Challenges and Opportunities: Primary Care and HIV in 2011

Howard Libman, Amy Justice, Gail Berkenblit, Amina Chaudhry, Joseph Cofrancesco Jr., and James Sosman

• HIV Primary Care and Training Needs
• HIV, Aging and Multimorbidity
• Models of Care for HIV

• Breakout sessions- focus on one of the above
• Summary
HIV Primary Care and Training Needs

Howard Libman, MD
Professor, Harvard Medical School
Director of the HIV Program in Healthcare Associates at Beth Israel Deaconess Medical Center
SGIM Workshop 2011
Overview

• Over 50,000 patients are diagnosed with HIV infection annually in the US, and a significant proportion of them are over the age of 40

• Recent guidelines advocate earlier initiation of ART

• Patients with chronic HIV infection are living longer, and some will develop complications of therapy and other comorbid conditions

• The first generation of HIV providers are maturing with their patients, and many will retire over the next ten years

• Future primary care providers will have a substantial responsibility for the care of these patients

• Training of this next generation should be designed to meet anticipated care needs
Primary Care Provider Roles in HIV Care

• Universal HIV screening and prevention
• Antiretroviral therapy * and medication adherence
• Prophylaxis of opportunistic infections
• Management of comorbid conditions
• Health care screening
• Immunizations
• Other HIV-related HCM issues
• Age- and sex-related HCM issues

* Involvement with vary depending upon interest and experience of PCP and availability of HIV specialists
Increasing Prevalence of Persons Living with HIV/AIDS

Institute of Medicine, HIV Screening and Access to Care, 2011.
Percent of American Adults Ever Tested for HIV, 1997-2010

Centers for Disease Control and Prevention, 2010.
### Indications for Initiating ART: Chronic Infection (1)

<table>
<thead>
<tr>
<th>Clinical Category and/or CD4 Count</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS-defining condition, current or past</td>
<td>Initiate ART</td>
</tr>
<tr>
<td>CD4 count of &lt; 500/mm³</td>
<td></td>
</tr>
<tr>
<td>Pregnant women</td>
<td></td>
</tr>
<tr>
<td>HIV-associated nephropathy</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B coinfection, when HBV treatment is indicated *</td>
<td></td>
</tr>
</tbody>
</table>

* Treatment with suppressive drugs for both HIV and HBV is recommended.

## Indications for Initiating ART: Chronic Infection (2)

<table>
<thead>
<tr>
<th>Clinical Category and/or CD4 Count</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD4 count of &gt; 500/mm³, asymptomatic, without conditions listed above</td>
<td>Optimal time to initiate ART is not well defined; half the panel favors treatment, and half the panel considers it optional</td>
</tr>
</tbody>
</table>

Long Term Treatment Complications

- Lipid metabolism
  - increased triglycerides
  - increased cholesterol, LDL, cholesterol/HDL ratio
  - decreased HDL
- Glucose metabolism
  - insulin resistance
  - glucose intolerance
  - diabetes mellitus
- Fat accumulation
  - increase visceral fat
  - buffalo hump
  - lipomatisosis
  - gynecomastia
- Fat atrophy
  - face, extremities, buttocks
- Lactic acidemia/acidosis
- Osteopenia/osteoporosis
- Avascular necrosis of hips
- Peripheral neuropathy
# Chronic Complications by Age and HIV Status

<table>
<thead>
<tr>
<th></th>
<th>HIV-positive patients</th>
<th>HIV-negative patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 40 yrs</td>
<td>41 to 50 yrs</td>
</tr>
<tr>
<td>N = 111</td>
<td>62.16%</td>
<td>45.41%</td>
</tr>
<tr>
<td>N = 403</td>
<td>25.23%</td>
<td>38.96%</td>
</tr>
<tr>
<td>N = 176</td>
<td>12.61%</td>
<td>13.65%</td>
</tr>
<tr>
<td>N = 58</td>
<td>13.65%</td>
<td>38.96%</td>
</tr>
</tbody>
</table>

Increased HIV Screening of Population

Increased Survival of HIV-infected Patients

Increased Number of Patients, Many on ART, Requiring HIV Care

Aging of Patient Population and Development of LTTC and Comorbid Medical Conditions

