personality inventory.
- Concluded that there is general continuity of personality across the life span.
- Valliant follow up study of Harvard graduates: significant changes can occur related to either positive or negative adult life events.
- People with a rigid understanding of themselves are less able to employ mature defenses in negotiating age related changes.
Personality Disorders

- Longitudinal observations support the fact that:
  - Cluster B group [narcissistic, borderline, antisocial, histrionic] shows improvement over time.
  - Cluster A and C [schizoid, schizotypal, paranoid, avoidant, dependent, obsessive–compulsive] have a more chronic course.
  - All personality disorders are disposed to depression and the risk of depression may increase with age.
  - Having any PD increase the risk of developing dementia in later life.

Anxiety Disorders

- In the USA, 1 year prevalence for all anxiety disorders among adults 18-54 exceeds 16%.
- Women have a higher prevalence of 30%, whereas men have a prevalence of 19%.
- More frequent in lower socioeconomic status.
- Have an early age of onset, chronic, relapsing or recurrent course often leading to disability.
- Significant overlap [comorbidity] with mood and substance abuse disorders.

Early vs. Late-Onset GAD

- [Graph showing data from Le Roux, Gatz, & Wetherell, 2005]

Le Roux, Gatz, & Wetherell, 2005
Anxiety Disorders

- Estimated prevalence of anxiety in the older adult groups ranges from 3.2-14.2%.
- One study that included GAD, and using a national sample found a 12.2% prevalence.
- The Epidemiological Catchment Area (ECA) found 1 month prevalence of 5%.
- The national Comorbidity Survey-Replication found a 7% prevalence over 12 months.

Comorbidity in late-life depression and anxiety

- Depression alone
- With comorbid anxiety
- Anxiety alone
- With comorbid depression

Beekman et al., 2000 (LASA)

Older adults experience life transitions:

- Retirement
- Physical health problems
- Caregivers for their spouses
- Loss of loved ones
- Reduced economic resources
- Fears of being a burden for others
Medical Conditions

- Parkinson’s disease [45%]
- Cardiovascular problems [36-45%]
- Pulmonary disorders [18-50% of COPD patients]
- Endocrine problems
- Medications
  - Cognitive decline including dementia [5-21%]

Late-Life Anxiety Disorders

- Common
- Different risk factors
- Probably more vulnerable to harmful effects

In the clinical practice we see anxiety mostly as a comorbid symptom related to depression, neurodegenerative disorder (dementia, Parkinson’s disease)

Some times it is over diagnosed and mistreated

GAD is the most commonly seen and the most challenging in terms of treatment approaches.
Mood Disorders

- 20.9 millions or 9.5% of the US population will suffer from a mood disorder [MDD, Bipolar Mood Disorder]

- Major Depressive Disorder
  - Leading cause of disability
  - 14 million [6.7%]
  - Can develop at any age [median age 30]
  - Women more than man
**Bipolar Disorder**
- Overall worsening of symptoms
- Non specific presentation
- Could be related to long term medication management
- Decreased tolerance to medications that worked for many years [lithium]
- Medical illness complicating the course and the management of symptoms
- Aging and ability to tolerate medication
- BPD in elderly patient could occur or become complicated as a result of neurodegenerative disorder [vascular BPD]

**Depression**
- The prevalence of MDD decreases with age while depressive symptoms increase
- Only about 11% of depressed patients in primary care receive adequate treatment
- 34% received inadequate treatment and 55% received no treatment
- Many older adults who committed suicide have visited their PCP close to the time of the suicide: 20% same day and 40% within a week [Conwell 1994]
Suicide

- In 2006, 33,000 or 11 in 100,000 people died by suicide
- 90% of people who committed suicide had a diagnosable mental illness or substance abuse
- 4 times more men than women will die by suicide
- 2-3 times more women will attempt suicide
- Highest risk: white males over 85 years

Depression: Under-recognized and Under-treated in the Elderly

- Approximately 6% of people 65 and over have a diagnosable depressive symptom (2 million individuals)
- The direct and indirect cost of depression has been estimated at 43 billion each year
- In 1996, 18% of psychiatrists had a geriatric case load of 20%
- 30%-45% of patients in nursing homes
- 13% of residents in nursing homes who experience first episode of depression
Health Services Utilization in Depressed Elderly Patients

- \( P < 0.001 \) after controlling for comorbidity, type of insurance, and the use of antidepresants
- \( N = 3,481 \) primary care patients >65 years of age

Geriatric Depression: Can Look Different from Adult Depression

<table>
<thead>
<tr>
<th>Symptoms Domain</th>
<th>Adult Presentation</th>
<th>Geriatric Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood</td>
<td>Depressed</td>
<td>Weary, Hopeless, Angry</td>
</tr>
<tr>
<td></td>
<td>Anhedonic</td>
<td>Anxious</td>
</tr>
<tr>
<td></td>
<td>Suicidal Thoughts</td>
<td>Thoughts of death</td>
</tr>
<tr>
<td>Somatic</td>
<td></td>
<td>Pain and Somatic</td>
</tr>
<tr>
<td></td>
<td>Sleep</td>
<td>symptoms overlap with</td>
</tr>
<tr>
<td></td>
<td>Appetite</td>
<td>effects of medications,</td>
</tr>
<tr>
<td></td>
<td>Psychomotor</td>
<td>comorbid disease</td>
</tr>
<tr>
<td></td>
<td>Increased pain</td>
<td></td>
</tr>
<tr>
<td>Cognitive</td>
<td>Concentration</td>
<td>Selective attention</td>
</tr>
<tr>
<td></td>
<td>Indecisiveness</td>
<td>Working memory/retrieval</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New learning</td>
</tr>
</tbody>
</table>

Gallo et al. 1997; Geiselmann and Bauer 2000; Degroot 1994; Mazure et al. 2002; Lezec 1994; Lavreisky and Kumar 2002

Schizophrenia

- Life long relapsing and remitting illness affecting 1% of the population
- 50-70% of the patients have a chronic persistent course
- Patients have increased morbidity and mortality including suicide
- Patients have a higher degree of disability related to cognitive impairment and side effects of long term treatment with neuroleptics
- Atypical neuroleptics have a particular set of side effects [metabolic syndrome, increased mortality]
Schizophrenia

- There is marked heterogeneity in the course of the disease
- Few studies including elderly patients, or studied longitudinal biological changes
- Till 1990 the course of the disease in patient older than 55 was speculative
- Was thought that by the age of 55-60 the disease ran its course (burning out of psychotic symptoms)

- 10 studies were reviewed, 834 patients, ages 24-78
- Two distinct neurocognitive trajectories identified
  - No deterioration of IQ and gross cognitive status greater than associated with aging in a community dwelling outpatient population.
  - Significant decline in cognitive performance sometimes associated with the emergence of Tardive dyskinesia symptoms in middle age-elderly institutionalized patients.

- Delusions in late onset schizophrenia tend to involve greater suspiciousness/paranoia and tend to be more fixed, with patient’s having less insight into their delusional nature
- Hallucinations are less common in late onset schizophrenia and are reported by fewer than 35% of patients (versus 60% in patients with earlier onset). Over half of the patients with late onset schizophrenia reported attenuated psychotic symptoms (whispers, shadows) rather than clearly distinguishable phenomena.
- The levels of anxiety, depression and distress were equal in late onset and earlier-onset patients.
Schizophrenia

- Patients have three-fold higher mortality rates compared with the general population, corresponding to a 10-25 year reduction in life expectancy.
- Reasons for the reduced life expectancy:
  - Tend to lead less healthy lifestyles, with a greater prevalence on unhealthy diets, less physical activity, and increased rates of both smoking and substance abuse.
  - Antipsychotic drugs may have adverse effects
  - Physical illness is common, but tend to be diagnosed later and treated insufficiently
  - The risk of suicide and accidents is higher

- Antipsychotic drugs may have adverse effects
- Physical illness is common, but tend to be diagnosed later and treated insufficiently
- The risk of suicide and accidents is higher

Schizophrenia

- Treatment of non-resistant, late life schizophrenia with olanzapine and risperidone appears to be supported. However, data on geriatric patients are generally scarce, particularly for treatment resistant subpopulations, underscoring the need for more research in this area.
- Side effect profiles tend to be more frequent and severe in older adults. Adverse effects of antipsychotics in older adults include an increased risk of mortality and cerebrovascular events, as well as metabolic effects, extrapyramidal symptoms, falls, cognitive worsening, cardiac arrhythmia, and pneumonia. Sedation and anticholinergic effects are also more prominent.

Schizophrenia

- Possible mechanism for worsening side effect profiles may include:
  - Peripheral pharmacokinetic mechanism - a higher plasma level for a given oral dose in older individuals (referred to as peripheral pharmacokinetic hypothesis)
  - Age-related physiologic changes in liver and kidney functions
  - Older adults tend to be treated with polypharmacy and unexpected and unexplored drug-drug interactions could occur
  - Age-related sensitivity may be a result of increased central access from loosening of tight junctions in the blood-brain barrier, or decline in the function of P-glycoprotein, which results in a higher occupancy at a target site for a given plasma drug level
  - Age-related decline in receptor reserve, resulting in greater susceptibility to clinical and adverse effects at a given level of drug occupancy
Schizophrenia

- Deficits in many cognitive domains are common; however, "rapid forgetting," loss of crystallized knowledge, and greater than age-normal declines in cognitive function are rare and warrant a search for secondary causes.

- Lifetime number of affective episodes in bipolar disorder may adversely affect cognitive functions in bipolar disorder, but severe deficits and/or substantive declines over a period of a few years are unusual and warrant careful evaluation for secondary causes.

Schizophrenia

- The majority of older patients are well behind their healthy age-peers with respect to various aspects of social functioning. At the same time, a considerable heterogeneity among patients can be found. Cognitive abilities feature as a factor of major impact on social functioning, outweighing clinical support.
Objectives:

1. Present awareness to chronic illness in the aging.

2. Discuss the pitfalls of chronic illness in the aging.

3. Apply communications skills to improve chronic illness in the aging.
Aging with Chronic Illness

Thomas Gross MD

AGING AND FRAILTY
1) Human life 78 years old Japanese women 85
2) Data linear growth continues
3) Modest gain in healthy years
4) Increased compromised, after 70 sharp increase in Hospital, nursing homes, restricted activity.
5) Most older adults die of atherosclerosis, cancer, dementia
6) Oldest adults die of loss of muscle strength
7) Theory: compression of life (or facilitation of chronic illness decrease)
   Increase quality of life and length of life
8) Primary prevention: BMI, smoking, exercise

CONTAIN CHRONIC ILLNESS, DISABILITY, LATE IN LIFE

• Biology and Physiology Theory of Aging

• 1) Intrinsic: Programmed
   This emphasizes a biological timetable. Certain genes turn off others turn on.

