**Perspective**

**Aging and HIV Infection: Focus on Cardiovascular Disease Risk**

Effective antiretroviral therapy has extended life expectancy for individuals with HIV. Estimates from 2015 indicate that 47% of persons with HIV in the US were older than 50 years of age and 16% were older than 65 years. These older patients are at increased risk of age-related diseases and conditions. Further, there is substantial evidence that patients with HIV infection accumulate age-related conditions earlier than those in the general population. There is risk for increased comorbidities and polypharmacy in the aging HIV-infected population. Specific measures for assessing and reducing the risk of cardiovascular disease and other age-related conditions in the aging HIV population are needed. This article summarizes a presentation by Judith A. Aberg, MD, at the International Antiviral Society-USA (IAS-USA) annual continuing education program held in Chicago, Illinois, in May 2019.

**Keywords:** HIV, aging, comorbidities, cardiovascular disease, diabetes, dyslipidemia, antiretroviral therapy

HIV infection, even when controlled with effective therapy, is associated with chronic immune activation that is superimposed on immunologic senescence in the older adult. Older persons with newly diagnosed HIV infection tend to have more advanced HIV disease at presentation, and there is a less robust immunologic response to antiretroviral therapy (ART) in this population. People with HIV (PWH) accumulate age-related diseases at a younger chronologic age and these conditions account for the majority of deaths in this population. Practitioners need guidance on how best to manage PWH who may develop or already have these comorbidities given the younger age at time of presentation, quicker progression, specific recommendations for PWH, and potential drug interactions.

Since the 1980s, the proportion of PWH older than 50 years has gradually increased. According to data from the Centers for Disease Control and Prevention, in 2015, approximately 47% of PWH in the US were older than 50 years and 16% were older than 65 years. In 2016, 17% of newly diagnosed cases of HIV were in adults aged 50 years or older, with 55% of these persons diagnosed with AIDS (down from 40% in 2015). African Americans accounted for 42% of cases, whites for 37% of cases, and Hispanics/Latinos for 18%. Men having sex with men is the most common mode of transmission in older men, and heterosexual contact is the most common mode in older women.

PWH on suppressive ART have an increased life expectancy compared with those not on ART, although life expectancy is still shorter than that in the general population, particularly among patients with low CD4+ cell counts and those who are on salvage ART regimens, most likely representing a more prolonged period of time with unsuppressed HIV. Issues in aging that need to be addressed include the impact of this increased life expectancy on prevalence and types of comorbidities. Considerations include the fact that older patients are more likely to be treatment experienced and to have had consequences of toxic effects of previous ART regimens (eg, metabolic derangements). A major issue for practitioners, given the likelihood of increased comorbidities with aging is the appropriateness of applying primary care practice guidelines for the general population to the population with HIV. To date, there is no systematic way to predict whether or what guidelines developed for the general population should apply to individuals with HIV, although the consensus appears to be that guidelines for PWH need to be more detailed and comprehensive. The 2013 Infectious Diseases Society of America HIV primary care guidelines are expected to be updated in 2020. The 2018 European AIDS Clinical Society guidelines are comprehensive and easy to use. A revised version was released in November 2019 with expanded drug interaction tables including medications used to treat common comorbidities as well as specific recommendations for elderly PWH.

**Age-Associated Comorbidities**

Health conditions prominent in aging patients include: cardiovascular disease (CVD); endocrine disorders; kidney disease; gastrointestinal and genitourinary malignancies; liver diseases; lung diseases; nervous system disorders; and psychosocial issues including depression and substance use.

It bears continual repeating that the prevalence of cigarette smoking among PWH is much higher than in the general population irrespective of age, sex, race, ethnicity, education level, or income.

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could be made in reducing and preventing comorbidities in PWH with interventions and programs focusing on smoking cessation.

Figure 1 shows the increase in proportion of patients with age-associated comorbidities during the early 2000s as reported by the NA-ACCORD (North American AIDS Cohort Collaboration on Research and Design); an update is expected in the near future. As can be seen, this includes an increase in the numbers of patients with numerous comorbidities. These data showed that, as in the general population, hyperlipidemia and hypertension are the most common conditions. Data from an Italian cohort indicate that additional chronic comorbidities accrue in PWH a decade earlier than in the general population for every 10-year age group from 25 years to 64 years, whereas no significant difference was observed in the 65 to 74 year age group. It was also found that risk of CVD death was significantly lower among PWH who had viral suppression than among those without full suppression.

In the Italian cohort mentioned above, analysis of patients aged 65 years or older showed increasing prevalence of a number of health conditions by duration of HIV infection. However, there was no significant difference in overall prevalence in the PWH population compared with the general population for CVD or hypertension, whereas significantly higher rates were found among the HIV population for dyslipidemia, chronic kidney disease, and type 2 diabetes. Data from this cohort also showed that number of comorbidities and number of medications in addition to ART increased with increasing duration of HIV infection emphasizing the issue of polypharmacy in this older population. The association of CVD with duration of HIV infection may reflect a longer period of time of viremia especially during the era when ART was not recommended until the CD4+ count was below 200 cells/µL or below 350 cells/µL and more toxic ART with metabolic adverse effects were prescribed.

