Primary Care Management

This is a PDF version of the following document:
Module 2: Basic HIV Primary Care
Lesson 5: Primary Care Management

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Topic Overview

With the advent of potent antiretroviral therapies, the life expectancy of individuals with HIV has increased dramatically, and HIV clinical care has transitioned to a chronic disease model. Now, proportionately fewer individuals with HIV experience AIDS-related complications compared with non-AIDS serious illnesses, such as cardiovascular disease and non-AIDS-defining malignancies.[1] Consequently, clinicians who provide primary care to persons with HIV should have the knowledge and skills to recognize and manage common primary care conditions and to implement evidence-based prevention measures. This review will explore several common topics in the primary care management of persons with HIV.

Cancer Screening

People with HIV have an overall increased risk of cancer (and a younger age of onset) compared with the general population.[2,3,4] Research suggests a correlation between HIV-related immunodeficiency and malignancy, possibly through a mechanism of immune dysregulation and decreased immune surveillance; it is now well recognized that a low CD4 cell count increases the risk of malignancy.[5,6] As persons with HIV live longer in the era of effective antiretroviral therapy, a shift has occurred from predominantly AIDS-defining malignancies to non-AIDS-defining malignancies.[6,7,8,9] Since 2003, the number of non-AIDS-defining malignancies has exceeded the number of AIDS-defining malignancies, and consequently, clinicians must be vigilant in surveillance for all forms of malignancy, AIDS-associated or not.

Cancer Epidemiology in Persons with HIV

Data from the CDC and the HIV/AIDS Cancer Match Study showed a sharp increase in non-AIDS-defining cancers among persons with HIV from 1991 through 2005.[8] Additional data suggest the trend of increasing non-AIDS-defining cancers will continue and that by 2030, prostate and lung cancer will be the most common types of cancer in people with HIV.[4] Kaposi’s sarcoma and non-Hodgkin's lymphoma (both AIDS-defining malignancies), along with lung cancer (linked to excess tobacco exposure), are currently the most common cancers in persons with HIV.[4,10]

Cancer Surveillance

The shifting spectrum of cancer in persons with HIV underscores the importance of incorporating standardized cancer surveillance practices in the care of persons with HIV, including those with relatively preserved immune function. The U.S. Preventive Services Task Force (USPSTF) has recommendations for cancer screening, but these are for the general population and not specific to people with HIV. Recommendations regarding screening for malignancies specific to individuals with HIV have also been issued. In general, cancer screening recommendations for breast, colon, lung, and prostate cancers are not significantly impacted by HIV status, whereas screening recommendations for anal and cervical cancer differ for individuals with HIV.

Cancer Screening Recommendations Not Impacted by HIV

Breast Cancer Screening

In the United States, breast cancer is the most common cancer in women and the second leading cause of cancer deaths in women.[11] Although unusual clinical presentations and more rapid progression of breast cancer have been reported among women with HIV, breast cancer prevalence does not appear to be increased in women with HIV.[12] The recommendations for breast screening in women with HIV are the same for women without HIV.[13] There are, however, slight differences in the USPSTF and the American Cancer Society recommendations as to the optimal age of initiation and the frequency of breast cancer screening in women.[14,15,16]

- **USPSTF Recommendations for Breast Cancer Screening**: The USPSTF recommends screening with mammography every other year for women 40 to 74 years of age.[16] There are no recommendations for or against breast cancer screening in women 75 years of age and older.[16]
- **American Cancer Society**: For women who have an average risk of breast cancer, the American Cancer Society (ACS) recommends annual mammography screening beginning at age 45 years.[15] Women 40 to 44 years of age should have the opportunity to begin annual screening.[15] In addition, at 55 years of age, women should have the option to transition to mammographic screening every other year.[15] Screening should continue in women who have overall good health and a life expectancy of at least 10 years.[15]

Colon Cancer Screening

In the general United States population, colon cancer is the fourth most common cancer, accounting for approximately 50,000 deaths per year.[11] Although persons with HIV may have a slightly higher risk of developing colon cancer, screening for colon cancer in persons with HIV should not be based on HIV RNA levels or CD4 cell count. The recommendations for colon cancer screening for people with HIV are the same as for the general population.[13]