• 2) Extrinsic: Environmental Assaults
   Aging is a result of gradual faults in cells and tissues due to outside forces.
CARDIOVASCULAR SYSTEM
Both structure and function of the heart and vascular system is affected with Aging.
Cardiac structure:
1) Echocardiography LV wall thickness increases with age
2) Loss of myocytes
3) Increase in myocyte volume
4) Lower myocardial mass due to cell loss and hypertrophy
5) Increase in myocardial stiffness, decrease compliance
6) Pacemaker cells decrease in number
Cardiac function:
1) LV early diastolic filling rate decreases to 50 %
2) More filling does occur in late diastole
3) Atrial contraction becomes more vigorous
4) LV ejection fraction (systolic function) is maintained but less reserve
5) Resting heart rate does not change
6) Stroke volume does not change
7) Maximal cardiac output decreases because max heart rate is 70 %

RESPIRATORY SYSTEM
1) Chest wall stiffens
2) Muscle strength decreases
3) decreased FEV1
4) Partial pressure of O2 decreases
5) Mismatch of ventilation and perfusion more prominent at exercise
6) O2 and CO2 drives diminish
7) Increase in dead space
8) Alveolar ducts increase in size
9) Surface area for diffusion decreases by 15%
10) FEV1 decreases by 30 ml/yr after 65 (about a 10 % decline per decade)
11) TLC maintains but shifts toward increasing residual declining vital
12) Higher alveolar arterial O2 gradients

RENAL SYSTEM
1) 25 % loss of renal mass from 30 to 85 years old
2) Increased hyalinization of blood vessels
3) Fewer glomeruli
4) Arteriosclerosis and arteriolar obliteration
5) Loss of nephrons due to ischemia
6) Interstitial fibrosis
7) Decreasing Na reabsorption and decrease in K secretion
8) GFR declines 50 to 65 %, from 30 to 80 years of age (healthy)
9) Intolerance to water deprivation or febs. Decreased urine concentration is not understood.
10) ANF increases with age, ADH levels are maintained, aldosterone decreases, Renin decreases, angiotensin II decreases, salt wasting exaggerated, and hypovolemic.
**GASTROINTESTINAL**

1. Neuromuscular degeneration
2. Decreased complex reflexes for swallow and propulsion
3. Muscle weakness
4. Cricopharyngeus upper esophageal sphincter alters
5. Contraction weakness, slowing
6. GERD increases
7. Gastric atrophy
8. Small bowel villi decrease in size
9. Colon muscle thickens
10. Elastin accumulation contributes to constipation
11. Diverticular disease

**ENDOCRINE**

1. About one third of life hormone deficiency
2. Menopause: first decade bone loss is rapid due to
3. Decreased estrogen
4. Then slow bone loss
5. Osteoporosis
6. Loss of estrogen causes increased LDL, lower HDL, increased atherogenesis, loss of cardiac function
7. Vasomotor symptoms, urogenital atrophy, mood, libido loss,
8. Men testosterone loss
9. DHEA, DHEA sulfate decline
10. SHBG, LH, FSH increase; libido, muscle, mood, sleep, osteoporosis
11. GH declines, IGF1 declines; decreased lean body mass
12. Thyroid changes, fibrosis, less T3
13. PTH increased, Ca increases, parathyroid decreases
14. Adrenal changes in diurnal cortisol
15. Higher evening cortisol
16. Increases of epinephrine but blunted responses

16) Increased in sleep disturbances, less deep sleep stages 3 and 4 and REM

**NEUROLOGICAL**

1. Cortical atrophy
2. Decreased cerebral volume
3. Increase in peripheral CSR
4. Neurodegenerative associated with neuronal loss
5. CBF declines
6. Decline in all senses
7. Overall slower mental responses, memory, cognitive, etc.
DISEASES, DIAGNOSES, TREATMENT, CONSIDERATIONS

AGING AND DEMENTIA

1) Progressive
2) Terminal
3) Palliative approach beneficial
4) Palliative care units vs. home based
5) Prevalence 1.5 % at 65 years old.
6) Doubles every 4 years
7) 30 % at 80 years
8) Average life expectancy is 4 years from onset
9) Memory loss, short term initially
10) Language early
11) Cognitive, communication, difficulty independence
12) Aggressiveness in 24 %
13) Daily activity of caring, eating, bathing, hygiene, dressing, delirium, falls Etc.,

PALLIATIVE APPROACH

14) Palliative care units vs. home based
15) Prevalence 1.5 % at 65 years old
16) Doubles every 4 years
17) 30 % at 80 years
18) Average life expectancy is 4 years from onset
19) Memory loss, short term initially
20) Language early
21) Cognitive, communication, difficulty independence
22) Aggressiveness in 24 %
23) Daily activity of caring, eating, bathing, hygiene, dressing, delirium, falls Etc.,

MENOPAUSE

1) Cessation of menstruation
2) diagnosed after 12 months of amenorrhea
3) loss of estrogen
4) average age 51.4
5) HT alleviates vasomotor, emotional complications, sleep disturbances,
6) In the 1990’s Long term HT (5-10 years) was advantageous for dementia, Osteoporosis, cardioprotective.
7) WHI increased CHD, stroke, and various thromboembolism (est-prog)
8) Reduction for fracture, colon cancer
9) Estrogen alone (hyst) slight increase in CHD, breast cancer, but reduced Hip fracture.
10) Peri or early post menopausal may derive CHD benefit but this is Controversial
11) Selective Est-receptor modulators (tamoxifen) decreased by 70 % CHD Osteoporosis, contralateral breast cancer in menopausal.
12) Raloxifene no relationship with CHD, but has shown increase fatal Stroke, and in venous thromboembolic

ANDROPAUSE

1) Testosterone drops after 40 at 1 % per year
2) Clinical vs chemical diagnosis Both very weak indicators
3) No clear improvement in flexibility, strength, hand grip, libido, some Relationship in bone density increase
4) Follow prostate size, PSA, hemoglobin

HT for women between 45 to 60 for vasomotor
14) HT not indicated for CVD protection in their 70
15) HT therapy started close to menopause transition is not resolved (vasomotor, urogenital)
16) SERMs bisphosphonates, H blockers, flecabolet lowering agents
17) Risk of breast cancer use of SERMs (ralsalene)
DHEA or DHEAS
1) Precursor of peripheral local production and action estrogens and androgens. No convincing studies to report.

GROWTH HORMONE
1) Declines 1% per decade
2) Treatment showed increase in bone density but lost after 12 months
3) No improvement in strength, 6M walk distance, functional capacity, did increase lean body mass
4) Adverse carpal tunnel, gynecomastia, fluid retention, hyperglycemia

GOALS
1) Self management
2) Pain free
3) Independence
4) Non restricted movement
5) Social awareness and interaction
6) Mental and cognitive function
7) Emotional stability
8) Physical strength, comfort
9) Problem solving
10) Coping mechanisms
11) Social support
12) Environmental resources
13) Prevention is key
14) Extending quality of life, not just life
Not Just Any Old Person: Improving the Health & Healthcare of Older Adults with Intellectual and Other Developmental Disabilities.

Carl V. Tyler, M.D.

Objectives:

1. Describe the epidemiology of elders with Intellectual and other Developmental Disabilities (I/DD) in the United States.

2. Compare the health and health service needs of elders with IDD to those of elders without I/DD.

3. Identify concrete ways you can improve the healthcare of elders with I/DD.
Not Just Any Old Person: Improving the Health and Health Care of Older Adults with Intellectual and Other Developmental Disabilities

Carl V. Tyler Jr, MD, MSc, CAQ-Geriatrics
Associate Professor
Medicine Institute
Cleveland Clinic Lerner College of Medicine
Case Western Reserve University

Learning objectives

After this presentation, the learner will be able to:

1. Describe the epidemiology of elders with intellectual and other developmental disabilities (IDD) residing in the United States
2. Compare the health and service needs of elders with IDD to those of elders without IDD
3. Identify concrete ways you can improve the healthcare of elders with IDD

Epidemiology of Elders with IDD
Developmental Disability

Severe chronic disability
- Manifesting before age 22
- Due to physical and/or mental impairment
- Resulting in substantial functional limitations in 3 or more of the following life activities: (1) self-care; (2) receptive & expressive language; (3) learning; (4) mobility; (5) self-direction; (6) capacity for independent living; (7) economic sufficiency

Increasing Life Expectancy for Persons with IDD

<table>
<thead>
<tr>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 1930s: 14.9 years</td>
<td>• 1930s: 22 years</td>
</tr>
<tr>
<td>• 1970s: 54.1 years</td>
<td>• 1970s: 49.8 years</td>
</tr>
<tr>
<td>• 1980s: 65.5 years</td>
<td>• 1980s: 65.5 years</td>
</tr>
<tr>
<td>• Current:</td>
<td>• Current:</td>
</tr>
<tr>
<td>- 76.9 years (mild IDD)</td>
<td>- 76.9 years (mild IDD)</td>
</tr>
<tr>
<td>- 50 years (severe IDD)</td>
<td>- 50 years (severe IDD)</td>
</tr>
</tbody>
</table>

Specific Developmental Disabilities in U.S. Children Aged 3-17 Years*

<table>
<thead>
<tr>
<th>Disability</th>
<th>Percent Change between 1997-1999 and 2006-2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any developmental disability</td>
<td>7.6%</td>
</tr>
<tr>
<td>ADHD</td>
<td>22.3%</td>
</tr>
<tr>
<td>Autism</td>
<td>29.5%*</td>
</tr>
<tr>
<td>Receptive &amp; expressive language</td>
<td>8.4%</td>
</tr>
<tr>
<td>Central policy</td>
<td>3.4%</td>
</tr>
<tr>
<td>Moderate or profound hearing loss</td>
<td>3.4%</td>
</tr>
<tr>
<td>Learning disability</td>
<td>3.5%</td>
</tr>
<tr>
<td>Intellectual disability</td>
<td>1.5%</td>
</tr>
<tr>
<td>Selectively deaf, past 12 months</td>
<td>9.1%</td>
</tr>
<tr>
<td>Speech or language, past 12 months</td>
<td>8.1%</td>
</tr>
<tr>
<td>Other developmental delay</td>
<td>3.7%*</td>
</tr>
</tbody>
</table>

Population Prevalence of Elders with IDD

- In USA in the year 2000, an estimated 641,000 adults with IDD were older than age 60
- Their number will increase by 3 fold to nearly 2 million persons in 2020
Health & Service Needs

Challenges of Longevity

- Survivors of institutionalization and lifetimes of poor lifestyles and sub-optimal health care
- Risk for secondary disabilities
- Unique aging trajectories with specific syndromes
  - Higher incidence of Alzheimer's dementia in Down's Syndrome
- Specific needs for residential alternatives, long term financial and legal planning, and medical care

Relative Prevalence of Co-morbid Conditions in Aging Adults with IDD Compared to Adults without IDD

<table>
<thead>
<tr>
<th>Conditions with Higher Prevalence</th>
<th>Conditions with Similar Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Depression</td>
<td>Ischemic heart disease</td>
</tr>
<tr>
<td>Fatal respiratory infections</td>
<td>CVA</td>
</tr>
<tr>
<td>Dementia</td>
<td></td>
</tr>
<tr>
<td>Thyroid conditions</td>
<td></td>
</tr>
<tr>
<td>Cardiac arrhythmias</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td></td>
</tr>
</tbody>
</table>
Common Chronic Diseases in Elders with IDD
Under-recognized- Under-diagnosed- Poorly Managed

<table>
<thead>
<tr>
<th>Epilepsy</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysphagia</td>
<td>Hypothyroidism</td>
</tr>
<tr>
<td>GERD</td>
<td>Smoking</td>
</tr>
<tr>
<td>Chronic constipation</td>
<td></td>
</tr>
<tr>
<td>Dental disease</td>
<td></td>
</tr>
<tr>
<td>Sensory impairment</td>
<td></td>
</tr>
<tr>
<td>Psychiatric disorders</td>
<td></td>
</tr>
<tr>
<td>Osteoporosis</td>
<td></td>
</tr>
</tbody>
</table>