Need for Increased Primary Care Involvement in HIV Care

Decreased Capacity for Provision of Primary Care to HIV-infected Patients

Decreased Number of Medical Residents Pursuing Primary Care

Inadequate Training of Medical Residents in HIV Outpatient Medicine

First Generation of HIV Providers Nearing Retirement in Next 10 Years
“…One of the challenges is the emergence of HIV as a chronic medical condition, increasing the complexity of treating HIV-positive individuals…Infectious disease specialists may, as a rule, have greater expertise than primary care providers in treating HIV, but increasingly HIV-positive patients require the broader skills of primary care physicians, APRNs, and PAs to address their other health care needs.”

Institute of Medicine, HIV Screening and Access to Care: Health Care System Capacity for Increased HIV Testing and Provision of Care, 2011.
Universal HIV Screening
Epidemiology (1)

• Despite advances in treatment, HIV infection remains a leading cause of illness and death
• Estimated 1,106,400 HIV-infected persons in US
• Approximately 56,300 new cases/year
• 57% of new cases are transmitted by male-to-male sexual contact, 31% by heterosexual contact, 9% by injection drug use, and 3% by male-to-male sexual contact and injection drug use

Hall HI et al. JAMA 2008;300:520-529.
Epidemiology (2)

- 34% of new cases are in persons age 13-29 years, 24% age 30-39 years, 25% age 40-49 years, and 17% age 50 years or older.

- Among males, 46% of new cases are in African Americans, 32% in whites, and 19% in Hispanics; among females, 67% of new cases in African Americans, 18% in whites, and 13% in Hispanics.

- 21% of persons are unaware of their HIV infection.

Medical treatment dramatically decreases HIV-related morbidity and mortality, but:

- Persons unaware of their infection are unable to benefit from care

- HIV testing often is not performed until late in the disease process: 32% of people were diagnosed with AIDS within 1 year of testing positive for HIV in 2007

Transmission rates are higher among people who do not know they are HIV-infected

CDC. MMWR 2010;59:1550-1555.
Marks G et al. AIDS 2006;20:1447-1450.
2006 CDC Revised Recommendations for HIV Testing

- **Routine** voluntary screening for patients age 13-64 in health care settings unless prevalence <0.1%
- **Opt-out** testing
- **No** separate consent required
- Pre-test counseling **not** required

CDC Recommendations for Routine HIV Antibody Testing

• Screen all healthy patients after notification that an HIV test will be performed unless they decline ("opt-out" testing)

• All persons should be screened at least once, and those at high risk annually

• Prevention counseling should not be required as part of routine HIV testing, but it is strongly recommended for persons at high risk
Implementation of Routine HIV Screening Has Been Slow

- National Health Interview Survey
- Estimate percentage of persons aged 18-64 years who reported ever being tested for HIV in the US
- Stable at approximately 40% between 2001 and 2006
- Increased modestly to 45% in 2009

Centers for Disease Control and Prevention. MMWR 2010;59:1550-1555.
Why Don’t Physicians Test for HIV?
A Review of the Literature

- Insufficient time
- Burdensome consent process
- Lack of knowledge/training
- Lack of patient acceptance
- Pretest counseling requirements
- Competing priorities
- Inadequate reimbursement

Regulatory Barriers to HIV Screening

• As of November, 2008, statutory regulations of sixteen states were inconsistent with the CDC recommendations on HIV testing and precluded implementation of one or more of its provisions

• The general trend over time has been for more states to modify their regulations to make them consistent with the guidelines

• State regulations on HIV testing continue to vary widely

• As of early 2011, written informed consent was still mandated in five states

National HIV/AIDS Clinicians' Consultation Center.
http://www.nccc.ucsf.edu/consultation_library/state_hiv_testing_laws.
Breakout Session Group 1: Training Needs

• What are the most pressing **training needs and deficits** in relation to students, residents, other providers:
  – To make universal testing happen?
  – To manage primary care for people with HIV?
  – To train others to care for HIV?

• What **solutions or models** can be applied to address training challenges in your area for
  – Universal testing?
  – Linkage to care?
  – Primary care for HIV patients?
  – Improving models of care?
HIV, Aging and Multimorbidity: How Can We Most Effectively Improve Patient Outcomes?

