Aging and HIV

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Reported Cases of HIV Infection (not AIDS), by Age Group and Sex, Cumulative through 2007—47 States, the District of Columbia, and 5 U.S. Dependent Areas

No. of cases (in thousands)

Age at diagnosis

Males N = 242,580*
Females N = 95,006*

Note. Data from 47 states, the District of Columbia, and 5 U.S. dependent areas with confidential name-based HIV infection reporting as of 2007.
*Excludes 7 persons of unknown sex.
Estimated HIV Incidence*—United States, 2006

56,300 new HIV infections in 2006

95% Confidence Interval: 48,200 to 64,500

*Based On Stratified Extrapolation Approach

Ref: JAMA, Vol 300, No. 5, August 6, 2008

Note: Data have been adjusted for reporting delay and cases without risk factor information were proportionately redistributed.
Estimated Percentage of New HIV Infections by Age—United States, 2006

- 13-29 yrs.: 34%
- 30-39 yrs.: 31%
- 40-49 yrs.: 25%
- ≥ 50 yrs.: 10%

Note: Data have been adjusted for reporting delay.
Transmission risk category of males diagnosed with HIV in 2007 by age, NYC

Males 50+
- Heterosexual: 13%
- Injection drug use: 13%
- MSM: 24%
- Unknown: 50%

Males 13–49
- Injection drug use: 5%
- Heterosexual: 6%
- MSM: 61%
- Unknown: 28%

Half of males diagnosed with HIV who are 50+ years old do not have a documented transmission category. MSM is the largest documented category. As reported to the New York City Department of Health and Mental Hygiene by September 30, 2008.
Concurrent HIV/AIDS among persons diagnosed with HIV in 2006, by age group, United States

Among persons newly diagnosed with HIV, the probability of being diagnosed with AIDS within 12 months increases with age.

Late Presentation for Human Immunodeficiency
Virus Care in the United States and Canada


Background. Initiatives to improve early detection and access to human immunodeficiency virus (HIV) services have increased over time. We assessed the immune status of patients at initial presentation for HIV care from 1997 to 2007 in 13 US and Canadian clinical cohorts.

Methods. We analyzed data from 44,491 HIV-infected patients enrolled in the North American–AIDS Cohort Collaboration on Research and Design. We identified first presentation for HIV care as the time of first CD4+ T lymphocyte (CD4) count and excluded patients who prior to this date had HIV RNA measurements, evidence of antiretroviral exposure, or a history of AIDS-defining illness. Trends in mean CD4 count (measured as cells/mm³) and 95% confidence intervals were determined using linear regression adjusted for age, sex, race/ethnicity, HIV transmission risk, and cohort.

Results. Median age at first presentation for HIV care increased over time (range, 40–43 years; P < .01), whereas the percentage of patients with injection drug use HIV transmission risk decreased (from 26% to 14%; P < .01) and heterosexual transmission risk increased (from 16% to 23%; P < .01). Median CD4 count at presentation increased from 256 cells/mm³ (interquartile range, 96–455 cells/mm³) to 317 cells/mm³ (interquartile range, 135–517 cells/mm³) from 1997 to 2007 (P < .01). The percentage of patients with a CD4 count ≥350 cells/mm³ at first presentation also increased from 1997 to 2007 (from 38% to 46%; P < .01). The estimated adjusted mean CD4 count increased at a rate of 6 cells/mm³ per year (95% confidence interval, 5–7 cells/mm³ per year).

Conclusion. CD4 count at first presentation for HIV care has increased annually over the past 11 years but has remained <350 cells/mm³, which suggests the urgent need for earlier HIV diagnosis and treatment.
Survival Trends in HIV-infected Patients Have Changed Since the Adoption of HAART

Cumulative survival curve for HIV-infected persons (without hepatitis C coinfection) and persons from the general population.

N=383,862 (HIV-infected patients, n=3990; General population controls, n=379,872)

Lohse N, et al. Ann Int Med. 2007;146(2): 87-95. Figure 1. Used with permission.
FIGURE 1. Estimated AYLL after HIV diagnosis by sex, 25 states (cases from 25 states with confidential name-based HIV reporting since 1996), 2005.

(J Acquir Immune Defic Syndr 2010;53:124–130)
Impact of HAART on Survival

HIV Prevalence Age

- 27% of people living with AIDS in the US are older than 50!