Cause-Specific Mortality

<table>
<thead>
<tr>
<th>Common causes</th>
<th>Rare causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>Accidents</td>
</tr>
<tr>
<td>Respiratory infections</td>
<td>Homicide</td>
</tr>
<tr>
<td>Cancer</td>
<td>Suicide</td>
</tr>
<tr>
<td>Seizures</td>
<td>Smoking, alcohol</td>
</tr>
</tbody>
</table>

Common Causes of Change in Adaptive Functioning include:

1. Sensory impairments
2. Painful conditions
3. Mental health disorders
4. Adverse drug effects
Sensory Impairments

- Visual (Optic Atrophy, Glaucoma, Keratoconus)
- Auditory (Conductive, Sensori-neural)

Consider when elders with IDD:
- Avoid social interactions
- Are reluctant to leave familiar environments
- Show a decline in work performance
- Regress in self-care abilities

Sensory impairment: Vision

Visual impairment:
- Higher prevalence of cataracts, refractive error, glaucoma, and retinopathy
- Occurrences at earlier ages
- Screening Recommendation:
  Ocular examination every 2 years by optometrist or ophthalmologist

Sensory impairment: Hearing

Hearing loss:
- 25% in IDD individuals 65-75 years
- 50% in those >75 years
- 70% in persons with DS age 50-59 years
- Screening Recommendation:
  Otoscopic exam every encounter
  Audiometry q2 years
Oral Health

- Dental abscess
- Periodontal disease

Consider when elders with IDD:
- Avoid eating & lose weight
- Have foul breath
- Change food preferences
- Self-injure to face
- Are irritable

Gastro-intestinal Problems

- Dysphagia
- Constipation
- GERD, Peptic Ulcer Disease, H Pylori

Consider when elders with IDD:
- Self-injure
- Are irritable or cough when eating
- Have disturbed sleep
- Eat poorly, vomit repeatedly & lose weight
- Have unexplained anemia

Thyroid disease & Down syndrome

- High prevalence of thyroid disorders
  - Lifetime prevalence up to 40%
  - Compensated hypothyroidism
- Difficult to recognize clinically
- Annual TSH and T4 recommended
- High prevalence of thyroid auto-antibodies
- Rarer reports of hyperthyroidism
Celiac Disease & Down Syndrome

- Prevalence ~10% in DS and Turner's
- No difference in symptoms of vomiting, abd pain, abnormal bowels in DS with or w/out celiac disease
- Bloating more frequent in celiac disease
- Consider: targeted screening of persons with hypothyroidism, anemia, or type 1 diabetes
- No expert recommendations on screening silent disease

Musculoskeletal Conditions

- Degenerative Joint Disease
- Osteoporosis/Osteomalacia
- Spinal instability, stenosis, radiculopathy

Consider when elders with IDD manifest:

Musculoskeletal Disorders & Down syndrome

- Spinal degenerative disease
- Osteoarthritis
- Patellar subluxation
- Osteoporosis, osteomalacia & fracture
- Gout
- Ankle pronation
Musculoskeletal disorders in Cerebral Palsy

- Spasticity
- Degenerative joint disease
- Fragility Fractures
  - 5 X more likely in adults with cerebral palsy
- Fatigue
- Chronic pain

Musculoskeletal disorders

- Immobility decreases strength by 1% to 1.5% per day.
- Muscle loss due to immobility is greatest in the quadriceps and other extensor groups
- Anti-Epileptic Drugs, heparin, PPI and SSRIs accelerate bone loss.

Management: MSK disorders

- Screen for osteoporosis
- Monitor changes in physical & adaptive functioning
- Physical therapy to maintain function and prevent contractures
- Optimize pharmacotherapy for spasticity
Spine Disease & Down Syndrome

- Spinal cord compression occurs due to
  - ligamentous laxity
  - atlanto-axial instability
  - atlanto-occipital instability
- compression fractures
- congenital & acquired spinal & foraminal stenosis

Screen for Spine Disease

- Instruct caregivers to observe & report
  - Change in neck posturing, strength in limbs, bowel or bladder function, gait
- Examine for weakness, clonus, gait abnormalities, spasticity, ↑ DTRs, Babinski
- C-spine plain X rays not useful to screen for AAI in asymptomatic persons

Neurological Conditions

- Seizures
- Compressive neuropathies at wrist, elbow, knee, ankle
- Sleep disorders
- Alzheimer’s disease

Consider when elders with IDD:
  - Have staring spells, or have repetitive movements
  - Lose strength in hand grip
  - Change their walking pattern
  - Exhibit daytime sleepiness
  - Assume unusual sleeping positions
Peripheral Neuropathies: Upper Extremities

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Sensory</th>
<th>Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>Digits 1-4</td>
<td>Pinch grasp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Holding utensils</td>
</tr>
<tr>
<td>Ulnar (elbow)</td>
<td>Digits 4&amp;5</td>
<td>Interossei</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Finger &amp; wrist flexion</td>
</tr>
<tr>
<td>Ulnar (wrist)</td>
<td>Digits 4&amp;5</td>
<td>Interossei</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less effect on finger flexors</td>
</tr>
<tr>
<td>Radial</td>
<td>Dorsum hand, posterior forearm</td>
<td>Wrist finger ext</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brachioradialis</td>
</tr>
</tbody>
</table>

Peripheral Neuropathies: Lower Extremities

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Sensory</th>
<th>Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral</td>
<td>Anteromedial thigh, knee, leg and medial foot</td>
<td>Cannot walk, standing unstable</td>
</tr>
<tr>
<td>Sciatic (complete)</td>
<td>Sole and dorsum foot, lateral aspect of leg</td>
<td>All muscles below knee</td>
</tr>
<tr>
<td>Common peroneal</td>
<td>Dorsum of foot and ankle, lateral aspect of leg</td>
<td>Acquired equinovarus, anterior and lateral compartments of leg, short extensors of toes</td>
</tr>
<tr>
<td>Tibial</td>
<td>Sole of foot (prone to ulcers)</td>
<td>Acquired calcaneovarus, plantar flexion and inversion of foot, loss of ankle DTR</td>
</tr>
</tbody>
</table>

Alzheimer’s Disease In Down Syndrome

- Neuropathology by age 35 in all adults with Down Syndrome
- Mean age clinical diagnosis = 51 years
- Some live > 70 years without evident AD

<table>
<thead>
<tr>
<th>Age</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>40-49</td>
<td>10-25%</td>
</tr>
<tr>
<td>50-59</td>
<td>20%-50%</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>60-75%</td>
</tr>
</tbody>
</table>
AD: Early Stage

- Main symptoms: confusion, disorientation, wandering
- Subtle memory loss & deficits in visuo-spatial orientation
- Behavioral changes
  - Selective attention
  - Exaggeration of long-standing traits
  - Inability to perform job duties
  - Maladaptive behaviors

AD: Early Stage (continued)

- Visual deficiencies
  - Peripheral visual disorders made worse by ocular pathology
  - Responsible for getting lost, tasks requiring visuomotor coordination, accidents & falls, difficulty learning
- Loss of language & communication skills
- Impairment in social & adaptive skills
- Loss of Activities of daily living skills

AD: Middle Stage

- Dependent on others in basic ADLs
- Reduced communication
- Behavior problems exaggerated
  - Psychotic behavior
- Dysphagia with choking episodes
- Progressive gait disorder
  - Parkinsonism
- Epileptic seizures
AD: Late Stage

- Total dependence on others
- Bed-confined with marked rigidity & little voluntary movement
- Duration from first symptoms to death around 9 years (7-11 years)
- Duration from clinical diagnosis to death around 8 years (5-12 years)

AD: Neuroimaging

- CT recommended to R/O subdural collections, tumors, multiple infarcts
  - Bilateral symmetric basal ganglia calcifications are frequent but unrelated to AD
  - Cerebral atrophy & ventricular enlargement associated with AD
- MRI may show decrease in hippocampus & medial temporal lobe in adults w/o dementia

Screening Tools

- Adaptive Behavior Dementia Questionnaire
- Dementia Scale for Down Syndrome
- Dementia Scale for Mentally Retarded Persons
- DSQIID
Functional Assessment Staging (FAST)

1. No difficulties
2. Subjective forgetfulness
3. Decreased job functioning and organizational capacity
4. Difficulty with complex tasks, instrumental ADLs
5. Supervision with ADLs
6. Impaired ADLs, with incontinence
7. A. Ability to speak limited to six words
   B. Ability to speak limited to single word
8. C. Loss of ambulation
   D. Inability to sit
   E. Inability to smile
   F. Inability to hold head up

Monitoring: FAST

- Categorizes patient’s abilities perform bADLs and respond to environment
- Assists in decision-making re: supportive programs & residential needs
- Administer at Dx, q 6 months, & whenever significant change in status

Alzheimer’s Disease Medications & Down syndrome

- Cholinesterase Inhibitors-
  - Limited evidence in DS
- Namenda - no evidence of benefit in DS
- Recognize and treat co-morbid depression or anxiety

Mohan M, Carpenter PK. Cochrane Database of Systematic Reviews 2009
Hospice eligibility for AD

1. Stage 7 on FAST
2. Co-morbid conditions (combined effect with AD support a < 6 months prognosis): CHF, COPD, cancer, neuro, renal or liver failure etc
3. One of the following in the past 12 months:
   - Delirium, recurrent infections, sepsis, multiple stage 3-4 pressure ulcers, 10% wt loss in 6 months/albumin<2.5, aspiration pneumonia

Eligibility: 1+2 or 3

ABDQ

<table>
<thead>
<tr>
<th>Question</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are they able to dress themselves better/worse than normal?</td>
</tr>
<tr>
<td>2</td>
<td>Can they use their hands better/worse than normal?</td>
</tr>
<tr>
<td>3</td>
<td>Are they able to have a conversation better/worse than normal?</td>
</tr>
<tr>
<td>4</td>
<td>Is their awareness of time better/worse than normal?</td>
</tr>
<tr>
<td>5</td>
<td>Do they help to prepare food better/worse than normal?</td>
</tr>
<tr>
<td>6</td>
<td>Do they help to clear the tables better/worse than normal?</td>
</tr>
<tr>
<td>7</td>
<td>Are they able to perform daily jobs better/worse than normal?</td>
</tr>
<tr>
<td>8</td>
<td>Do they carry out simple jobs better/worse than normal?</td>
</tr>
<tr>
<td>9</td>
<td>Is their presence in doing activities better/worse than normal?</td>
</tr>
<tr>
<td>10</td>
<td>Do they take care of their personal belongings better/worse than normal?</td>
</tr>
<tr>
<td>11</td>
<td>Is their cooperation better/worse than normal?</td>
</tr>
<tr>
<td>12</td>
<td>Do they participate in group activities better/worse than normal?</td>
</tr>
<tr>
<td>13</td>
<td>Is their ability to do things independently better/worse than normal?</td>
</tr>
</tbody>
</table>

Exercise

- Wheelchair bound individuals can participate in exercise programs too!
- Rehabilitation psychologist can help overcome fears if the program is overwhelming
- Group exercises and exercise partners can promote adoption & adherence to physical activity programs
7 Principles of Health Care in Adults with IDD

Principle 1

Adults with IDD often have unmet health care needs

- Preventive health care
- Diagnosis
- Treatment

Adults with IDD have similar cardiovascular risk profiles as the general population

1. True
2. False
Principle 2

Adults with certain syndromes have additional specific health care needs

Preventive health care
Associated conditions
Secondary disabilities

Conditions associated with Down syndrome include:

1. Dementia
2. Gout
3. Osteoporosis
4. Celiac sprue
5. #1 & #3
6. #1, #2, #3, #4

Individuals with Down Syndrome carry an increased risk for the following cancers:

1. Leukemia
2. Breast
3. Testicular
4. Colon
5. #1 & #3
6. All of the above
Principle 3

Understanding the cause of the developmental disability may help with health care planning

Example: People with chronic lung disease often have anxiety which contributes to their shortness of breath; medications to treat the lung disease may worsen the anxiety

Principle 4

Physical Health and Mental Health problems often co-exist and contribute to each other

Example: People with chronic lung disease often have anxiety which contributes to their shortness of breath; medications to treat the lung disease may worsen the anxiety
Principle 5

Behavioral problems may be due to underlying medical conditions

Example: Self-injurious behavior may be due to constipation, a bleeding stomach ulcer, or an infected tooth

Common causes of facial self-injurious behavior include:

1. Caries
2. Sinusitis
3. Otitis Media
4. Headache
5. #2 & #4
6. All

Principle 6

Some conditions occur more frequently in adults with IDD

Examples: Osteoporosis, dysphagia, seizures, dental problems
Principle 7

All adults with IDD need a Primary Care Physician

Primary care physicians provide preventive care, recognize drug interactions & side effects, coordinate care, and help prioritize health care needs.
The Role of Exercise in Healthy Aging with Diabetes

Rick Black, P.T., D.P.T., M.S., G.C.S.

