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Optimizing Care for those Aging with HIV Infection

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More People Are Living With HIV

- Living Patients
- New patients
- Deaths

Mortality per 100 patient-years

Number of patients (1000)

www.aids2012.org

www.aids2012.org
Percentage of Adults Living with HIV Aged 50+ By Year and Region

With increased prevalence, incidence is likely to follow....

Source: UNAIDS 2012 estimates.
Sex Doesn’t End at 50

• Sexual activity
  – US: 84% of men and 62% of women in last year\(^1\)
  – SA: 63% of men and 30% of women in last month\(^2\)

• Risk of transmission greater given exposure:
  – In US, men 50+ years 6X less likely to use condoms \(^3\)
  – Ugandan men 50+ years:
    • More likely to have STDs than younger men \(^4\)
    • 40% remained sexually active after HIV dx \(^4\)
  – Women have thinner vaginal wall, increasing risk \(^5\)

Neither Does Alcohol and Drug Use

• HIV+ more likely to continue using alcohol, tobacco, MJ, cocaine and opioids as they age

• HIV+ may be more susceptible to harm from use
  – Risky sex more likely in context of substance use
  – Adherence to ART may be compromised
  – Even low dose may interact with polypharmacy
    • Cognitive compromise
    • Liver, renal, bone marrow toxicity
    • Lung, bladder, and liver cancer
Issues Depend on Treatment Phase

• **Diagnosis and antiretroviral treatment**
  – Treatment cascade
  – Treatment as prevention

• ‘Return to health’/maintenance
  – Obesity
  – Polypharmacy
  – Monitoring/managing risk
  – Sensible primary care (vaccinations)

• End of Life
  – Social isolation
  – Care transitions: home, hospital, extended care
Mr. M

Patient: A 60 y/o white male with a past history of hypertension, hyperlipidemia, MI x 3, CHF s/p AICD placement, and COPD.

Chief complaint: fatigue, loss of appetite, and a 40 lb weight loss /1 year. Also reports progressive dyspnea and dry cough.

Mr. M’s Work Up

- 3-5/13: GI, EGD shows esophageal candidiasis
- 2/14: Hematology BM biopsy for pancytopenia
- 5/14: Pulmonary
- 5-6/14: Dermatology skin biopsy shows squamous cell carcinoma and CMV inclusions
- 7/14: Rheumatology (livido reticularis)
  - HIV test positive,
  - CD4 count 18 cels/dL,
  - HIV-1 RNA 1.2 million copies/ml

It took 9 Months to diagnoses HIV infection in one of the country’s leading tertiary care hospitals. WHY?

- Seen in Cardiology 11/13
HIV Manifestations Not Unique
Delayed Presentation By Age

Barriers to Detection in Older Individuals

- HIV screening not practiced (recommended for individuals 13-64 years of age by CDC and USPTF)
- False belief that sex and drug use cease with age
- Common alternative causes of symptoms
- Unaware that verbal consent is sufficient
- Lack of appreciation of the growing prevalence/incidence in this population
Consequences of Delayed Diagnosis

- HIV transmission
  - Knowledge of status increases condom use
  - ART decreases HIV-1 RNA and risk of transmission
  - Overall, risk of transmission 3.5 times lower\(^1\)

- Prolonged suffering and expense (e.g., Mr. M)

- Poorer response to antiretroviral treatment
  - Only those with CD4 \(\geq 500\) have “normal” life expectancy\(^2\)
  - Lower CD4 counts at initiation make this less likely

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1. Marks G. Estimating sexual transmission from persons aware and unaware...AIDS 2006:20;1447-50
2. Costagliola D. Demographics of HIV and aging. Current Opinions in HIV and AIDS 2014:9;294-301
and Sabin CA. BMC Medicine 2013:11;251-7
Awareness of HIV Serostatus & Transmission

~25% Unaware of Infection

~75% Aware of Infection

People Living with HIV/AIDS: 1,200,000

accounting for:

~54% of New Infections

~46% of New Infections

New Sexual Infections Each Year: ~50,000

Marks et al, AIDS, 2006
Biomedical Prevention of Sexual Transmission of HIV

**Study**  
- Treatment for prevention  
  (Africa, Asia, America’s)  
  Effect size (CI)  
  96% (73; 99)

- PrEP for discordant couples  
  (Partners PrEP)  
  Effect size (CI)  
  73% (49; 85)

- PrEP for heterosexuals  
  (Botswana TDF2)  
  Effect size (CI)  
  63% (21; 48)

- Medical male circumcision  
  (Orange Farm, Rakai, Kisumu)  
  Effect size (CI)  
  54% (38; 66)