**As a risk enhancer, the presence of HIV infection can lower the risk-based threshold for initiating statin therapy**

Assessment and Management of CVD Risk in HIV Infection

Despite evidence of the earlier onset of CVD in the PWH population, it still has proven difficult to determine to what degree HIV infection increases risk of CVD or to determine to what degree risk assessment instruments for the general population apply to the PWH.

As noted above, smoking remains one of the largest contributors to development of CVD and the incremental increase in risk associated with HIV infection other traditional risk factors has been difficult to calculate. A step toward quantifying additional risk posed by HIV infection has been taken in the 2018 American Heart Association multispecialty guideline on management of blood cholesterol for primary prevention of atherosclerotic CVD.

The new guideline includes measurement of CVD risk in younger age groups than previous guidelines (including 0-19- and 20-39-year age groups) and includes HIV infection as a risk enhancer. As a risk enhancer, the presence...
Among statins, rosuvastatin, atorvastatin, and pitavastatin are the best choices for persons with HIV. Simvastatin and lovastatin should not be used in patients receiving an HIV protease inhibitor or cobicistat due to drug-drug interactions, and pravastatin has a drug interaction with boosted darunavir. From a drug interaction perspective, pitavastatin may be the safest although it is more expensive than rosuvastatin or atorvastatin and may not be available on payor formularies. Further, the guidelines encourage based threshold for initiating statin therapy, and every 12 months change in ART, to assess response to statin therapy, and every 12 months during statin treatment.

It has been proposed that statins may not work as well in persons with vs without HIV, but this does not appear to be the case. Figure 3 shows results of the INTREPID (Pitavastatin versus Pravastatin in Adults with HIV-1 Infection and Dyslipidemia) trial comparing pitavastatin with pravastatin in PWH with dyslipidemia. Results showed that pitavastatin was superior in reducing low-density lipoprotein cholesterol (LDL-C), non-high-density lipoprotein cholesterol (non-HDL-C), and apolipoprotein B at 12 and 52 weeks; these reductions in atherogenic lipids were essentially the same as what is observed in the general population

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of HIV infection can lower the risk-based threshold for initiating statin therapy. Thus, for example, in adults aged 40 to 75 years without diabetes and an intermediate 10-year risk of a CVD event (7.5%-19.9%), the presence of HIV infection (or other risk enhancers) favors the initiation of statin therapy. Further, the guidelines encourage discussion of starting statin therapy in patients at borderline risk (10-year risk of 5.0%-7.5%) if HIV infection or another risk enhancer is present. In individuals at intermediate risk who are uncertain about starting statin therapy, coronary artery calcium imaging may be recommended, with a score of 1 to 99 favoring statin therapy and higher scores warranting statin therapy. At this time, imaging for non-calcified plaque remains investigational.

![Figure 3](image-url)
than in the placebo group (4.1% vs 3.2% respectively; rate ratio, 1.29; \( P = .005 \)). Thus, risks and benefits of aspirin therapy must be weighed even among patients with diabetes in the primary prevention setting.

The new American Diabetes Association definition of diabetes is: HbA1c PWH who may be most likely to benefit from preventative daily aspirin therapy are those aged 40 years or older who have diabetes, but risks and benefits must be weighed of 6.5% or higher; fasting plasma level of 126 mg/dL or higher confirmed by repeat testing; plasma glucose level 2 hours after 75 g oral glucose tolerance test of 200 mg/dL or higher; or random plasma glucose level of 200 mg/dL or higher with polyuria and polydipsia. Numerous studies have now shown that HbA1c is not an accurate measure of blood glucose in PWH. Depending on ART being taken, it may underestimate or overestimate blood glucose level. Thus, the new guidelines stipulate that in conditions associated with an altered relationship between HbA1c and glycemia, such as HIV infection and sickle cell disease, only plasma blood glucose criteria should be used to make a diagnosis of diabetes.

Summary

There is excess CVD risk in the population with HIV. Risk in persons aging with HIV may be different than that in individuals newly diagnosed with HIV infection. The greatest modifiable risk factor for comorbid conditions is smoking. The etiology of CVD associated with HIV infection is multifactorial, including chronic inflammation, direct viral effects, effects of ART drugs and other medications, and other factors. There remains a need for improved risk assessments for CVD in the PWH population. Fasting blood glucose (or other plasma blood glucose criteria) rather than HbA1c should be used to diagnose diabetes in PWH on ART. The 2018 American Heart Association (AHA) multispecialty guidelines provide more guidance on management of blood cholesterol level among PWH than in prior publications. Following the recommendations of the American Diabetic Association (ADA) and AHA provides additional guidance for the primary prevention of CVD in PWH. For example, those aged 40 years or older with diabetes and LDL-C greater than 70 mg/dL should be on a statin and aspirin if no contraindications are present. Measures to improve incorporating primary care prevention during routine HIV monitoring visits are needed.


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