Amy C. Justice, MD, PhD
Professor, Yale University School of Medicine
Section Chief, General Internal Medicine, VA Connecticut

SGIM Workshop 2011
Non AIDS Conditions (Comorbidity) Affecting Those Aging with HIV

- Aging
- Treatment Toxicity
- Substance Use and Other Behaviors
- HIV Associated Non AIDS (HANA) Conditions
HIV Associated Non AIDS Conditions (HANA)

• After adjustment for usual risk factors, HIV association remains
  – Usual risk factors determine most of the risk
  – Increasing age and substance use often important

• Subset of comorbid disease we are seeing

• May be due to HIV, to ART or both
  – May or may not be associated with usual markers of HIV disease (CD4 count or HIV-1 RNA)
## Conditions Have Overlapping Risks

<table>
<thead>
<tr>
<th>Condition</th>
<th>HIV or HCV – Associated?</th>
<th>Aging-Associated?</th>
<th>Substance Use-Associated?</th>
<th>Toxicity-Associated?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial Infarction</td>
<td>Both</td>
<td>Yes</td>
<td>Tobacco, Cocaine</td>
<td>Possibly PIs</td>
</tr>
<tr>
<td>Diabetes</td>
<td>HCV</td>
<td>Yes</td>
<td>Alcohol</td>
<td>PIs</td>
</tr>
<tr>
<td>Stroke</td>
<td>Both</td>
<td>Yes</td>
<td>Cocaine</td>
<td>Anticoagulants</td>
</tr>
<tr>
<td>Fragility Fractures</td>
<td>HIV</td>
<td>Yes</td>
<td>Alcohol, Tobacco</td>
<td>Steroids, PPIs</td>
</tr>
<tr>
<td>Liver Cirrhosis</td>
<td>Both</td>
<td>Yes</td>
<td>Alcohol</td>
<td>Lots</td>
</tr>
<tr>
<td>“Infectious” Cancers</td>
<td>Liver-HCV, Anal-HIV, HPV</td>
<td>Yes</td>
<td>Liver-Alcohol</td>
<td>Unknown</td>
</tr>
<tr>
<td>Non-Infectious Cancers</td>
<td>Lung-HIV</td>
<td>Yes</td>
<td>Lung-Tobacco</td>
<td>Unknown</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>HIV</td>
<td>Yes</td>
<td>Tobacco, Alcohol</td>
<td>Unknown</td>
</tr>
<tr>
<td>Obstructive Lung Disease</td>
<td>HIV</td>
<td>Yes</td>
<td>Tobacco</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Of Note

- Range of relative risk with HIV variable
  - Fragility fracture risk modest (1.3)
  - Cardiovascular risk may be substantial (>2 fold)

- Incidence/prevalence of a particular condition separate issue from that of relative risk
  - Relative risk of anal cancer very high
  - Incidence/prevalence lower than for lung cancer

- Consider competing risk of death

- Multimorbidity is the rule
<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>HR for AMI with 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV infection</td>
<td>1.94 (1.58-2.37)</td>
</tr>
<tr>
<td>Age (10 yrs)</td>
<td>1.39 (1.26-1.54)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>0.79 (0.64-0.98)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.39 (1.03-1.88)</td>
</tr>
<tr>
<td>Other</td>
<td>0.42 (0.22-0.80)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.36 (1.10-1.68)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.01 (1.68-2.53)</td>
</tr>
<tr>
<td>Hypercholesterolemia</td>
<td>1.30 (1.06-1.59)</td>
</tr>
<tr>
<td>Ever Smoking</td>
<td>1.87 (1.38-2.52)</td>
</tr>
<tr>
<td>HCV infection</td>
<td>1.10 (0.88-1.38)</td>
</tr>
<tr>
<td>EGFR&lt;30 ml/min/1.73m²</td>
<td>4.93 (3.12-7.77)</td>
</tr>
<tr>
<td>BMI ≥ 30kg/m²</td>
<td>0.90 (0.72-1.12)</td>
</tr>
<tr>
<td>History of cocaine abuse or dependence</td>
<td>1.42 (0.97-2.09)</td>
</tr>
<tr>
<td>History of alcohol abuse or dependence</td>
<td>0.80 (0.56-1.11)</td>
</tr>
</tbody>
</table>