- Numbers of such persons expected to increase with increasing survival under HAART treatment

- Disproportionate demand on total HIV care
  - Co-morbidities w age
    - CVD / PVD / CKD / Htn / DM / Cognitive / CA
  - Screening for non-HIV illness
    - Lipids / cancer / bone disease, etc.
Estimated percentage of persons living with HIV/AIDS who are 50+ by year, 2001–2007

Are Our HIV Clients Older People?

Epidemiologic data suggests shortened life-span despite HAART?

HAART may produce chronic adverse effects
- CAD risk increased
- Metabolic abnormalities more common
  - Type DM / Htn / Obesity / Dyslipidemia

HAART may not protect from CANCER with AGE
- Esophageal / Lung / Rectal (HPV) / Renal / Liver

Conditions seen at earlier age / unusual groups
- Osteopenia / hypogonadism / neurocognitive
Premature Age-Related Comorbidities Among HIV-Infected Persons Compared With the General Population

Giovanni Guaraldi,1 Gabriella Orlando,1 Stefano Zona,1 Marianna Menozzi,1 Federica Carli,1 Elisa Garlassi,1 Alessandra Berti,2 Elisa Rossi,2 Alberto Roverato,3 and Frank Palella4

1Department of Medicine and Medical Specialties, University of Modena and Reggio Emilia, 2Health Care Systems Department, CINECA Consortium of Universities, 3Department of Statistical Sciences, Alma Mater Studiorum, University of Bologna, Italy, and 4Department of Medicine, Division of Infectious Diseases, Northwestern University, Feinberg School of Medicine, Chicago, Illinois

(See the Editorial Commentary by Capeau, on pages 1127–9.)

Background. Human immunodeficiency virus (HIV)—infected patients may have a greater risk of noninfectious comorbidities (NICMs) compared with the general population. We assessed the prevalence and risk factors for NICMs in a large cohort of HIV-infected adults and compared these findings with data from matched control subjects.

Methods. We performed a case-control study involving antiretroviral therapy (ART)—experienced HIV-infected patients treated at Modena University, Italy, from 2002 through 2009. These patients were compared with age-, sex-, and race-matched adults (control subjects) from the general population included in the CINECA ARNO database. NICMs included cardiovascular disease, hypertension, diabetes mellitus, bone fractures, and renal failure. Polypathology (Pp) was defined as the concurrent presence of ≥2 NICMs. Logistic regression models were constructed to evaluate associated predictors of NICMs and Pp.

Results. There were 2854 patients and 8562 control subjects. The mean age was 46 years, and 37% were women. Individual NICM and Pp prevalences in each age stratum were higher among patients than among controls (all \( P < .001 \)). Pp prevalence among patients aged 41–50 years was similar to that among controls aged 51–60 years (\( P \) value was not statistically significant); diabetes mellitus, cardiovascular disease, bone fractures, and renal failure were statistically independent after adjustment for sex, age, and hypertension. Logistic regression models showed that independent predictors of Pp in the overall cohort were (all \( P < .001 \)) age (odds ratio [OR], 1.11), male sex (OR, 1.77), nadir CD4 cell count <200 cells/μL (OR, 4.46), and ART exposure (OR, 1.01).

Conclusions. Specific age-related NICMs and Pp were more common among HIV-infected persons than in the general population. The prevalence of Pp in HIV-infected persons anticipated Pp prevalence observed in the general population among persons who were 10 years older, and HIV-specific cofactors (lower nadir CD4 cell count and more prolonged ART exposure) were identified as risk factors. These data support the need for earlier screening for NICMs in HIV-infected patients.
In treated patients who achieve durable suppression of the HIV virus, natural ageing, drug-specific toxicity, lifestyle factors, persistent inflammation, and perhaps residual immunodeficiency are causally associated with premature development of many complications normally associated with ageing, including cardiovascular disease, cancer, and osteoporosis or osteopenia.
**Panel’s Recommendations**

- Antiretroviral therapy (ART) is recommended for all HIV-infected individuals. The strength of this recommendation varies on the basis of pretreatment CD4 cell count:
  - CD4 count <350 cells/mm³ (Al)
  - CD4 count 350 to 500 cells/mm³ (AII)
  - CD4 count >500 cells/mm³ (BIII)

- Regardless of CD4 count, initiation of ART is strongly recommended for individuals with the following conditions:
  - Pregnancy (Al) (see [perinatal guidelines](#) for more detailed discussion)
  - History of an AIDS-defining illness (Al)
  - HIV-associated nephropathy (HIVAN) (AII)
  - HIV/hepatitis B virus (HBV) coinfection (AII)

- Effective ART also has been shown to prevent transmission of HIV from an infected individual to a sexual partner; therefore, ART should be offered to patients who are at risk of transmitting HIV to sexual partners (Al [heterosexuals] or AIII [other transmission risk groups]; see text for discussion).

