Evaluation of the ACC/AHA CVD Risk Prediction Algorithm Among Hospital-Infected Patients

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Introduction

• There is an increased burden of cardiovascular disease (CVD) in HIV-infected individuals, and accurate CVD risk prediction is a key component to the long-term care of this population.
• Increased CVD risk is likely to be driven by novel, HIV-related CVD risk factors and cannot be explained by traditional CVD risk factors alone.
• It is unclear whether CVD risk prediction algorithms developed for the general population are accurate in HIV.

• Based on current mechanistic knowledge, existing CVD risk prediction algorithms which incorporate only traditional CVD risk factors may underestimate risk in the setting of HIV.

• In 2013, The American College of Cardiology (ACC)/American Heart Association (AHA) developed a new CVD risk prediction algorithm (Pollard: Cohort Equations) for the general population designed to be applicable for a more general U.S. population.

• Initial reports demonstrate possible overestimation of risk by the new algorithm in general population cohorts.

• Neither the longstanding Framingham Risk Score (FRS) nor the new ACC/AHA CVD risk prediction algorithm has been formally evaluated in an HIV population.

• Accurate CVD risk prediction underlies CVD prevention and is a critical and public health component of the long-term care of HIV populations.

Objectives

• We compared the proportion of HIV patients with high predicted 10-year CVD risk using the FRS versus the ACC/AHA CVD risk prediction algorithm.

• We assessed the degree of discordance and the characteristics of patients with discordant CVD risk prediction scores (FRS vs ACC/AHA).

• We compared observed to predicted 5-year CVD event rates in HIV patients separately for both the FRS and the ACC/AHA CVD risk prediction algorithm.

Methods

• Partners HealthCare System HIV longitudinal cohort, comprised of patients seen at Brigham & Women's Hospital or Massachusetts General Hospital in Boston, MA.

• Data derived from the Research Patient Data Registry, a clinic-wide data registry which includes comprehensive clinical information for over 4.5 million patients.

• Exclusion criteria included: < age 18, died prior to 1/1/2009, missing data to generate risk scores, or relevant outcome prior to date of risk score calculation.

• CVD risk scores calculated with data from a 3-year window ending 1/1/2009.

• CVD outcomes hard coronary heart disease (CHD, ascertainment using ICD codes 410.414) for FRS and atherosclerotic CVD (ASCVD, ascertainment using ICD codes 410.414 or 433.4) for ACC/AHA.

• Patients considered to be off anti-hypertensives treatment for ACC/AHA risk score calculation.

• FRS for CHD calculated for 2570 HIV patients, with median follow-up time 6.3 years.

• ACC/AHA risk score calculated for 2152 HIV patients, with median follow-up time 6.2 years.

Conclusions & Implications

• In an HIV clinical care cohort, the ACC/AHA risk prediction algorithm classified a higher proportion of patients as high CVD risk.

• CVD risk prediction scores were discordant in 16% of patients, with the ACC/AHA score predicting high risk and the FRS predicting low risk in 99% of the discordant cases.

• Both the ACC/AHA risk score and the FRS underestimated CVD risk in HIV patients, comparing 5-year observed to predicted event rates.

• Risk factors that reflect the specific and increasingly understood mechanistic factors in HIV-associated CVD are likely to be important to generate HIV-specific accurate tools.

• Incorporating HIV or HIV-specific factors may increase the accuracy of CVD risk prediction.

• As the scope of expanding knowledge on management of high CVD risk in HIV and paradigm shifts in CVD risk prediction, accurate, clinically applicable, HIV-specific CVD risk prediction strategies are critical to improving long-term outcomes for HIV patients.

Table 1. Patient characteristics. Demographic and clinical characteristics are shown overall and by gender. Diagnosis were ascertained using ICD codes 401 for HTN, 250 for diabetes, and 272 for dyslipidemia. CHD counts were available for 1301 patients (420 female and 861 male) and HIV RNA was available for 1246 patients (310 female and 836 male).

<table>
<thead>
<tr>
<th>Category</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (median)</td>
<td>46.1</td>
<td>46.1</td>
<td>46.1</td>
</tr>
<tr>
<td>CVD (n=2770)</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>HTN</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>Diagnosed</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>Hypertensive - N (%)</td>
<td>12/34 (36.6)</td>
<td>12/34 (36.6)</td>
<td>12/34 (36.6)</td>
</tr>
<tr>
<td>2 DM - mean</td>
<td>72 (10.8)</td>
<td>72 (10.8)</td>
<td>72 (10.8)</td>
</tr>
<tr>
<td>ACC/AHA Low</td>
<td>1667 (74)</td>
<td>5 (0.2)</td>
<td></td>
</tr>
<tr>
<td>ACC/AHA High</td>
<td>351 (16)</td>
<td>216 (10)</td>
<td></td>
</tr>
<tr>
<td>ACC/AHA N (%)</td>
<td>221</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>ACC/AHA All (N=1667)</td>
<td>56 (25)</td>
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</table>

Figure 2. CVD risk score concordance. High risk defined as ≥10% predicted 10-year risk for FRS and ≥7% predicted 10-year risk for ACC/AHA.

Table 2. Patient characteristics by risk score category.

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