Freiberg M.S. et al. HIV is Associated with Clinically Confirmed MI. CROI 2011 Abstract# W-176
### Fragility Fractures HIV+/- (n= 125,259)

<table>
<thead>
<tr>
<th></th>
<th>HIV Model</th>
<th>Full Model</th>
<th>HIV+ Men</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIV</strong></td>
<td>1.32 (1.20, 1.47)</td>
<td>1.10 (0.97, 1.25)</td>
<td>--</td>
</tr>
<tr>
<td>Age (10 yr increments)</td>
<td>--</td>
<td>1.32 (1.25, 1.40)</td>
<td>1.52 (1.39, 1.66)</td>
</tr>
<tr>
<td>White race</td>
<td>--</td>
<td>1.80 (1.60, 2.03)</td>
<td>1.85 (1.52, 2.25)</td>
</tr>
<tr>
<td>Alcohol abuse</td>
<td>--</td>
<td>1.80 (1.50, 2.17)</td>
<td>1.50 (1.12, 2.02)</td>
</tr>
<tr>
<td>Liver disease</td>
<td>--</td>
<td>1.38 (1.10, 1.73)</td>
<td>1.39 (1.03, 1.87)</td>
</tr>
<tr>
<td>Smoker</td>
<td>--</td>
<td>1.21 (1.04, 1.42)</td>
<td>1.30 (1.00, 1.67)</td>
</tr>
<tr>
<td>Any PPI use</td>
<td>--</td>
<td>1.70 (1.51, 1.92)</td>
<td>1.55 (1.28, 1.89)</td>
</tr>
<tr>
<td>BMI</td>
<td>--</td>
<td>0.82 (0.79, 0.85)</td>
<td>0.87 (0.77, 0.99)</td>
</tr>
<tr>
<td>BMI²</td>
<td>--</td>
<td>1.002 (1.002, 1.003)</td>
<td>1.00 (1.00, 1.00)</td>
</tr>
<tr>
<td>Current corticosteroid use</td>
<td>--</td>
<td>1.45 (1.21, 1.74)</td>
<td>1.41 (1.06, 1.88)</td>
</tr>
<tr>
<td>CD4/100 cells/mm³</td>
<td>--</td>
<td>--</td>
<td>1.01 (0.98, 1.05)</td>
</tr>
<tr>
<td>Current TDF use</td>
<td>--</td>
<td>--</td>
<td>1.29 (0.99, 1.70)</td>
</tr>
<tr>
<td>Current PI use</td>
<td>--</td>
<td>--</td>
<td>1.41 (1.16, 1.70)</td>
</tr>
</tbody>
</table>
Multimorbidity

• Patients have multiple conditions of varying level of severity that likely interact

• Need to consider cumulative injury not just a subset of diagnoses

• Need a means of tracking cumulative injury
Rationale for Multivariable Risk Index

- A single, summary measure of disease
- Identifies important thresholds for lab tests
- Resolves conflicting results
- Informs prioritization
- Has major statistical advantages
  - Decreased measurement error
  - Each person has a measurable outcome at any time point

Approach to Screening

• Universal screening for age-associated conditions may not be reasonable

• Need to balance:
  – Benefits which require
    – Effectiveness of treatment among those with HIV
    – Sufficient life expectancy to realize benefit
  – Against risks/harms
    – General risks (e.g. perforation from colonoscopy)
    – HIV specific risks (e.g. infection after breast biopsy)

• A summary risk index might be helpful
Example: Framingham Risk Assessment

Risk score results:
Age: 60
Gender: male
Total Cholesterol: 280 mg/dL
HDL Cholesterol: 100 mg/dL
Smoker: Yes
Systolic Blood Pressure: 120 mm/Hg
On medication for HBP: No
Risk Score* 10%

*R The risk score shown was derived on the basis of an equation. Other NCEP materials, such as ATP III print products, use a point-based system to calculate a risk score that approximates the equation-based one.