Objectives:

1. Describe problems associated with aging & diabetes.

2. Describe benefits of exercise on diabetes and age associated problems.

3. Discuss strategies to help people with diabetes to exercise.
The Role of Exercise in Healthy Aging with Diabetes

17th Annual Geriatric Medicine Symposium: Health, Wellness & Aging with Disabilities or Chronic Illness

Rick Black, PT, DPT, MS, GCS
Corporate Rehabilitation Consultant
HCR ManorCare

Objectives

• Participants will be able to:
  1. Describe problems associated with aging & diabetes.
  2. Discuss benefits of exercise on diabetes and age associated problems.
  3. Describe strategies to help people with diabetes to exercise.

Diabetes Statistics

• 366 million people worldwide have diabetes (IFD)
• 2010- 25.8 million people in US had diabetes
• 27% of US residents >65 yo have diabetes
• 7th Leading cause of death in US
• 2007- Direct/Indirect cost of diabetes was $174 Billion dollars (USA only)
• Risk of Death 2x> for people with DM vs. non-DM of same age

CDC, National Diabetes Fact Sheet, 2011
Older Adults with Diabetes

- Have higher rates of:
  - Premature death
  - Functional disability
  - HTN
  - CHD
  - Stroke

Diabetes Care, Standards of Medical Care in Diabetes - 2013 Volume 36, Supplement 1, Jan 2013, S11-S66

Greater risk for:

- Polypharmacy
- Depression
- Cognitive impairment
- Urinary incontinence
- Injurious falls
- Persistent pain

Diabetes Care, Standards of Medical Care in Diabetes - 2013 Volume 36, Supplement 1, Jan 2013, S11-S66

Accelerated Aging

- Age related conditions occur at an earlier age for people with diabetes.
  - Cognitive Impairment
  - Falls
  - Incontinence
  - Low BMI
  - Dizziness
  - Vision impairment
  - Hearing impairment
  - Pain

Intensive Lifestyle Intervention

- Intensive Lifestyle Intervention (Diet & Exercise) can prevent or reverse DMII


ADA Standards of Medical Care - 2013

- Guidelines for Physical Activity
  - “People with diabetes should be advised to perform at least 150 min/wk of moderate-intensity aerobic physical activity (50-70% of max HR)”
  - “In the absence of contraindications, people with type 2 diabetes should be encouraged to perform resistance training at least twice per wk.”

Diabetes Care, Jan, 2013, Vol36: S11-66

Muscle Tissue

- Largest Glucose absorbing organ in the body.
- Accounts for ~80% of total body glucose disposal

Acute Adaptations with Exercise

• Acute
  – Muscle Contractions- increase glucose uptake- Insulin independent
  – Glycogen depletion- stimulates glucose uptake

Chronic Adaptations with Exercise

• Enhanced responsiveness to insulin
• Increased expression/activity of proteins
• Increased insulin signal transduction such as adenosine monophosphate activated protein kinase
• Increased lipid oxidative capacity in s. muscle
• Improved muscle mitochondrial function
• Increased glucose effectiveness

Clinical Considerations

• Thorough Medical History
• Cardiopulmonary Screening
• Diabetic Foot Exam
• Neuropathy Screening
  – Peripheral Neuropathy
  – Autonomic Neuropathy
• Peripheral Arterial Disease (PAD)
Exercise Testing

- Monitoring Tolerance to Exercise
- EKG
- Stress Testing

Type 1 vs. Type 2
Effect of Exercise on Blood Glucose

- Strong evidence to show that exercise can lead to a reduction in blood glucose in patient with DM2.
- Evidence for exercise to lower HbA1c in DM1 is inconsistent and weak.

Aerobic Training

- **Author**: Bjorgaas et al. (2004), n=29
  - **Types of Exercise**: light jogging, coordination exercises, knee bends, stretching. Monitored activity with pedometer on off days.
  - **Duration**: 90 mins, 12 wks
  - **Frequency**: 2x/wk
  - **Intensity**: aimed to keep intensity to 50-85% of MaxHR.
  - **Results**: HbA1c decreased by .5% in high attendance and .4% in low attendance.

*Bjorgaas, Diabetes Obes Metab. 2005;7(6):737-744*
The Role of Exercise in Healthy Aging with Diabetes

Strength Training

- **Types of Exercise:** PRT- 5-12 exercises focusing on large muscle groups, e.g. chest & hip & knee extensors, upper back, knee flex, lats, etc.
- **Duration:** 30-45 min sessions/16-26 wks
- **Frequency:** 3x/wk
- **Intensity:** Beginning 50-60% 1 RM, Progress to 70-85% 1RM, 3 x 8 reps, one study- 6 x 10-15 reps to exhaustion
- **Results:** HbA1c decreased by 1.1-1.2%

Castaneda, Diabetes Care. 2002 Dec; 25(12):2335-41
Cauza, Arch PM&R. 2005 Aug; 86(8)

Aerobic & Strength Training

DARE Clinical Trial

Diabetes Aerobic & Resistance Exercise

<table>
<thead>
<tr>
<th>Group</th>
<th>Change in HbA1c</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic</td>
<td>7.41 to 6.98%</td>
<td>-0.43%</td>
</tr>
<tr>
<td>Resistance</td>
<td>7.48 to 7.18%</td>
<td>-0.3%</td>
</tr>
<tr>
<td>Combined</td>
<td>7.46 to 6.56%</td>
<td>-0.9%</td>
</tr>
<tr>
<td>Control</td>
<td>7.44 to 7.51%</td>
<td>+0.07%</td>
</tr>
</tbody>
</table>

Effect of Aerobic & Strength Training is Additive

Sigal, Annals of Int Med. 2007:357-69

Physical Activity Advice vs. Structured Exercise Program

Meta-analysis

<table>
<thead>
<tr>
<th>Groups</th>
<th>Reduction in HbA1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic Exercise</td>
<td>-.73%</td>
</tr>
<tr>
<td>Structured Resistance</td>
<td>-.57%</td>
</tr>
<tr>
<td>Aerobic &amp; Resistance</td>
<td>-.51%</td>
</tr>
<tr>
<td>Physical Activity Advice*</td>
<td>-.43% Not Significant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration of Exercise</th>
<th>Reduction in HbA1c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise &gt; 150 min/wk</td>
<td>-.89%</td>
</tr>
<tr>
<td>Exercise &lt;150 min/wk</td>
<td>-.36%</td>
</tr>
</tbody>
</table>

Supervision

- Supervision and adequate intensity of exercise is necessary to maintain the glycemic control obtained from a six month supervised gym based resistance exercise training program.
- Home based resistance training did not maintain reduction in HbA1c achieved with a six month supervised gym based resistance exercise training program.

Dunstan, Diabetes Care, Jan, 2005, 28 (2):3-9

Treatment Effect on HbA1c

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Reduction in HbA1c</th>
<th>Reduction in BG (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise (DM2)*</td>
<td>0.67%</td>
<td>19</td>
</tr>
<tr>
<td>Insulin, sulfonylureas, &amp; Metformin</td>
<td>1-2%</td>
<td>29-58</td>
</tr>
<tr>
<td>α-glucosidase inhibitors, glitazones, eglitinides</td>
<td>0.5-2%</td>
<td>14.5-58</td>
</tr>
<tr>
<td>Exenatide</td>
<td>~1%</td>
<td>29</td>
</tr>
<tr>
<td>Pramlintide</td>
<td>~0.5%</td>
<td>14.5</td>
</tr>
<tr>
<td>Sitagliptin</td>
<td>~0.8%</td>
<td>23</td>
</tr>
</tbody>
</table>


Contraindications to Intense Exercise

- BG > 300 mg/dl with presence of ketones
- BG < 100 mg/dl
- Proliferative diabetic retinopathy (PDR)
- Severe nonproliferative diabetic retinopathy (NPDR)
- Autonomic Neuropathy (should undergo cardiac investigation prior to beginning more intense exercise program)
- Uncontrolled HTN

Effect of Exercise on Blood Glucose is dependant on:

- BG levels at start of exercise
- Type of exercise
- Intensity of exercise
- Type of antidiabetic medication
- Timing of antidiabetic medication

Monitoring Blood Glucose with Exercise

- When adjusting to a new exercise program a patient should test BG:
  - Before
  - During
  - Immediately after
  - 2-3 hours after

Managing Hyper & Hypoglycemia associated with exercise

- Desired outcome
  - Long term- Decrease Hyperglycemia
  - Short term- Avoid Hypoglycemia
Hyperglycemia

- Not necessary to postpone exercise if blood glucose is high as long as:
  - Pt feels well
  - Blood and urine ketones are negative
  - Exercise can worsen ketosis

Pts on insulin, sulfonylureas, insulin secretagogues at increased risk of hypoglycemia with exercise

Symptoms of Hypoglycemia

**Initially**
- Headache
- Fatigue
- Tremor
- Hunger
- Tachycardia
- Sweating
- Anxiety
- Confusion

**Severe Hypoglycemia**
- Loss of consciousness
- Convulsions
- Death
The Role of Exercise in Healthy Aging with Diabetes

Counter Regulatory Response

<table>
<thead>
<tr>
<th>BG (mg/dl)</th>
<th>Insulin Declines</th>
<th>Glucagon &amp; Epinephrine Increases</th>
<th>Autonomic &amp; Neuroglycopenic Symptoms Appear</th>
<th>Severe Hypoglycemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Strategies for Management of Blood Glucose during/after Exercise

- Reduce pre-exercise bolus insulin
- Reduce pre-exercise basal insulin
- Take extra CHO with exercise
- Pre-exercise or post exercise sprint
- Insulin pump therapy
- Reduce basal insulin post exercise

Age Associated Problems that benefit from Exercise

- Osteoarthritis
- Osteoporosis
- Dementia
- Heart Disease
- Falls
- Sarcopenia
- Loss of mobility
Diabetes Associated Problems the benefit from Exercise

- Heart Disease
- PVD
- Peripheral neuropathy
- Autonomic neuropathy

Improving Exercise Compliance

Multi-levels of Influence

- Individual- self efficacy, pain, impairments
- Interpersonal- professionals, family, friends
- Environmental- walkability, parks, shops & stores nearby

Starting an Exercise Program

- Begin gradually
- Divide up bouts of exercise into smaller chunks
- Set reasonable goals
- Choose activities the patient finds enjoyable
- Use exercise journal or calendar to record activity level
- Address impairments
- Enlist support of family & friends
- Regularly follow up to monitor progress

Summary

- Diabetes is a worldwide problem
- Exercise can be critical for controlling blood glucose
- Exercise type, frequency, intensity & duration are important
- Multiple benefits from exercise
- Must be aware of strategies to prevent hypo & hyperglycemia

Thank you

- Rick Black
  - rblack@hcr-manorcare.com
HIV & AGING
“Growing Old with HIV”
Robert L. Brandt, Jr., M.D., FAAFP, AAHIVS

Objectives:

1. Explain that by the year 2015 in the USA, greater than 50% of those living with HIV will be ages 50 and over.

2. Discuss the risks of malignancies, and explain how they are greater in HIV infected individuals over the age of 50, than uninfected individuals.