- PrEP for MSMs  
  (America’s, Thailand, South Africa)  
  Effect size (CI)  
  44% (15; 63)

- STD treatment  
  (Mwanza)  
  Effect size (CI)  
  42% (21; 58)

- Microbicide  
  (CAPRISA 004 tenofovir gel)  
  Effect size (CI)  
  39% (6; 60)

- HIV Vaccine  
  (Thai RV144)  
  Effect size (CI)  
  31% (1; 51)
Issues Depend on Treatment Phase

• Diagnosis and antiretroviral treatment
  – Treatment cascade
  – Treatment as prevention

• ‘Return to health’/maintenance
  – Obesity
  – Polypharmacy
  – Monitoring/managing risk
  – Sensible primary care (vaccinations)

• End of Life
  – Social isolation
  – Care transitions: home, hospital, extended care
Resting Energy Expenditure (kJ) per kg Fat-Free Mass in HIV-positives and Healthy Controls

Weight Change Over 12 Months by Baseline Weight Status

Uninfected

HIV Infected After ART Initiation

Baseline BMI

Weight change over 12 months following start date
- Yellow: Lost > 5 lbs
- Blue: Remained within ± 5 lbs
- Red: Gained > 5 lbs

Tate J et al. CROI [Poster] Atlanta, Georgia, March 3-6, 2013.
Weight Change after ART And Mortality
(Normal n=2226 Vs. Overweight/Obese n=1842)

*Adjusted for VACS Index at ART Initiation
Incidence of Diabetes by BMI at Baseline and Weight Gain Over 12 Months

<table>
<thead>
<tr>
<th>Weight Gain</th>
<th>Normal</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5 - 10 lbs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+10 - 20 lbs</td>
<td>13</td>
<td>38</td>
<td>73</td>
</tr>
<tr>
<td>&gt;20</td>
<td>11</td>
<td>43</td>
<td>82</td>
</tr>
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</table>

HIV -

<table>
<thead>
<tr>
<th>Weight Gain</th>
<th>HIV -</th>
<th>HIV +</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5 - 10 lbs</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>+10 - 20 lbs</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>&gt;20</td>
<td>13</td>
<td>37</td>
</tr>
</tbody>
</table>

HIV +

<table>
<thead>
<tr>
<th>Weight Gain</th>
<th>HIV -</th>
<th>HIV +</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5 - 10 lbs</td>
<td>38</td>
<td>8</td>
</tr>
<tr>
<td>+10 - 20 lbs</td>
<td>43</td>
<td>12</td>
</tr>
<tr>
<td>&gt;20</td>
<td>23</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight Gain</th>
<th>HIV -</th>
<th>HIV +</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5 - 10 lbs</td>
<td>73</td>
<td>4</td>
</tr>
<tr>
<td>+10 - 20 lbs</td>
<td>82</td>
<td>9</td>
</tr>
<tr>
<td>&gt;20</td>
<td>64</td>
<td>9</td>
</tr>
</tbody>
</table>

Tate J et al. CROI [Poster] Atlanta, Georgia, March 3-6, 2013.
Polypharmacy

• Typically defined as >5 chronic drugs

• Associated with diminished marginal benefit from additional medication due to:
  – Non adherence
  – Drug-drug interactions
  – Cumulative toxicity

• Risk of adverse events increases approximately 10% with each additional medication

Gandhi TK. N Engl J Med 2003;348:1556-64
Daily Pill Count By Age and Purpose 1990-2010
(Southern Alberta Cohort, Canada)

ARV Pill Count Decreasing
For <45 and 45+ Years of Age

Non ARV Pill Count
Differentially Increasing
For 45+ Years of Age

### Table 5. Most Common ADEs That Were Classified as Causal or Contributory to Admission and Possibly or Definitely Avoidable as per Hallas Criteria