To interpret the risk score and for specific information about CHD risk assessment as part of detection, evaluation, and treatment of high blood cholesterol, see ATP III Executive Summary and ATP III At-a-Glance.
Framingham Index

- Assigns points based on 6 factors (5 modifiable) to estimate risk of MI or CVD death over 10 years (from 1% to >56%)
- Assumes that change in risk due to change in factor is same as never having had the factor
- Quantifies absolute level of CHD risk for individual patients and allows level of treatment to be matched to level of risk
- CHD guidelines are based on these estimates, has been used as an outcome in RCTs

*D’Agostino RB. Et al. Validation of the Framingham Coronary Heart Disease Prediction Scores: Results of a Multiple Ethnic Groups Investigation. JAMA 2001;286:180-187*
Veterans Aging Cohort Study Risk Index (VACS Index)

• Composed of age and laboratory tests currently recommended for clinical management
  
  – **HIV Biomarkers**: HIV-1 RNA and CD4 Count
  
  – “**non HIV Biomarkers**”: Hemoglobin, hepatitis C, composite markers for liver and renal injury

• Developed in US veterans, validated in Europe and North America
Composite Biomarkers

\[
\text{FIB 4} = \frac{\text{AGE} \times \text{AST}}{\text{PLT} \times \sqrt{\text{ALT}}}
\]

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

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

\[
\text{BLACK\_VAL} = \begin{cases} 
1.21 \text{ if black,} \\
1 \text{ otherwise}
\end{cases}
\]
## VACS Index for External Validation

<table>
<thead>
<tr>
<th>Index Score</th>
<th>Restricted</th>
<th>VACS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50</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</td>
<td>44</td>
<td>27</td>
</tr>
<tr>
<td><strong>CD4 cells/mm³</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 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>
<tr>
<td><strong>HIV-1 RNA copies/ml</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 500</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>500 to 1x10^5</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>≥ 1x10^5</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td><strong>Hemoglobin g/dL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 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>
<tr>
<td><strong>FIB-4</strong></td>
<td></td>
<td></td>
</tr>
<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>
<tr>
<td><strong>eGFR mL/min</strong></td>
<td></td>
<td></td>
</tr>
<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>

**Hepatitis C Infection**

5

Tate J. et al. IDSA 2010 Vancouver, BC October 21-24th. Poster 1136
VACS Index Highly Predictive of Long Term (5 Year) All Cause Mortality


## Discrimination of VACS vs. Restricted Index

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>VACS Index C-stat</th>
<th>Restricted Index C-stat</th>
<th>p-value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>0.80</td>
<td>0.75</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Male</td>
<td>0.81</td>
<td>0.75</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Female</td>
<td>0.81</td>
<td>0.77</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>White</td>
<td>0.79</td>
<td>0.74</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Black</td>
<td>0.81</td>
<td>0.76</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.90</td>
<td>0.78</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50</td>
<td>0.81</td>
<td>0.75</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&gt;= 50</td>
<td>0.74</td>
<td>0.69</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>HIV-1 RNA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;500</td>
<td>0.77</td>
<td>0.68</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>&gt;=500</td>
<td>0.78</td>
<td>0.74</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
Calibration of VACS vs. Restricted Index (5 Year Mortality)

Justice AC. et al. A Prognostic Index for those Aging with HIV. CROI 2011 Poster # 793
Summary: VACS Index

• Is calibrated and discriminating for mortality among patients with access to ART in North America

• Can be applied at any point in care

• Offers substantially more information than CD4, HIV RNA, and age alone, or in combination

• Has fulfilled all the same criteria as the Framingham index (with similar or better results)
## Potential Interventions to Lower VACS Risk Index

<table>
<thead>
<tr>
<th>Intervention</th>
<th>CD4 and HIV-1 RNA</th>
<th>Hemoglobin</th>
<th>eGFR</th>
<th>FIB 4</th>
<th>HCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARV optimization (choice, timing, and adherence)</td>
<td>+++</td>
<td>+++/-</td>
<td>+/-</td>
<td>+/-</td>
<td>NA</td>
</tr>
<tr>
<td>Alcohol Cessation</td>
<td>++ (adherence)</td>
<td>+</td>
<td>NA</td>
<td>+++</td>
<td>NA</td>
</tr>
<tr>
<td>HCV Treatment</td>
<td>NA</td>
<td>+</td>
<td>NA</td>
<td>++/-</td>
<td>+++</td>
</tr>
<tr>
<td>HBV Treatment</td>
<td>NA</td>
<td>+</td>
<td>NA</td>
<td>++/-</td>
<td>NA</td>
</tr>
<tr>
<td>Medication Review</td>
<td>+</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>NA</td>
</tr>
<tr>
<td>Blood Pressure Control</td>
<td>NA</td>
<td>NA</td>
<td>+++</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
Advantages