3. Present chronic health issues that appear at younger ages and higher rates in people with HIV disease.
HIV & Aging
“Growing Old with HIV”
Robert L. Brandt, Jr., MD
FAAFP, AAHIVS
03/01/2013

PROGRAM OVERVIEW

- Epidemiology of HIV infection in the United States by age

- Clinical considerations in aging patients with HIV
  - Virologic and immunologic response in HIV-infected patients ≥50 years treated with ART
  - HIV disease progression
  - Risk of adverse events following ART initiation

- Aging-related comorbidities in patients with HIV
  - Chronic kidney disease
  - BMD loss
  - CVD
  - Neurocognitive abnormalities
  - Risk of malignancy

ART, antiretroviral therapy; BMD, bone mineral density; CVD, cardiovascular disease.

Global HIV/AIDS Epidemic

- An estimated 33.3 million people are living with HIV worldwide as of 2009
  - 30.8 million adults
  - 15.9 million women
  - 2.5 million children under 15 years of age

- Approximately 2.6 million new HIV infections occurred in 2009

- Estimated 1.8 million deaths occurred in 2009 due to AIDS

Estimated Rates of HIV Infection in Adults and Adolescents
40 States and 5 US Dependent Areas, Year-end 2008
N = 679,590

Adapted from: CDC. 2009. 21. Table 21.

Estimated HIV Rate per 100,000:
- <100
- 100.0-199.9
- 200.0-299.9
- ≥300.0

Awareness of HIV Status in the US

<table>
<thead>
<tr>
<th>HIV estimated prevalence¹</th>
<th>1,056,400 - 1,156,400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undiagnosed²</td>
<td>232,700</td>
</tr>
<tr>
<td>Estimated new annual infections (2006)²</td>
<td>56,300</td>
</tr>
</tbody>
</table>

- From 2006 to 2009, the estimated number and rate of newly diagnosed HIV infection cases in the 40 states with confidential name-based HIV infection reporting remained stable³


US Population and HIV Prevalence by Race/Ethnicity

US Population (40 States, 2009) (N = 241,832,054)¹
- White: 68%
- Black: 13%
- Hispanic/Latino: 13%
- Other: <5%

Estimated HIV Prevalence by Race/Ethnicity (40 States, Through Year-end 2008) (N = 663,084)²
- White: 32%
- Black: 48%
- Hispanic/Latino: 17%
- Other: <2%

Trends in Age-Adjusted Annual Rates of Death Due to HIV Disease by Race/Ethnicity (US, 1990-2007)

Note: For comparison with data for 1999 and later years, data for 1990-1998 were modified to account for ICD-10 rules instead of ICD-9 rules.

Note: The age distribution of 2000 US population.


AIDS Diagnoses Among Adults and Adolescents, by Race/Ethnicity and Year of Diagnosis, 1985-2009

Note: All displayed data have been statistically adjusted to account for reporting delays, but not for incomplete reporting.

Note: Hispanics/Latinos can be of any race.


Distribution and Rates of Diagnoses of HIV Infection in Adults and Adolescents, by Race/Ethnicity and Sex (US, 2009)

Note: All data are from confidential name-based HIV infection reporting.

Note: Estimates may vary by state based on differences in reporting completeness and procedures for estimating delays in reporting.

Note: Hispanics/Latinos can be of any race.


1 Adapted from CDC. HIV Surveillance Report, 2009. Vol. 20. Table 1b.

Estimated HIV Infection Prevalence by Age and Gender in the US (Through End of 2008)

Estimated Persons Living With a Diagnosis of HIV Infection by Age (N = 682,668)

<table>
<thead>
<tr>
<th>Age</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-24</td>
<td>4.4%</td>
</tr>
<tr>
<td>25-34</td>
<td>14.2%</td>
</tr>
<tr>
<td>35-44</td>
<td>31.9%</td>
</tr>
<tr>
<td>45-54</td>
<td>33.7%</td>
</tr>
<tr>
<td>55-64</td>
<td>16.3%</td>
</tr>
</tbody>
</table>

- At the end of 2008:
  - 72% of all adults and adolescents living with a diagnosis of HIV infection were male and 28% were female.


- Estimated rates resulted from statistical adjustment that accounted for reporting delays, but not for incomplete reporting.
- 40 states and 5 US dependent areas with confidential name-based HIV infection reporting.

Case: 53 y/o wmale

- Presents with Sx’s of fatigue, he thinks more than should be happening. Not SOB, No chest Pain. Not seen a PCP in 10 years.
- Past Hx: Tonsilectomy and appendectomy as child. No Hx of chronic illness. Turned yellow once in his early 30’s but not Tx. May have had shingles 5 years ago.
- Family Hx: Significant for CAD, High Lipids, and MI in father and older siblings (2 brothers in their 60’s).
- ROS: Unremarkable, except for fatigue.
- Phys Exam: 6’, 200# 145/84 All negative except scarring on right chest wall (old shingles), OHL both sides of tongue, generalized lymphadenopathy in axillae and groin.

What lab work are you going to order?

- CMP, CBC with diff, Lipid panel
- U/A, PSA
- RPR
- Hep A total antibody
- Hep B surface Ag and surface Ab
- Hep C antibody with reflex to RIBA
- HIV 1/2 Ab with reflex to WB ☑️
2006 CDC Opt-Out HIV Screening Guidelines

- Revised CDC Recommendations for HIV Testing of Adults, Adolescents, and Pregnant Women in Health-Care Settings issued in 2006

2006 CDC Opt-Out HIV Testing Objectives

- Increase HIV screening of patients, including pregnant women, in health-care settings
- Foster earlier detection of HIV infection
- Identify and counsel persons with unrecognized HIV infection and link them to clinical and prevention services
- Further reduce perinatal transmission of HIV in the United States

2006 CDC Opt-Out HIV Testing Recommendations

- All patients aged 13-64 in all health-care settings should be tested
- Patients should be notified that testing will be performed, and can decline (“opt-out”)
- Those at high risk should be tested at least annually
- Written consent should not be required; general consent for medical care is sufficient
- Prevention counseling should not be required

Labs

- CMP, CBC with diff, Lipid panel
- Globulins 5.2  11/33 h/h  210 TC, 26 HDL, 182 LDL, 366 Trigs
- U/A, PSA : normal
- RPR pos with 1:128 and FTA pos
- Hep A total antibody : pos = IMMUNE
- Hep B surface Ag neg, Ab pos = IMMUNE
- Hep C antibody  Negative
- HIV 1/2 Ab pos with pos WB
Older patients are more likely than younger patients to present late for HIV diagnosis and care.

Physicians are less likely to discuss HIV/AIDS and related risk factors with older patients.

Asymptomatic older HIV-infected individuals are less likely to seek out testing and medical care.

Symptomatic older HIV-infected individuals are more likely to attribute HIV-related symptoms to...
HIV Screening Labs

• CD4, Helper/Suppressor Ratio  375 mm$^3$
• HIV RNA by PCR    326,000 copies/ml
• HIV Genotype    wildtype
• Toxo IGG   positive
• HSV 1/2 antibodies   positive to both
• CMV IGG  positive
• LDH baseline   normal

2011 DHHS Guidelines: When to Start

<table>
<thead>
<tr>
<th>Clinical Condition and/or CD4 Count</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of AIDS-defining illness or CD4 count &lt;350 cells/mm$^3$</td>
<td>ART should be initiated</td>
</tr>
<tr>
<td>Other (regardless of CD4 count):</td>
<td></td>
</tr>
<tr>
<td>– Persons with HIVAN</td>
<td></td>
</tr>
<tr>
<td>– HIV/HBV coinfection when treatment for HBV indicated</td>
<td></td>
</tr>
<tr>
<td>Pregnant women who do not meet criteria for treatment</td>
<td>A combination antiretroviral (ART) drug regimen is recommended with the goal to prevent perinatal transmission</td>
</tr>
<tr>
<td>Patients with CD4 counts 350-500 cells/mm$^3$</td>
<td>ART is recommended</td>
</tr>
<tr>
<td>Patients with CD4 count &gt;500 cells/mm$^3$</td>
<td>ART favored or optional</td>
</tr>
</tbody>
</table>


2011 DHHS Guidelines: Summary of Benefits and Potential Limitations of Initiating ART in Treatment-Naive Patients

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Potential Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in mortality</td>
<td>Concerns about adverse effects with cumulative use of ART</td>
</tr>
<tr>
<td>Reduction in HIV-related morbidity, including:</td>
<td></td>
</tr>
<tr>
<td>– HIV-associated nephropathy</td>
<td></td>
</tr>
<tr>
<td>– Cardiovascular disease</td>
<td></td>
</tr>
<tr>
<td>– AIDS-defining and non-AIDS defining malignancies</td>
<td></td>
</tr>
<tr>
<td>– Neurocognitive complications</td>
<td></td>
</tr>
<tr>
<td>More robust immunologic response when treatment is initiated at a younger age</td>
<td>Earlier resistance in nonadherent patients</td>
</tr>
<tr>
<td>Attenuated rate of liver disease progression in patients coinfected with HBV and/or HCV</td>
<td>Nonadherence to ART</td>
</tr>
<tr>
<td>Prevention of HIV transmission</td>
<td>Adds to annual cost, but several studies showed that initiating ART at higher CD4 cell counts may be cost effective</td>
</tr>
</tbody>
</table>

Achieving HIV RNA <500 Copies/mL at 12 Months

Experiencing HIV RNA Rebound Within 2 Years

ART in Patients 50 Years and Older: ATHENA National Cohort

Median CD4 Response in Patients 50 Years and Older at Start of ART

Higher Risk of Clinical Progression in Patients 50 Years and Older

Outcome | Adjusted HR | P Value
--- | --- | ---
Progression to ADE or death | 1.52 | 0.035
Progression to new ADE | 1.50 | 0.087
HIV-1 RNA <500 copies/mL | 1.23 | <0.05
Kaiser Permanente of Northern California: Clinical Outcomes

- Kaiser Permanente of Northern California chart review study of all members who initiated ART from 1995-2004 (N=5090)
- 18 years and older, starting 1 or more antiretrovirals in combination; median follow-up: 3.8 years

<table>
<thead>
<tr>
<th>Parameter</th>
<th>18 - 39 Years (n=4094)</th>
<th>40 - 49 Years (n=997)</th>
<th>≥50 Years (n=997)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC and LDLa</td>
<td>310 (21.0)</td>
<td>311 (26.4)</td>
<td>241 (34.0)</td>
</tr>
<tr>
<td>Glucoseb</td>
<td>917 (6.0)</td>
<td>713 (11.4)</td>
<td>486 (14.4)</td>
</tr>
<tr>
<td>Creatininec</td>
<td>1285 (3.2)</td>
<td>1021 (5.8)</td>
<td>625 (8.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>n (%)</th>
<th>n (%)</th>
<th>OR (95% CI)</th>
<th>n (%)</th>
<th>OR (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC and LDL</td>
<td>310 (21.0)</td>
<td>311 (26.4)</td>
<td>1.31 (0.84-2.06)</td>
<td>241 (34.0)</td>
<td>1.66 (1.02-2.70)</td>
</tr>
<tr>
<td>Glucose</td>
<td>917 (6.0)</td>
<td>713 (11.4)</td>
<td>1.92 (1.17-3.15)</td>
<td>486 (14.4)</td>
<td>2.85 (1.71-4.78)</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1285 (3.2)</td>
<td>1021 (5.8)</td>
<td>1.06 (0.53-2.12)</td>
<td>625 (8.3)</td>
<td>2.03 (1.03-4.00)</td>
</tr>
</tbody>
</table>

*P<0.01 and **P<0.05 vs <50 years.