<table>
<thead>
<tr>
<th>ADE</th>
<th>No. (%)</th>
<th>Attributed to STOPP Criteria PIMs</th>
<th>Attributed to Beers Criteria PIMs</th>
<th>ADEs Appearing Both in STOPP and Beers Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall(s) while receiving benzodiazepines</td>
<td>24 (15.9)</td>
<td>24 (100)</td>
<td>22 (91.7)</td>
<td>22 (91.7)</td>
</tr>
<tr>
<td>Symptomatic orthostasis while receiving antihypertensives</td>
<td>17 (11.3)</td>
<td>15 (88.2)</td>
<td>1 (5.9)</td>
<td>1 (5.9)</td>
</tr>
<tr>
<td>Falls while receiving opiates</td>
<td>10 (6.6)</td>
<td>10 (100)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hyponatremia while receiving diuretics</td>
<td>10 (6.6)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Constipation while receiving opiates</td>
<td>6 (4.0)</td>
<td>6 (100)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Falls while receiving sedative hypnotics</td>
<td>6 (4.0)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acute kidney injury while receiving diuretics</td>
<td>6 (4.0)</td>
<td>3 (50)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Symptomatic orthostasis while receiving diuretics</td>
<td>5 (3.3)</td>
<td>5 (100)</td>
<td>1 (20)</td>
<td>1 (25)</td>
</tr>
<tr>
<td>Falls on neuroleptics</td>
<td>5 (3.3)</td>
<td>5 (100)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NSAID-related gastritis/peptic ulcer disease</td>
<td>4 (2.6)</td>
<td>3 (75)</td>
<td>1 (25)</td>
<td>1 (25)</td>
</tr>
<tr>
<td>Bradycardia while receiving β-blockers</td>
<td>4 (2.6)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Abbreviations: ADEs, adverse drug events; NSAID, nonsteroidal anti-inflammatory drug; PIMs, potentially inappropriate medicines; STOPP, Screening Tool of Older Persons’ potentially inappropriate Prescriptions.

## Non-ART Medications by Age

<table>
<thead>
<tr>
<th>Medication</th>
<th>Total n (%)</th>
<th>&lt;50</th>
<th>50-64</th>
<th>&gt;65</th>
<th>P₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antihypertensives (not ACE inhibitors)</td>
<td>831 (9.8)</td>
<td>323 (5.6)</td>
<td>367 (16.4)</td>
<td>141 (31.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Antihypertensives (ACE inhibitors)</td>
<td>935 (11.1)</td>
<td>355 (6.2)</td>
<td>432 (19.4)</td>
<td>148 (32.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lipid-lowering agents</td>
<td>1071 (12.7)</td>
<td>356 (6.2)</td>
<td>527 (23.6)</td>
<td>188 (41.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Oral antidiabetics</td>
<td>179 (2.1)</td>
<td>51 (0.9)</td>
<td>87 (3.9)</td>
<td>41 (9.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Insulin</td>
<td>116 (1.4)</td>
<td>40 (0.7)</td>
<td>50 (2.2)</td>
<td>26 (5.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Antiplatelet drugs</td>
<td>488 (5.8)</td>
<td>121 (2.1)</td>
<td>237 (10.6)</td>
<td>130 (28.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>846 (10.0)</td>
<td>560 (9.7)</td>
<td>251 (11.2)</td>
<td>35 (7.8)</td>
<td>0.659</td>
</tr>
</tbody>
</table>

₁ Test for trend across age-groups

Abbreviations: ART, antiretroviral therapy; ACE, Angiotensin converting enzyme
Chronic Medication Count by Age and HIV Status (VACS)

Edelman EJ et al. IDSA [oral], San Francisco, California, October 2-6, 2013.
Medication Count and Mortality (VACS)

Seven or more medications is associated with an increased risk of mortality after adjusting for HIV status and disease severity.

*Note: reference is 3 medications

Edelman EJ et al. IDSA [oral], San Francisco, California, October 2-6, 2013.
Sensible Primary Care: Vaccinations

• Vaccines less immunogenic/ antibody response shorter in HIV+

• Routine inactivated vaccines (flu, Td or TdaP, HPV up to 26 yrs, Pneumococcal, HBV if not immune)
  – More effective once CD4 count ≥200 cells/ml
  – May consider revaccinating after counts improve

• Some live vaccines OK if CD4≥200 cells/ml
  – Zoster vaccine safe if CD4≥200, consider if 60+yrs.
  – BCG IS NOT RECOMMENDED IN HIV+

Frailty results from multimorbidity (and polypharmacy).
Frailty$^{1,2}$

- **Concept:** decreased tolerance due to cumulative physiologic injury increasing risk of catastrophic declines

- **Biological underpinnings:**
  - Dysregulation across systems: Chronic inflammation, anabolic and catabolic hormones, insulin resistance, immune dysfunction/suppression (telomere length), oxidative stress, and micronutrient deficiencies

- **Approaches to measurement vary:**
  - Phenotypic (Fried et al.): Weight loss, exhaustion, weakness, slowness, low activity
  - Deficit accumulation (Rockwood et al.): 30 measures of function, symptoms, and diagnoses


Pathophysiology of Frailty

Is Frailty Expressed the Same Way Among those Aging with HIV?