• Computationally easy, widely valid, well calibrated

• Uses lab tests currently part of routine care; but extends well beyond CD4 and HIV-1 RNA

• Identifies modifiable risk early in course of disease
  – To prioritize care
  – To motivate behavior change

• Offers a means of comparing effectiveness of diverse interventions (behavior to therapeutics)

• A new approach to when to start, switch, or stop
Current Limitations, Future Work

• Due to limited availability, does not include:
  – Direct effects of smoking (varies by level of smoking)
  – Blood pressure, Lipids, or BMI
  – Muscle strength or functional status
  – Inflammatory biomarkers (possibly, D-dimer)

• Need to use change in index to map expected change in risk in response to behavior change and other interventions
Veterans Aging Cohort Study

- **PI and Co-PI**: AC Justice, DA Fiellin

- **Scientific Officer (NIAAA)**: K Bryant

- **Participating VA Medical Centers**: Atlanta (D. Rimland), Baltimore (KA Oursler, R Titanji), Bronx (S Brown, S Garrison), Houston (M Rodriguez-Barradas, N Masozera), Los Angeles (M Goetz, D Leaf), Manhattan-Brooklyn (M Simberkoff, D Blumenthal, H Leaf, J Leung), Pittsburgh (A Butt, E Hoffman), and Washington DC (C Gibert, R Peck)

- **Core Faculty**: K Akgun, S Braithwaite, C Brandt, K Bryant, R Cook, K Crothers, J Chang, S Crystal, N Day, R Dubrow, M Duggal, J Erdos, M Freiberg, M Gaziano, M Gerschenson, A Gordon, J Goulet, N Kim, M Kozal, K Kraemer, V LoRe, S Maisto, K Mattocks, P Miller, P O’Connor, C Parikh, C Rinaldo, J Samet

- **Staff**: H Bathulapalli, T Bohan, D Cohen, A Consorte, P Cunningham, A Dinh, C Frank, K Gordon, J Huston, F Kidwai, F Levin, K McGinnis, L Park, C Rogina, J Rogers, L Sacchetti, M Skanderson, J Tate, E Williams

- **Major Collaborators**: VA Public Health Strategic Healthcare Group, VA Pharmacy Benefits Management, Massachusetts Veterans Epidemiology Research and Information Center (MAVERIC), Yale Center for Interdisciplinary Research on AIDS (CIRA), Center for Health Equity Research and Promotion (CHERP), ART-CC, NA-ACCORD, HIV-Causal

- **Major Funding by**: National Institutes of Health: NIAAA (U10-AA13566), NIA (R01-AG029154), NHLBI (R01-HL095136; R01-HL090342; RCI-HL100347), NIAID (U01-A1069918), NIMH (P30-MH062294), and the Veterans Health Administration Office of Research and Development (VA REA 08-266) and Office of Academic Affiliations (Medical Informatics Fellowship).
Breakout Session Group 2: HIV Associated Non-AIDS Conditions

• How can we adapt and apply preventive health guidelines for HIV-infected persons?

• How do we best tailor and prioritize care for individual patients with HIV?

• What are the relative benefits and downsides of disease-specific versus multimorbidity approaches to management?

• How well does the current health delivery system address the needs of complex multimorbid patients with HIV?
HIV Models of Care

Gail Berkenblit, MD/PhD
Assistant Professor, Johns Hopkins Hospital
SGIM Workshop 2011
Snapshots of current HIV care

The “Treatment Cascade” From HIV Diagnosis Through Suppressed Viral Load

- True HIV positive: 25,000
- Diagnosed HIV positive: 20,000
- Receiving care: 15,000
- Eligible for ART: 10,000
- Receiving ART: 5,000
- Viral load suppressed: 1,000

Greenberg et al, Health Affairs, 2009
Donabedian Model of Quality Care

Structures of Care → Processes of Care → Health Care Outcomes

Patient Characteristics
Provider Characteristics
Health Care Setting
Patient Characteristics: What is unique to chronic HIV care?