Kaiser Permanente of Northern California: Incidence of Laboratory Abnormalities After ART Initiation, by Age

<table>
<thead>
<tr>
<th>Parameter</th>
<th>18 - 39 Years (n=4094)</th>
<th>40 - 49 Years (n=997)</th>
<th>≥50 Years (n=997)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC and LDL</td>
<td>310 (21.0)</td>
<td>311 (26.4)</td>
<td>241 (34.0)</td>
</tr>
<tr>
<td>Glucose</td>
<td>917 (6.0)</td>
<td>713 (11.4)</td>
<td>486 (14.4)</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1285 (3.2)</td>
<td>1021 (5.8)</td>
<td>625 (8.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>n (%)</th>
<th>n (%)</th>
<th>OR (95% CI)</th>
<th>n (%)</th>
<th>OR (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC and LDL</td>
<td>310 (21.0)</td>
<td>311 (26.4)</td>
<td>1.31 (0.84-2.06)</td>
<td>241 (34.0)</td>
<td>1.66 (1.02-2.70)</td>
</tr>
<tr>
<td>Glucose</td>
<td>917 (6.0)</td>
<td>713 (11.4)</td>
<td>1.92 (1.17-3.15)</td>
<td>486 (14.4)</td>
<td>2.85 (1.71-4.78)</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1285 (3.2)</td>
<td>1021 (5.8)</td>
<td>1.06 (0.53-2.12)</td>
<td>625 (8.3)</td>
<td>2.03 (1.03-4.00)</td>
</tr>
</tbody>
</table>

*Abnormal cutoff defined as ≥240 mg/dL for total cholesterol and ≥160 mg/dL for LDL cholesterol.
*Abnormal cutoff defined as ≥126 mg/dL for fasting and ≥161 mg/dL for random.
*Abnormal cutoff defined as ≥240 mg/dL for total cholesterol and ≥160 mg/dL for LDL cholesterol.


Treatment Plan

- Dx: HIV positive no O.I., HTN, Mixed Hyperlipidemia, Hep A & B immune, Obesity
- Tx: HTN Lisinopril 20mg daily
  Hyperlipidemia simvastatin 20mg daily
  Obesity diet and exercise
  HIV raltegravir 400mg twice daily
  emtricitabine/tenofovir 1 daily
Age-related Comorbidities in Patients with HIV

Non-AIDS-related Causes of Death in HIV+ Persons Treated with ART (1996-2006)

- Assessed deaths in 13 HIV-1 cohorts composed of 39,727 persons (5293 patients 50 years and older)
- Of 1876 deaths, definitive cause in 85%
  - Malignancy 23.5%
  - Other 9.0%
  - Respiratory 3.1%
  - Renal 3.0%
- Non-AIDS related deaths in 50.5%:
  - Infection Non-AIDS 16.3%
  - CVD 15.7%
  - Violence Sub Abuse 15.4%
  - Liver-related 14.1%

HIV and Age as Renal Risk Factors

- Among 2857 HIV-infected patients participating in ALLRT study:
  - At baseline, 16% of patients had abnormal levels of urine protein as measured by ratio of spot urine (P/Cr ≥ 0.2)
  - Older age was significantly associated with P/Cr ≥ 0.2
    - Per 10 years: OR 1.21 (95% CI, 1.10-1.33; P < .001)
- In the EuroSIDA cohort, the rate of chronic renal failure at baseline ranged from 3.5% to 4.7% depending on the method of GFR calculation
  - By multivariate analysis, age was a strong predictor of chronic renal failure at baseline
  - OR 5.47, 95% CI, 4.4-6.72; P < .0001

Multiple studies have found increased prevalence of osteoporosis and osteopenia in persons with HIV compared with uninfected persons.

Meta-analysis of studies:
- 67% persons with HIV had reduced BMD (OR 6.4)
- 15% persons with HIV had osteoporosis (OR 3.7)

Aging, BMD Loss, and HIV Infection

Research Patient Data Registry: Fracture Prevalence Is Associated with HIV Infection

HOPS: Attributable Risk for CVD
Neuropsychological Impairment, HIV, and Older Age

- In a cross-sectional analysis of 202 patients with HIV enrolled in the Hawaii Aging with HIV Cohort (n=103 patients 50 years and older):
  - HIV-associated dementia was more frequent in adults aged 50 years and older vs those aged 20-39 years
    - With an odds ratio 2.13, 95% CI, 1.02-4.44
  - After adjusting for education, race, drug use, ART status, viral load, CD4 count, and Beck Depression Inventory score, risk of HIV-associated dementia was even higher among older patients
    - With an odds ratio 3.26, 95% CI, 1.32-8.07


Age at ADM and NADM Diagnosis in Patients with HIV vs General Population

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Cancer Diagnosis (Mean Age ± SD)</th>
<th>HIV ( \text{HIV}^a )</th>
<th>HIV ( \text{HIV}^b )</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anal/rectal SCC</td>
<td>51.65 ± 8.66</td>
<td>57.53 ± 15.93</td>
<td>.0001</td>
<td></td>
</tr>
<tr>
<td>Hodgkin lymphoma</td>
<td>39.66 ± 7.80</td>
<td>41.42 ± 17.87</td>
<td>.685</td>
<td></td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>41.54 ± 9.20</td>
<td>65.56 ± 16.17</td>
<td>.0001</td>
<td></td>
</tr>
<tr>
<td>Cervical</td>
<td>41.94 ± 5.29</td>
<td>51.20 ± 17.87</td>
<td>.053</td>
<td></td>
</tr>
<tr>
<td>Liver</td>
<td>40.94 ± 6.39</td>
<td>65.36 ± 14.86</td>
<td>.0001</td>
<td></td>
</tr>
<tr>
<td>Head and neck</td>
<td>50.67 ± 11.58</td>
<td>67.11 ± 13.44</td>
<td>.0001</td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td>51.65 ± 8.66</td>
<td>68.81 ± 12.52</td>
<td>.0001</td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>44.92 ± 12.00</td>
<td>80.57 ± 10.25</td>
<td>.0001</td>
<td></td>
</tr>
<tr>
<td>Prostate</td>
<td>53.46 ± 12.72</td>
<td>71.48 ± 15.98</td>
<td>.0001</td>
<td></td>
</tr>
</tbody>
</table>

\( \text{ADM, AIDS-defining malignancy; NADM, non-AIDS-defining malignancy; SCC, squamous cell carcinoma.} \)

![Nguyen ML et al. 18th IAC; Vienna; 2010. Abstract WA1405.](https://example.com)

Patient follow-up

- 1 month later: VL is 290 copies/ml
- 3 months later: VL is < 50 copies/ml and his CD4 count is 418 mm³
- 6 months later: VL is < 50 copies/ml and his CD4 is 445 mm³
- 9 months later: (while auditing my 2010 tax return) He expires from a MI, found to have 3 vessel, CAD
Summary: HIV and Aging

- The number of HIV-infected persons 50 years and older is increasing
- Morbidity associated with normal aging may be enhanced by HIV infection and/or ART
- Clinicians should be aware of the challenges associated with management of an older patient with HIV
  - Older patients may present with more advanced HIV disease
  - Immunologic response in aging patients is less robust

Reference Slides
Cuzin Study (2007): Study Overview

- A prospective cohort of patients with HIV at a large HIV center in France
- Examined ART-naïve patients initiating therapy between 1996 and 2006
- N=639
- Patients aged <50 years: n=540
- Patients aged ≥50 years: n=99

Late HIV testing was defined as a CD4 count ≥200 cells/mm³ at HIV infection diagnosis or an AIDS-defining event in the first year following the diagnosis.

- A CD4 cell count ≥200 cells/mm³ and an HIV-1 RNA load <2.3 log copies/mL after 6 months of ART were chosen as indicators of immunologic reconstitution and virological efficacy, respectively.

Clinical progression was defined as any new AIDS-defining event or death, whatever the cause of death.

All analyses were intention-to-continue-treatment analyses, and only the first treatment regimen was considered.

### Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Age &lt;50 Years</th>
<th>Age ≥50 Years</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median years (IQR)</td>
<td>35.0 (29.9 - 41.7)</td>
<td>57.1 (53.2 - 61.9)</td>
<td></td>
</tr>
<tr>
<td>CD4 cell count at ART initiation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median log copies/mL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200-350 cells/mm³</td>
<td>248 (43.5)</td>
<td>200 (40.3)</td>
<td>0.00</td>
</tr>
<tr>
<td>&gt;350 cells/mm³</td>
<td>154 (28.5)</td>
<td>20 (20.2)</td>
<td></td>
</tr>
<tr>
<td>Missing data</td>
<td>57 (10.5)</td>
<td>7 (6.9)</td>
<td></td>
</tr>
<tr>
<td>CD4 cell count nadir, median cells/mm³ (IQR)</td>
<td>193 (83 - 287.8)</td>
<td>167 (68 - 278.6)</td>
<td>0.28</td>
</tr>
<tr>
<td>HIV RNA level at ART initiation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median log copies/mL</td>
<td>4.4 (2.8 - 5.2)</td>
<td>4.52 (2.8 - 5.4)</td>
<td>0.84</td>
</tr>
<tr>
<td>&lt;5 log copies/mL</td>
<td>152 (33.3)</td>
<td>30 (33.7)</td>
<td></td>
</tr>
<tr>
<td>HIV RNA level zenith, median log copies/mL</td>
<td>4.9 (4.1 - 5.5)</td>
<td>4.9 (4.3 - 5.6)</td>
<td>0.98</td>
</tr>
<tr>
<td>Months between HIV infection diagnosis and ART initiation, median months (IQR)</td>
<td>3.24 (1.15 - 5.3)</td>
<td>2.13 (0.75 - 20.5)</td>
<td>0.46</td>
</tr>
<tr>
<td>Late diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>207 (46.9)</td>
<td>50 (50.5)</td>
<td>0.06</td>
</tr>
<tr>
<td>Because of AIDS-defining events</td>
<td>87 (16.7)</td>
<td>21 (21.2)</td>
<td>0.05</td>
</tr>
<tr>
<td>Because of a CD4 cell count &lt;50 cells/mm³ at diagnosis</td>
<td>120 (22.2)</td>
<td>26 (26.3)</td>
<td>0.05</td>
</tr>
</tbody>
</table>

### Cuzin Study: Findings

- Late testing was more frequent in older patients than in younger ones (56.2% vs 44.9%, P = 0.05).