• Fried phenotype uncommon (<7%), cognition not included, may be confounded by depression

• Rockwood Index is complex and requires measures not routinely collected

• What about routine laboratory markers...
Components of VACS Index

• Age
• HIV Biomarkers: HIV-1 RNA, CD4 Count
• General Biomarkers: Hemoglobin, HCV, Composite markers for liver and renal injury
• Assessed among those initiating treatment
• Adjusted to predict among those on treatment
Composite Biomarkers

\[
\text{FIB 4} = \frac{\text{AGE} \times \text{AST}}{\text{PLT} \times (\text{ALT}^{1/2})} \quad [1]
\]

\[
\text{eGFR} = 186.3 \times \text{CREAT}^{-1.154} \times \text{AGE}^{-0.203} \times \text{FEM\_VAL} \times \text{BLACK\_VAL} \quad [2]
\]

\[
\text{FEM\_VAL} = \begin{cases} 
0.742 & \text{if female, } 1 \text{ if male} \\
\end{cases}
\]

\[
\text{BLACK\_VAL} = \begin{cases} 
1.21 & \text{if black, } 1 \text{ otherwise} \\
\end{cases}
\]

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Restricted</th>
<th>VACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50 years</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50 to 64</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>&gt; 65 years</td>
<td>44</td>
<td>27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CD4 Cells/mm³</th>
<th>Restricted</th>
<th>VACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 500</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>350 to 499</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>200 to 349</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>100 to 199</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>50 to 99</td>
<td>40</td>
<td>28</td>
</tr>
<tr>
<td>&lt; 50</td>
<td>46</td>
<td>29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HIV-1 RNA Copies/ml</th>
<th>Restricted</th>
<th>VACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 500</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>500 to 1x10⁵</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>≥ 1x10⁵</td>
<td>25</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hemoglobin g/dL</th>
<th>Restricted</th>
<th>VACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 14</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12 to 13.9</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>10 to 11.9</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>&lt; 10</td>
<td>38</td>
<td>38</td>
</tr>
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<table>
<thead>
<tr>
<th>FIB-4</th>
<th>Restricted</th>
<th>VACS</th>
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<tbody>
<tr>
<td>&lt; 1.45</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1.45 to 3.25</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>&gt; 3.25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>eGFR mL/min</th>
<th>Restricted</th>
<th>VACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 60</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>45 to 59.9</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>30 to 44.9</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>&lt; 30</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hepatitis C Infection</th>
<th>Restricted</th>
<th>VACS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
A. NA-ACCORD (N = 10835)  
B. VACS (N = 5066)  
C. Men (N = 12785)  
D. Women (N = 3116)  
E. Age < 50 years (N = 11191)  
F. Age > 50 years (N = 4710)  
G. Black (N = 5878)  
H. White (N = 6079)  
I. Undetectable VL (N = 8715)  
J. Detectable VL (N = 7186)  

Justice AC. et al. Predictive Accuracy of the Veterans Aging Cohort Study (VACS) Index for Mortality with HIV infection: A North American Cross Cohort Analysis. JAIDS in press Feb 1 2012
Kaplan-Meier Survival Estimates

HIV Restricted Index

VACS Index

VACS Index Predicts Fragility Fractures

VACS Index Correlated with Biomarkers of Inflammation

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (SD)</th>
<th>VACS Index&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Restricted index&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Endurance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolic equivalents (METS)</td>
<td>6.0 (1.6)</td>
<td>-0.21 (0.1)</td>
<td>-0.25 (0.07)</td>
</tr>
<tr>
<td>Exercise time, median (range), min</td>
<td>12.0 (4-15)</td>
<td>-0.20 (0.2)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-0.23 (0.09)</td>
</tr>
<tr>
<td>6-min walk distance, m</td>
<td>533 (83)</td>
<td>-0.27 (0.05)</td>
<td>-0.10 (0.5)</td>
</tr>
<tr>
<td><strong>Strength</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadriceps strength, N</td>
<td>596 (163)</td>
<td>-0.45 (&lt;0.01)</td>
<td>-0.17 (0.2)</td>
</tr>
<tr>
<td>Grip strength, kg</td>
<td>40.5 (7.9)</td>
<td>-0.28 (0.04)</td>
<td>-0.18 (0.2)</td>
</tr>
<tr>
<td><strong>Body composition</strong>&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total percent body fat, %</td>
<td>21.0 (9.0)</td>
<td>-0.04 (0.7)</td>
<td>0.01 (0.9)</td>
</tr>
<tr>
<td>Total lean mass, kg</td>
<td>56.1 (7.4)</td>
<td>-0.51 (&lt;0.001)</td>
<td>-0.22 (0.1)</td>
</tr>
<tr>
<td>Leg lean mass, kg</td>
<td>18.7 (2.8)</td>
<td>-0.49 (&lt;0.001)</td>
<td>-0.19 (0.2)</td>
</tr>
<tr>
<td>Quadriceps cross-sectional area, cm&lt;sup&gt;2&lt;/sup&gt;</td>
<td>68.6 (13.3)</td>
<td>-0.37 (&lt;0.01)</td>
<td>-0.12 (0.4)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Pearson.