- Patients starting ART should be willing and able to commit to treatment and should understand the benefits and risks of therapy and the importance of adherence (AIII). Patients may choose to postpone therapy, and providers, on a case-by-case basis, may elect to defer therapy on the basis of clinical and/or psychosocial factors.

**Rating of Recommendations:** A = Strong; B = Moderate; C = Optional

**Rating of Evidence:** I = data from randomized controlled trials; II = data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = expert opinion
Exposure to HAART is Associated with Increased Risk of Myocardial Infarction (MI) Over Time

<table>
<thead>
<tr>
<th>Exposure (yr)</th>
<th>Incidence per 1,000 Person-Yr</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
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<tr>
<td>&lt;1</td>
<td>1</td>
</tr>
<tr>
<td>1-2</td>
<td>2</td>
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<tr>
<td>3-4</td>
<td>4</td>
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<td>5-6</td>
<td>6</td>
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<tr>
<td>6-7</td>
<td>7</td>
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<tr>
<td>&gt;7</td>
<td>8</td>
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</table>

<table>
<thead>
<tr>
<th>No. of Events</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>345</td>
</tr>
<tr>
<td>17</td>
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<td>20</td>
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<td>51</td>
<td></td>
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<tr>
<td>47</td>
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<tr>
<td>30</td>
<td></td>
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<tr>
<td>94,469</td>
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</tbody>
</table>

Metabolic syndrome in HIV-infected patients within 3 years of initiation of HAART

- Percentage of patients with metabolic syndrome defined by ATP III criteria (data from metabolic syndrome defined by International Diabetes Federation not shown)
- Median follow-up 192 weeks

Higher Proportions of CV Risk Factors in HIV-infected Individuals vs Non-infected Controls

CV Risk Factors in HIV vs Non-HIV Cohorts

* HIV vs Non-HIV, $P<0.0001$

HIV (n=3851) vs Non-HIV (n=1,044,589)

- Hypertension: 21.2% vs 15.9%
- Diabetes: 11.5% vs 6.6%
- Dyslipidemia: 23.3% vs 17.6%

NCEP ATP-III Guidelines
Where is HIV as a Risk Factor?

<table>
<thead>
<tr>
<th>Major Risk Factors (Exclusive of LDL Cholesterol) That Modify LDL Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarette smoking</td>
</tr>
<tr>
<td>Hypertension (BP $\geq$140/90 mmHg or on antihypertensive medication)</td>
</tr>
<tr>
<td>Low HDL cholesterol ($&lt;40$ mg/dL)*</td>
</tr>
<tr>
<td>Family history of premature CHD (CHD in male first degree relative $&lt;55$ years; CHD in female first degree relative $&lt;65$ years)</td>
</tr>
<tr>
<td>Age (men $\geq 45$ years; women $\geq 55$ years)</td>
</tr>
</tbody>
</table>

* HDL cholesterol $\geq 60$ mg/dL counts as a “negative” risk factor; its presence removes one risk factor from the total count.

If 2 or more are present perform a 10 year cardiovascular risk assessment
Risk factors for decreased bone density and effects of HIV on bone in the elderly

S. Jones · D. Restrepo · A. Kasowitz · D. Korenstein · S. Wallenstein · A. Schneider · M. J. Keller

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Abstract

Summary Most studies of bone density in HIV-infected individuals focus on young men. This study compares differences in bone density in elderly HIV positive men and women to HIV negative controls. Bone density was lower in the lumbar spine and hip in the HIV-infected group. Antiretrovirals may be associated with decreased bone mineralization.

Introduction Individuals with human immunodeficiency virus (HIV) may be at increased risk for osteoporosis. Prolonged exposures to HIV and/or antiretroviral therapy are possible causes for this association. This study compares differences in bone mineral density (BMD) in elderly HIV positive men and women to HIV negative controls.