- Late testing was associated with:
  - The probability of having a CD4 cell count ≥50 cells/mm³ after 6 months after initiating ART: OR 2.3; 95% CI, 1.6-3.6.
  - The probability of clinical progression: OR 3.4; 95% CI, 1.5-8.

- The median time before discontinuation was 6.4 months (IQR: 2.5-13.7 months) for older patients and 14.1 months (IQR: 4.9-31.0 months) for younger patients (P = 0.01, by log-rank test).

- In the multivariate analysis, discontinuation of the first ART regimen because of poor tolerance was independently associated with:
  - Age: OR 2.9; 95% CI, 1.1-7.6.
  - Late testing: OR 0.8; 95% CI, 0.5-1.2.
  - Year of treatment initiation: OR 0.25 (95% CI, 0.1-0.8) for 2003-2006 and OR 1.1 (95% CI, 0.7-1.9) for 2000-2002, respectively, compared with 1996-1999.

- Treatment discontinuations as the result of neurologic or psychiatric adverse effects were more frequent among older patients than younger patients (9.1% vs 3%, P = 0.03), as were hematological adverse effects (13.6% vs 5.5%, P = 0.03).
Skiest Study: Overview

- Mailed questionnaires to a randomly selected representative sample of family practice and internal medicine physicians who were members of the Dallas County (a large metropolitan area) Medical Society.

- The survey consisted of 14 questions concerning physician characteristics, demographics of physicians' practices, physicians' beliefs and practices with respect to HIV and AIDS, and AIDS-related risk behaviors in patients older than 50 years.

- Physicians were asked:
  - To estimate the percentage of HIV and AIDS cases in patients older than 50 years and to rank HIV risk factors in this age group in order of frequency.
  - How often they discussed HIV and AIDS and asked about HIV and AIDS risk factors and risk factor reduction strategies in patients older than 50 years.

- Physicians were asked:
  - To estimate how often their patients older than 50 years asked questions.

Skiest Study: Relevant Findings

- Physicians reported that 69.7% of their patients older than 50 years rarely or never asked them questions about HIV or AIDS.

- 60.8% of respondents reported rarely or never discussing HIV or AIDS with their patients aged >50 years, while 40% reported rarely or never asking their patients aged >50 years about possible HIV risk factors.

- 67.5% of respondents reported rarely or never discussing behaviors that may reduce HIV risk in their patients older than 50 years, while only 6.8% of the physicians rarely or never discussed risk factors in their patients younger than 50 years.

Siegel Study

- Study explored how symptom interpretations influence the initiation of HIV testing and medical care among adults aged ≥50 years through patient interviews.

- N=78 patients living with HIV (58 men, 20 women)
  - 19 patients aged ≥60
  - 32 African American, 15 Puerto Rican, 31 non-Hispanic whites
  - 51% identified as completely/mostly heterosexual, 42% as completely/mostly homosexual
  - 47 (60%) diagnosed with AIDS, 9 (12%) symptomatic HIV disease, 22 (28%) asymptomatic HIV infection
  - Mean CD4 cell count at first interview: 400 cells/mm³ (SD=311, range 32-1500 cells/mm³)
  - 91% reported other chronic health conditions: heart disease (27%), respiratory problems (36%), arthritis (28%), and other illnesses (41%)

- Presence or absence of putative symptoms of AIDS most often led to patients' HIV testing.

- Attributing symptoms to other illnesses (e.g., hypertension, normal aging, menopause) was a common reason for delaying HIV testing.

- Some patients delayed or refused to seek medical care even after being diagnosed as HIV+ because they did not feel ill and/or misattributed their symptoms to other illnesses.
Kaiser Permanente of Northern California (KPNC): Study Overview

• A retrospective observational cohort study within the KPNC system
  – Follow-up period: 1995-2004

• Present analysis: patients with HIV infections for whom dates of ART initiation were known
  – N=5090

KPNC: Selected Patient Characteristics

<table>
<thead>
<tr>
<th>Characteristic*</th>
<th>18 - 39 (n=2259)</th>
<th>40 - 49 (n=1834)</th>
<th>≥ 50 (n=997)</th>
<th>P Valueb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group (Years)</td>
<td>3.4 (1.4 - 6.0)</td>
<td>4.3 (1.8 - 6.0)</td>
<td>4.2 (1.9 - 6.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Male sex</td>
<td>86.8</td>
<td>91.5</td>
<td>93.7</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Years of known HIV infection</td>
<td>3.4 (0.5 - 6.9)</td>
<td>5.9 (1.5 - 9.0)</td>
<td>5.9 (1.1 - 9.1)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Prior AIDS diagnosis</td>
<td>61.7</td>
<td>69.4</td>
<td>72.1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Prior antiretroviral agents</td>
<td>43.5</td>
<td>50.9</td>
<td>53.6</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Hepatitis C virus coinfection</td>
<td>7.7</td>
<td>12.3</td>
<td>11.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Adherence in the year after ART initiation</td>
<td>83.7 (53.7 - 96.9)</td>
<td>85.7 (56.0 - 97.5)</td>
<td>88.9 (62.7 - 98.1)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Modified Charlson Comorbidity Index scorec | <.001 |

0 | 80.0 | 76.0 | 68.5 |
1 - 2 | 18.3 | 21.9 | 27.2 |
≥ 3 | 1.7 | 2.1 | 4.3 |

* Data are given as percentages or as medians (interquartile range).

KPNC: Virologic Response with ART Initiation, By Age Group

<table>
<thead>
<tr>
<th>Age Group, years</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Achievement of HIV RNA Level of &lt;500 Copies/mL Within 1 Year of ART Initiation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age Only</td>
<td>Adjusted for Adherence</td>
<td>Adjusted for Modified Charlson Comorbidity Index Score*</td>
</tr>
<tr>
<td>18 - 39</td>
<td>1.15 (1.04 - 1.27)</td>
<td>1.07 (0.95 - 1.19)</td>
<td>0.97 (0.88 - 1.06)</td>
<td>0.97 (0.88 - 1.06)</td>
</tr>
<tr>
<td>40 - 49</td>
<td>0.97 (0.88 - 1.06)</td>
<td>0.96 (0.87 - 1.05)</td>
<td>0.97 (0.88 - 1.06)</td>
<td>0.97 (0.88 - 1.06)</td>
</tr>
<tr>
<td>≥ 50</td>
<td>1 (Reference)</td>
<td>1 (Reference)</td>
<td>1 (Reference)</td>
<td>1 (Reference)</td>
</tr>
<tr>
<td>P value for age effect</td>
<td>.009</td>
<td>.007</td>
<td>.007</td>
<td>.007</td>
</tr>
</tbody>
</table>

Achievement of HIV RNA Level rebound (to 1000 Copies/mL) Within 2 Years of First Achieving <500 Copies/mL:

<table>
<thead>
<tr>
<th>Age Group, years</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Achievement of HIV RNA Level rebound (to 1000 Copies/mL) Within 2 Years of First Achieving &lt;500 Copies/mL:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age Only</td>
<td>Adjusted for Adherence</td>
<td>Adjusted for Modified Charlson Comorbidity Index Score*</td>
</tr>
<tr>
<td>18 - 39</td>
<td>0.80 (0.73 - 0.87)</td>
<td>0.87 (0.72 - 1.05)</td>
<td>0.87 (0.72 - 1.05)</td>
<td>0.83 (0.68 - 1.02)</td>
</tr>
<tr>
<td>40 - 49</td>
<td>0.81 (0.70 - 0.95)</td>
<td>0.81 (0.69 - 0.95)</td>
<td>0.81 (0.69 - 0.95)</td>
<td>0.75 (0.63 - 0.93)</td>
</tr>
<tr>
<td>≥ 50</td>
<td>1 (Reference)</td>
<td>1 (Reference)</td>
<td>1 (Reference)</td>
<td>1 (Reference)</td>
</tr>
<tr>
<td>P value for age effect</td>
<td>.003</td>
<td>.003</td>
<td>.003</td>
<td>.003</td>
</tr>
</tbody>
</table>
**KPNC: Additional Findings**

- CD4 cell counts were:
  - Similar among all patient groups at ART initiation
  - Highest in youngest patients 1 year after ART initiation
  - Similar among younger patients and older patients by year 3 in the unadjusted model ($P = .07$), but adjustment for adherence in model 2 resulted in the persistence at 3 years of higher CD4 cell counts among younger patients ($P = .01$)

<table>
<thead>
<tr>
<th>Age Group, years</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>49</td>
<td>111.4</td>
<td>116.2</td>
<td>117.2</td>
<td>113.2</td>
</tr>
<tr>
<td>40-49</td>
<td>113.1</td>
<td>124</td>
<td>123.3</td>
<td>127.5</td>
</tr>
<tr>
<td>18-39</td>
<td>111.6</td>
<td>136.9</td>
<td>131.9</td>
<td>141.9</td>
</tr>
</tbody>
</table>

P-values for age effect: .05 .02 .04 .01

**ATHENA: Study Overview and Selected Findings**

- AIDS Therapy Evaluation Project, Netherlands (ATHENA): a national observational HIV cohort

- Present analysis:
  - N=5299 ART-naïve patients who initiated ART between July 1, 1996 and December 31, 2004
  - Subset analysis: N=366 longitudinally followed patients who started ART between July 1, 1996, and June 30, 1998, and took ART continuously for at least 7 years
  - n=49 patients aged ≥50 years at the start of ART

- Older age, Southeast Asian or sub-Saharan African origin, and HIV infection through IDU were associated with a longer time to CD4 cell count ≥800 cells/mm³
  - Multivariate HR for likelihood of reaching ≥800 cells/mm³: 0.92 (95% CI 0.87-0.98; $P = .01$) per 10-yr age increase

**HOPS: Calculating Attributable Risk**

- Cox proportional hazards regression was used to assess the association of various baseline clinical and demographic factors with incident CVD events

- Calculated the population attributable risk (AR) associated with each factor by considering the prevalence of exposure in the study population and the multivariable hazard ratio associated with that factor
Decline in BMD with Age In General Population

- Volumetric trabecular BMD was determined by microscopic analysis of iliac crest bone biopsies obtained from male (n=102) and female (n=90) cadavers aged 20 - 90 years
  - Causes of death were accident or acute illness with no history of bone disease, bed rest not exceeding two weeks, and treatment that did not affect the skeleton
  - Specimens from subjects with histologic evidence of osteomalacia were excluded from all analyses
- The volume of trabecular bony tissue relative to the total cancellous volume was calculated by established point-counting procedures on Goldner trichrome stained formal saline fixed sections (mean value calculated from counting 4 fields in 16 sections for each specimen)


Research Patient Data Registry: Study Overview

- Data were obtained from the Research Patient Data Registry (RPDR), a clinical care data registry capturing all data from the Partners HealthCare System, which includes two primary hospitals, Brigham and Women’s Hospital (BWH) and Massachusetts General Hospital (MGH)
- Queried the RPDR for all patients with at least one encounter at BWH or MGH between October 1, 1996, and March 21, 2008
  - Separate searches for patients with and without HIV infection
  - Inpatient and outpatient encounters included
- Identified patients with vertebral, hip, or wrist fracture, or any of the three sites of fracture, at any time during the study period within HIV+ and HIV- groups
  - Patients with multiple fractures were counted only once
- Fracture outcomes were determined using ICD-9-CM codes selected on the basis of the likelihood of their being related to osteoporosis


Research Patient Data Registry: Number and Prevalence* of Fractures

<table>
<thead>
<tr>
<th>Site</th>
<th>HIV+ n</th>
<th>HIV+ Prevalence (95% CI)</th>
<th>HIV- n</th>
<th>HIV- Prevalence (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>245</td>
<td>2.87 (2.52 - 3.23)</td>
<td>39,073</td>
<td>1.77 (1.75 - 1.79)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Vertebral</td>
<td>96</td>
<td>1.01 (0.85 - 1.22)</td>
<td>16,269</td>
<td>0.47 (0.46 - 0.48)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Hip</td>
<td>81</td>
<td>0.72 (0.54 - 0.90)</td>
<td>11,222</td>
<td>0.51 (0.50 - 0.52)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Wrist</td>
<td>118</td>
<td>1.38 (1.14 - 1.63)</td>
<td>19,889</td>
<td>0.90 (0.89 - 0.91)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Men</td>
<td>53</td>
<td>2.08 (1.73 - 2.50)</td>
<td>11,891</td>
<td>1.21 (1.18 - 1.24)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Women</td>
<td>18</td>
<td>0.96 (0.70 - 1.35)</td>
<td>28,183</td>
<td>0.91 (0.90 - 0.92)</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

* Prevalence calculated per 100 persons.