- Complexity of treatment
- Rigor of adherence
- No easy daily monitoring mechanism
- Stigma may deprive patients of family & community support
- Comorbid mental illness and substance abuse
Provider Characteristics: Who should be the P in PCP?

- Community Health Worker
- Physician’s Assistant
- Nurse Practitioner
- General Internist
- Specialist
- ID
Provider Characteristics: Preconditions and enablers

- RCT of GIM resident clinic versus ID clinic management
  - Equal ART use, prevention measures, QOL; more hospitalization
  - 8-12 lectures in HIV management
  - Quarterly case conference

- RCT of nurse versus physician monitored ART in SA
  - No differences in mortality, virologic failure, or limiting toxic effects
  - Didactic teaching
  - Clinical telephonic support

- Cross sectional analysis of Ryan White sites
  - Similar performance of 6/8 quality measures by NPs/PAs as HIV experts
  - High level of experience
  - Focus on a single condition
  - Participation in teams or easy access to physicians

(1Kietz, JGIM 2001; Sanne, Lancet 2010; Wilson, Ann Int Med, 2005)
Setting Characteristics:
Integrated HIV care may lower viral load

<table>
<thead>
<tr>
<th>Level</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP/PA</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Clin.Coordinator</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>HIV physician</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pharmacist</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Social Worker</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychiatrist</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychologist</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 1018 patients at 5 VA sites
- Adjusted for patient demographics and clinic variables
- Caveats: experienced patients with multiple comorbidities

Hoang et al, Medical Care 2009
Donabedian Model of Quality Care

Structures of Care → Processes of Care → Health Care Outcomes

Interpersonal Style
Technical Style
Coordination of Care
Processes of Care: Interpersonal Style

- Patient satisfaction is linked to ART adherence
  - Does my provider “know me as a person?”\(^1\)

- Patients cared by teams of 3 or more providers\(^2\)
  - Better technical care
  - More reported problems with coordination
  - Lower satisfaction
  - Lower trust

- Higher turnover of providers linked to lower patient satisfaction rates\(^3\)
  - Larger clinics
  - Clinics with trainees

\(^1\) Beach et al. JGIM 2006; \(^2\)Rodriguez et al., Med Care 2008; \(^3\)Page et al. HIV Med 2003,
Processes of Care: IT Integration in HIV Care

• VA EMR prompts for HIV testing\(^1\)

• Automated voicemail/website delivery of negative results\(^2\)
  – 67% of persons tested accessed their results
  – Positive test results still given in person

• EMR Embedded Care Plan\(^3\)
  – Alerts & reminders delivered electronically
  – Median time to response 11 vs 52 days for alerts and 114 vs 360 days for reminders

• Mobile phone text message system for adherence reminders\(^4\)

\(^{1,2}\) Morris et al, Annals 2010; \(^3\)Safran, Lancet 1995; \(^4\)Lester et al, Lancet 2010
Processes of Care: Coordination of Care

• Basic: “Thank you for this interesting consult”

• Liaison
  – Case manager or other intermediary
  – Defined shared care protocols
  – Patient can act as intermediary

• Co-localization
  – Informal exchange
  – Multidisciplinary team meetings

• Telemedicine
  – Email or telephonic specialist support

• Audit-based
Processes of Care: Untapped Potential?

• Case management\(^1\)
  – Increases access to care
  – Increases in retention in care

• Peer counseling?
  – Not well studied

• Self management?
  – Not well studied

\(^1\)ARTAS
Donabedian Model of Quality Care

Structures of Care → Processes of Care → Health Care Outcomes

Quality Measures
Clinic Viral Load
# Health Care Outcomes: Proposed quality measures?