Methods A cross-sectional study was conducted among 57 HIV-infected and 47 HIV negative subjects over age 55. BMD at the lumbar spine and total hip and markers of bone turnover were compared.

Results BMD was borderline lower in the lumbar spine and significantly lower in the hip in the HIV-infected group. Controlling for age, sex, race and body mass index, differences between the groups were significant at both sites. There was no difference in markers of bone turnover between the groups. Tenofovir use was significantly associated with decreased BMD at the spine while protease inhibitor use was significantly associated with decreased BMD at the hip.

Conclusion Elderly men and women with HIV have lower bone mass than HIV negative controls. Decreased body mass index was the most important risk factor associated with decreased BMD. Bone demineralization was observed among HIV-infected subjects receiving either tenofovir or a protease inhibitor.
### Table 7 Prevalence of osteopenia and osteoporosis as defined by T score

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Osteopenia*</th>
<th>Osteoporosis**</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total hip</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV positive</td>
<td>23 (40%)</td>
<td>31 (54%)</td>
<td>3 (5%)</td>
<td>.25¹</td>
</tr>
<tr>
<td>HIV negative</td>
<td>35 (74%)</td>
<td>12 (26%)</td>
<td>0 (0%)</td>
<td>.007²</td>
</tr>
<tr>
<td><strong>Lumbar spine</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV positive</td>
<td>19 (33%)</td>
<td>22 (39%)</td>
<td>16 (28%)</td>
<td>.09¹</td>
</tr>
<tr>
<td>HIV negative</td>
<td>29 (62%)</td>
<td>12 (26%)</td>
<td>6 (13%)</td>
<td>.006²</td>
</tr>
</tbody>
</table>

*T score between −2.5 and −1 SD

** T score less than −2.5 SD

### Table 2 Median values of bone markers, endocrine and metabolic parameters

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>HIV positive</th>
<th>HIV negative</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years since menopause</td>
<td>14</td>
<td>13</td>
<td>.52</td>
</tr>
<tr>
<td>Years of estrogen use in women who received estrogen</td>
<td>4</td>
<td>5</td>
<td>.64</td>
</tr>
<tr>
<td>Daily calcium intake (mg/day)</td>
<td>721</td>
<td>709</td>
<td>.48</td>
</tr>
<tr>
<td>Serum calcium (mg/dl)</td>
<td>9.4</td>
<td>9.7</td>
<td>.011</td>
</tr>
<tr>
<td>TSH uIU/ml</td>
<td>1.89</td>
<td>1.73</td>
<td>.49</td>
</tr>
<tr>
<td>Intact PTH (pg/ml)</td>
<td>45</td>
<td>52.5</td>
<td>.056</td>
</tr>
<tr>
<td>25 OH’-D (ng/ml)</td>
<td>19.2</td>
<td>17.4</td>
<td>.49</td>
</tr>
<tr>
<td>1,25 OH’-D (pg/ml)</td>
<td>35.9</td>
<td>35</td>
<td>.62</td>
</tr>
<tr>
<td>N-telopeptide (nMBCE)**</td>
<td>20</td>
<td>20.8</td>
<td>.86</td>
</tr>
<tr>
<td>Osteocalcin (ng/ml)</td>
<td>2</td>
<td>1.85</td>
<td>.41</td>
</tr>
</tbody>
</table>
Unique Factors Hindering HIV Care: Aged

- Older people living with HIV face a double stigma
  - Age
  - HIV
- Difficult for seniors, women in particular, to disclose to family, friends, community HIV status
- Smaller network of aged HIV friends for support
- Cross-over symptoms between HIV and aging
  - Fatigue, wt loss, dementia, skin conditions
- Misdiagnosis of OIs more frequent / delayed
- Social isolation leads to depression
  - Not a clear cut diagnosis in elderly persons
  - Losing interest is common with aging
Summary Conclusions

- HIV population is aging due to treatment effect
- HIV despite effective therapy has limits on longevity as “HIV effect” ages persons more quickly
- As HIV clinics age, less time will be given to the young and more spent on the aged and co-morbidities
- Economic challenges exist to provide primary care to an aging HIV population
- Training and education needs to focus on co-morbid HIV related conditions seen with aging
- A fragmented model of “multi-docs” providing specialized care for older HIV persons may be too cumbersome to work