<sup>b</sup>Spearman.

<sup>c</sup>By DXA (n=50) and CT (n=48).

Oursler KK et al, *AIDS Research and Human Retroviruses* 2013; 29(9):1218-1223
FIG. 1. VACS index predicts quadriceps strength adjusted for muscle cross-sectional area (CSA).
The Veterans Aging Cohort Study Index is Associated With Concurrent Risk for Neurocognitive Impairment.


OBJECTIVE: The Veterans Aging Cohort Study (VACS) Index is predictive of mortality and combines age, traditional HIV biomarkers (HIV-1 plasma RNA and current CD4 count), and non-HIV biomarkers (indicators of renal and liver function, anemia, and hepatitis C coinfection). We examined the association between the VACS Index and HIV-associated neurocognitive impairment (NCI).

DESIGN AND METHODS: Participants included 601 HIV-infected adults enrolled in cohort studies at the University of California, San Diego, HIV Neurobehavioral Research Program (ages: 18-76 years; 88% male; 63% white; median current CD4 = 364 cells/mm; 63% on antiretroviral therapy; AIDS = 64%). Biomarkers used in calculating the VACS Index were measured in prospectively collected blood samples using conventional laboratory methods. NCI was defined using global and seven domain deficit scores.

RESULTS: Higher VACS Index scores were associated with concurrent risk for global NCI [P < 0.001; odds ratio = 1.21, confidence interval (CI): 1.12 to 1.32], even when adjusting for psychiatric comorbidities. This relation was statistically significant for most cognitive domains in adjusted models. Furthermore, the VACS Index predicted concurrent NCI beyond nadir CD4 and estimated duration of infection. Older age, lower hemoglobin, and lower CD4 counts were the VACS components most strongly linked to NCI.

CONCLUSIONS: The findings extend previous research on the potential usefulness of the VACS Index in predicting HIV-associated outcomes to include NCI. Although the effect size was relatively small, our findings suggest that demographic information, HIV-disease factors, and common comorbidities might each play important roles in the clinical manifestation of cognitive impairment among HIV-infected individuals. Additional research is needed to determine if a more sensitive and specific index can be developed.
VACS Index Measures Frailty in HIV

• Is associated with
  – Functional performance
  – Cognitive performance
  – Biomarkers of chronic inflammation

• Predicts
  – All cause and cause specific mortality
  – Hospitalization, MICU admission and 30 day mortality
  – Fragility fractures

• Is responsive to changes in care and behavior
  – ART interruption and intensification
  – Varying levels of ART adherence
Currently Active

Under Development

HTTP://VACS.MED.YALE.EDU
Issues Depend on Treatment Phase

• Diagnosis and antiretroviral treatment
  – Treatment cascade
  – Treatment as prevention

• ‘Return to health’/maintenance
  – Obesity
  – Polypharmacy
  – Monitoring/managing risk
  – Sensible primary care (vaccinations)

• End of Life
  – Social isolation
  – Care transitions: home, hospital, extended care
Social Isolation By HIV Status and Age

Veterans Aging Cohort Study (VACS)

The Veterans Aging Cohort Study (VACS) is a prospective, observational cohort study of HIV-positive and an age/race/si matched control group of HIV-negative veterans in care in the United States. The study’s aim is to understand the role of comorbid medical and psychiatric disease in determining clinical outcomes in HIV infection. It is funded primarily by the National Institute on Alcoholism and Alcohol Abuse, National Institutes of Health. The study has a special focus on the role of alcohol use and abuse in determining clinical outcomes.

The VACS study is built around the Veterans Health Administration (VA), the largest integrated health-care system in the United States, providing care to 5.6 million patients annually. The VA is also the largest single provider of HIV care in the nation, serving 15,000 HIV-positive veterans in 2003. The VA provides inpatient and outpatient medical care, pharmacy, mental-health services, substance-abuse treatment, long-term care, homeless care, and hospice services. The VA also has a national, fully electronic medical record system that includes all routine clinical data, administrative data, and comprehensive follow-up data for mortality, as the VA pays some burial expenses for veterans.
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