<table>
<thead>
<tr>
<th>Measure</th>
<th>Level of care impacted</th>
<th>Level of evidence(^b) [references]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process of care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Retention in care (seen at least twice annually at least 60 days apart)</td>
<td>P</td>
<td>Level II and QM [8, 17]</td>
</tr>
<tr>
<td>2. CD4 cell count measurement (measured at least twice annually)</td>
<td>P</td>
<td>Level II and QM [3, 8, 18, 19]</td>
</tr>
<tr>
<td>Screening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Syphilis screening (annually)</td>
<td>P</td>
<td>Level II and QM [20, 23–27]</td>
</tr>
<tr>
<td>5. Injection drug use screening (annually)</td>
<td>P</td>
<td>Level II [19, 20, 28]</td>
</tr>
<tr>
<td>6. High-risk sexual behavior screening (annually)</td>
<td>P</td>
<td>Level I and QM [19, 20, 28]</td>
</tr>
<tr>
<td>7. Tuberculosis screening (at least once)</td>
<td>P</td>
<td>Level I and QM [19, 29–32]</td>
</tr>
<tr>
<td>8. Hepatitis B screening (at least once)</td>
<td>P</td>
<td>Level III and QM [19, 20, 26, 27, 33]</td>
</tr>
<tr>
<td>9. Hepatitis C screening (at least once)</td>
<td>P</td>
<td>Level III and QM [19, 20, 26, 33]</td>
</tr>
<tr>
<td>Immunization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Influenza immunization (annually)</td>
<td>B</td>
<td>Level III [26, 34–37]</td>
</tr>
<tr>
<td>11. Pneumococcal immunization (at least once)</td>
<td>B</td>
<td>Level II and QM [38–41]</td>
</tr>
<tr>
<td>12. Hepatitis B vaccination first dose received (if appropriate)</td>
<td>P</td>
<td>Level II and QM [30, 33, 42]</td>
</tr>
<tr>
<td>13. Hepatitis B vaccination series completed (if appropriate)</td>
<td>S</td>
<td>Level II and QM [30, 33, 42]</td>
</tr>
<tr>
<td>Prophylactic therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. PCP prophylaxis if CD4 cell count &lt;200 cells/µL</td>
<td>B</td>
<td>Level I and QM [4, 9, 43, 44]</td>
</tr>
<tr>
<td>ART prescription</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Appropriately prescribed ART</td>
<td>P</td>
<td>Level I and QM [3, 8, 9, 45]</td>
</tr>
<tr>
<td>Viral control (after at least 6 months post–ART initiation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Achieving maximal viral control if prescribed ART</td>
<td>S</td>
<td>Level II and QM [3, 8, 9, 45]</td>
</tr>
<tr>
<td>17. Achieving maximal viral control if prescribed ART or treatment plan documentation if maximal viral control not achieved</td>
<td>P</td>
<td>Level II and QM [3, 8, 9, 45]</td>
</tr>
</tbody>
</table>

**NOTE.** ART, antiretroviral therapy; PCP, Pneumocystis jiroveci pneumonia.

\(^a\) Levels of care are as follows: P, physician; S, system; B, both.

\(^b\) Levels of evidence are as follows: I, evidence from ≥1 randomized, controlled trial; II, evidence from ≥1 clinical trial, multiple cohort studies, or multiple times series or dramatic results of uncontrolled experiments; III, expert opinion only; QM, previous quality measure data indicating gaps in care.
# Health Care Outcomes: Clinic Viral Load?

<table>
<thead>
<tr>
<th>Diagnosed, Not in Care</th>
<th>Engaged in Care, Not on ART</th>
<th>Engaged in Care, on ART, Not Suppressed</th>
<th>Engaged in Care, on ART, Suppressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>###</td>
<td>###</td>
<td>###</td>
<td>###</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Median CD4, VL@ Dx1</th>
<th>Mean, Total or AUC CVL</th>
<th>Mean, Total or AUC CVL</th>
</tr>
</thead>
</table>

Clinic Viral Load

On ART

Not on ART

Althoff et al. CROI 2011 #548
Breakout Session Group 3: Models of Care for HIV

Across the continuum of HIV care for those at risk and those with HIV in acute and chronic care...

- Do your structures of care adequately serve the stage?

- Do your processes of care optimally bridge between different stages?

- What outcome measures apply to each stage?
HIV Care Beyond 2011

- Personalized
- Predictive
- Pre-emptive
- Participatory