- Patients with HIV had significantly higher fracture prevalence in all categories, with the exception of hip fractures among women
  - Fracture prevalence was relatively higher across all age categories in each gender, although the differences did not reach statistical significance in some age groups
  - Fracture prevalence was higher for HIV+ than HIV- patients for African-American and Caucasian women and Caucasian men
- A series of secondary analyses conducted limiting the study duration to 3-year periods to minimize the potential time difference between HIV diagnosis and fracture produced similar results

ALLRT: Study Overview

- AIDS Clinical Trials Group (ACTG) Longitudinal Linked Randomized Trials (ALLRT) cohort:
  - Includes participants enrolled in the ACTG parent clinical trials in which they receive randomized ART regimens or management strategies and are followed longitudinally to evaluate long-term outcomes of ART
  - N=2857

- Present analysis included patients who had at least one urine protein to creatinine (P/Cr) measurement during follow-up

- Quantitative proteinuria was defined as the ratio of spot urine (P/Cr), which is an accepted surrogate measure of a 24 h urine collection for proteinuria
  - Clinically significant proteinuria was measured at two different levels, namely ≥0.2 or ≥1.0, at each annual P/Cr measurement

- GFR was estimated using the abbreviated MDRD equation

KPNC: Selected Patient Characteristics

<table>
<thead>
<tr>
<th>Age Group (Years)</th>
<th>Characteristic</th>
<th>18 - 39 (n=2259)</th>
<th>40 - 49 (n=1834)</th>
<th>≥50 (n=997)</th>
<th>P Valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Follow-up, years</td>
<td>3.4 (1.4 - 6.0)</td>
<td>4.3 (1.5 - 8.0)</td>
<td>4.2 (1.9 - 6.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Male sex</td>
<td>86.8</td>
<td>91.5</td>
<td>93.7</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Years of known HIV infection</td>
<td>3.4 (0.5 - 6.9)</td>
<td>5.9 (1.5 - 9.0)</td>
<td>5.9 (1.1 - 9.1)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Prior AIDS diagnosis</td>
<td>61.7</td>
<td>69.4</td>
<td>72.1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Prior antiretroviral agents</td>
<td>43.5</td>
<td>50.9</td>
<td>53.6</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Hepatitis C virus coinfection</td>
<td>7.7</td>
<td>12.3</td>
<td>11.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Adherence in the year after ART initiation</td>
<td>83.7 (53.7 - 96.9)</td>
<td>85.7 (56.0 - 97.5)</td>
<td>88.9 (62.7 - 98.1)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Modified Charlson Comorbidity Index scoreb</td>
<td>&lt;.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>80.0</td>
<td>76.0</td>
<td>68.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 - 2</td>
<td>16.3</td>
<td>21.9</td>
<td>27.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥3</td>
<td>1.7</td>
<td>2.1</td>
<td>4.3</td>
<td></td>
</tr>
</tbody>
</table>

KPNC: Virologic Response with ART Initiation, By Age Group

<table>
<thead>
<tr>
<th>Age Group, years</th>
<th>Model 1: Age Only</th>
<th>Model 2: Age Adjusted for Adherence</th>
<th>Model 3: Age Adjusted for Modified Charlson Comorbidity Index Scorec</th>
<th>Model 4: Age Adjusted for All Potential Predictorsb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achievement of HIV RNA Level of &lt;500 Copies/mL Within 1 Year of ART Initiation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 - 39</td>
<td>1</td>
<td>Reference</td>
<td>1</td>
<td>Reference</td>
</tr>
<tr>
<td>40 - 49</td>
<td>0.97 (0.88 - 1.06)</td>
<td>0.98 (0.87 - 1.04)</td>
<td>0.97 (0.88 - 1.06)</td>
<td>0.97 (0.89 - 1.06)</td>
</tr>
<tr>
<td>≥50</td>
<td>0.97 (0.89 - 1.06)</td>
<td>0.98 (0.87 - 1.04)</td>
<td>0.97 (0.88 - 1.06)</td>
<td>0.97 (0.89 - 1.06)</td>
</tr>
<tr>
<td>P Value for age effect</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Achievement of HIV RNA Level Rebounded to 1000 Copies/mL Within 2 Years of First Achieving &lt;500 Copies/mL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 - 39</td>
<td>1</td>
<td>Reference</td>
<td>1</td>
<td>Reference</td>
</tr>
<tr>
<td>40 - 49</td>
<td>0.88 (0.73 - 1.06)</td>
<td>0.90 (0.78 - 1.03)</td>
<td>0.87 (0.72 - 1.05)</td>
<td>0.83 (0.68 - 1.02)</td>
</tr>
<tr>
<td>≥50</td>
<td>0.88 (0.73 - 1.06)</td>
<td>0.90 (0.78 - 1.03)</td>
<td>0.87 (0.72 - 1.05)</td>
<td>0.83 (0.68 - 1.02)</td>
</tr>
<tr>
<td>P Value for age effect</td>
<td>.04</td>
<td>.01</td>
<td>.03</td>
<td>.03</td>
</tr>
</tbody>
</table>

a Data are given as percentages or as median (interquartile range).
b Based on Pearson product moment correlation statistic for categorical variables and Kruskal-Wallis test for continuous variables.
c Excludes HIV infection and AIDS diagnosis.
ALLRT: Study Overview

- AIDS Clinical Trials Group (ACTG) Longitudinal Linked Randomized Trials (ALLRT) cohort:
  - Includes participants enrolled in the ACTG parent clinical trials in which they receive randomized ART regimens or management strategies and are followed longitudinally to evaluate long-term outcomes of ART.
- Present analysis included patients who had at least one urine protein to creatinine (P/Cr) measurement during follow-up.
  - N=2857
- Quantitative proteinuria was defined as the ratio of spot urine (P/Cr), which is an accepted surrogate measure of a 24 h urine collection for proteinuria.
  - Clinically significant proteinuria was measured at two different levels, namely ≥0.2 or ≥1.0, at each annual P/Cr measurement.
- GFR was estimated using the abbreviated MDRD equation.

EuroSIDA: Study Overview

- A prospective study of HIV+ patients at 93 centers across Europe, Israel, and Argentina.
  - N=4474
- Present analysis included data collected through fall 2005.
- Patients from the EuroSIDA study with a minimum of two serum creatinine measurements measured after 1 January 2004 (when information on serum creatinine was first routinely collected as part of the EuroSIDA study) were included providing they had weight measured within 6 months of the serum creatinine measurement and had height recorded.
- Baseline was defined as the date of the first GFR measurement.
- GFR was calculated by Cockcroft-Gault and MDRD formulas:
  - GFR (CG)=[(140 – age (years)) x weight (kg)]/[serum creatinine x 72] x 0.85 if female
  - GFR (MDRD)=186 x serum creatinine -1.154 x age-0.203 x 0.742 if female x 1.21 if black
- Chronic renal failure (CRF) was defined as calculated GFR ≤60 mL/min/1.73m².

Chronic renal failure (CRF) was defined as calculated GFR ≤60 mL/min/1.73m².
![Image of a page from a document with tables and text]

**EuroSIDA: Selected Patient Characteristics**

<table>
<thead>
<tr>
<th></th>
<th>All Patients</th>
<th>CG CRF</th>
<th>MDRD CRF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong> (years)</td>
<td>4474</td>
<td>100%</td>
<td>158%</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3404</td>
<td>76.1%</td>
<td>131%</td>
</tr>
<tr>
<td>Female</td>
<td>1070</td>
<td>23.9%</td>
<td>27%</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>3807</td>
<td>85.1%</td>
<td>140%</td>
</tr>
<tr>
<td>Other</td>
<td>667</td>
<td>14.9%</td>
<td>18%</td>
</tr>
<tr>
<td><strong>Prior AIDS</strong></td>
<td>1382</td>
<td>30.9%</td>
<td>70%</td>
</tr>
<tr>
<td><strong>Hepatitis B</strong></td>
<td>224</td>
<td>5.0%</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Hepatitis C</strong></td>
<td>922</td>
<td>20.6%</td>
<td>14%</td>
</tr>
<tr>
<td><strong>HIV treatment before baseline</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>156</td>
<td>3.5%</td>
<td>0%</td>
</tr>
<tr>
<td>ART</td>
<td>236</td>
<td>5.3%</td>
<td>4%</td>
</tr>
<tr>
<td>cART</td>
<td>4092</td>
<td>91.2%</td>
<td>92%</td>
</tr>
<tr>
<td><strong>Atherosclerosis</strong></td>
<td>123</td>
<td>2.7%</td>
<td>16%</td>
</tr>
<tr>
<td><strong>Diabetes</strong></td>
<td>153</td>
<td>3.4%</td>
<td>19%</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
<td>1223</td>
<td>27.3%</td>
<td>54%</td>
</tr>
<tr>
<td><strong>Current smoker</strong></td>
<td>1533</td>
<td>34.3%</td>
<td>24%</td>
</tr>
<tr>
<td><strong>Past smoker</strong></td>
<td>227</td>
<td>5.1%</td>
<td>6%</td>
</tr>
</tbody>
</table>

*Adapted from Mockroft et al. AIDS. 2007;21:1119-1127.*

**Factors Associated with CRF (by CG) at Baseline**

(Multivariate Analysis)

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Europe origin</td>
<td>2.45</td>
<td>1.35 - 4.45</td>
<td>.0033</td>
</tr>
<tr>
<td>Prior AIDS</td>
<td>1.34</td>
<td>0.88 - 2.02</td>
<td>.17</td>
</tr>
<tr>
<td>Age, per 10 yrs increase</td>
<td>5.47</td>
<td>4.46 - 6.72</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>CD4 cell count nadir, per 50% higher</td>
<td>0.90</td>
<td>0.82 - 0.99</td>
<td>.028</td>
</tr>
<tr>
<td>Baseline vs 12 mos later</td>
<td>1.65</td>
<td>1.04 - 2.62</td>
<td>.033</td>
</tr>
<tr>
<td>Viral load</td>
<td>1.54</td>
<td>0.98 - 2.41</td>
<td>.062</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.34</td>
<td>0.92 - 1.95</td>
<td>12</td>
</tr>
</tbody>
</table>

Gold Patrons

Kingston Healthcare Company

AmeriCare Health Services, LLC

Comfort Keepers

Heritage Health Care

Hospice of Northwest Ohio

Interim Healthcare

Intermediate HomeStyle Services

Ohioans Home Healthcare

Orchard Villa

Part of the Legacy Health Services Family