- **USPSTF Recommendations for Colorectal Cancer Screening**: The USPSTF recommends screening for colorectal cancer in adults between the ages of 45 and 75 years.[18] Decisions regarding colorectal cancer screening for persons aged 76 to 85 years should be individualized, and routine screening is not recommended for adults older than 85 years of age.[18] The USPSTF guidelines provide the following screening options: (1) stool-based tests (e.g., high-sensitivity fecal occult blood testing [FOBT]), (2) fecal immunochemical testing (FIT), FIT-DNA testing, and (3) direct visualization tests (e.g., flexible sigmoidoscopy with or without FIT, colonoscopy, and computed tomographic colonography).[18] The screening interval depends on the screening modality and the results of the screening tests.
- **American Cancer Society**: The American Cancer Society recommends screening adults with an average risk of colorectal cancer starting at age 45 years.[19] This is a qualified recommendation (one with clear evidence of benefit but less certainty about the balance of benefits and harms), whereas their recommendation to screen adults aged 50 years and older is a strong recommendation.[19]
- **U.S. Multi-Society Task Force (USMSTF)**: In 2022, the USMSTF on Colorectal Cancer issued recommendations to initiate colon cancer screening at 45 years of age in persons at average risk.[20] The 2017 USMSTF guideline ranks the existing colon cancer screening tools as shown in the table below (Table 1).[21]

Lung Cancer Screening

In the United States, lung cancer is the third most common cancer in men and women and the leading overall cause of cancer deaths.[11] Increasing age and cumulative exposure to tobacco smoke are cited as the two most important risk factors for lung cancer.[22,23] In people with HIV, lung cancer is the leading cause of mortality from cancer.[24] Compared to the general population, persons with HIV have higher rates of lung cancer and may have poorer outcomes.[24] At this time, however, recommendations for lung cancer screening for people with HIV are the same as in the general population, as summarized by the following USPSTF guidance.[13,23]

- **USPSTF Recommendations for Lung Cancer Screening**: The USPSTF recommends annual screening with low-dose computed tomography in patients aged 50 to 80 years who have a greater than or equal to 20 pack-year smoking history if they are currently smoking or have quit smoking within the past 15 years.[23] Yearly screening should be discontinued if: (1) the person has not smoked for 15 years, or (2) they develop a health problem that limits their life expectancy or their ability or willingness to take part in curative strategies.

Prostate Cancer Screening

Men with and without HIV have a similar risk of prostate cancer.[2,10,25,26] The reduction in prostate cancer mortality achieved with prostate-specific antigen (PSA)-based screening is small, whereas the potential for patients to experience adverse effects from overdiagnosis and unnecessary treatment is high. The recommendations for prostate cancer screening in men with HIV are the same as for men in the general population.[13,27]

- **USPSTF Recommendations for Prostate Cancer Screening**: The USPSTF recommends that prostate cancer screening should be an individualized decision for men 55 to 69 years of age.[28] The guidelines note that the three most important risk factors for prostate cancer are: older age, African American race, and family history.[28] The recommended screening test, if performed, is a

measurement of the level of prostate-specific antigen (PSA) in the blood.[28] For men 70 years of age and older, the USPSTF guidelines recommend against routine screening for prostate cancer.[28]

Cancer Screening Recommendations Specific to HIV

Cervical Cancer Screening

Abnormal cervical cytology is nearly 11 times more common among women with HIV compared with individuals without HIV. Cervical cancer screening recommendations differ slightly between persons with HIV and those without HIV, as outlined below and in the Adult and Adolescent OI Guidelines.[29] The main difference is that cervical cancer screening for persons with HIV tends to start at an earlier age, occurs with more frequency, and continues for longer than in persons without HIV.[29]

- **Age for Initiating Cervical Cancer Screening**: Initiation of cervical cancer screening for women is recommended beginning at 21 years of age.
- **Duration of Cervical Cancer Screening**: Cervical cancer screening should continue throughout the woman's life, as opposed to the recommendation in the general population to stop cervical cancer screening after 65 years of age.
- **Cervical Cancer Screening at Entry to HIV Care**: Women with HIV who are sexually active and at least 21 years of age should undergo cervical cancer screening at initial entry to HIV care and again 12 months later. The woman's age should determine which screening test to use, as summarized below.
- **Cervical Cancer Screening Modality**
    - **Women with HIV 21-29 Years of Age**: Annual cervical Papanicolaou (Pap) testing is recommended in women with HIV who are 21–29 years of age, but if 3 consecutive annual screens are normal, cervical Pap tests can be performed every 3 years. Co-testing with human papillomavirus (HPV) is not recommended for routine screening in this age group due to a high HPV prevalence, but HPV testing can be done reflexively on abnormal cervical Pap results to direct further evaluation.
    - **Women with HIV 30 Years of Age or Older**: Women with HIV who are 30 years of age and older should have either (1) cervical cancer screening by Pap testing alone or (2) Pap testing plus simultaneous HPV co-testing. Most experts prefer the second option if available. If Pap testing alone is used, it should be performed at baseline and every 12 months; if the results of 3 consecutive Pap tests are normal, then follow-up testing can occur every 3 years. If Pap and HPV co-testing is performed and both are negative, follow-up screening can be performed in 3 years.
- **Summary of Cervical Cancer Screening Algorithms for Women with HIV:** The figure below summarizes guidelines for managing normal and abnormal cervical cytology results in women with HIV who are 21–29 years of age and in women 30 years of age and older. For women 30 years of age and older, the recommendations differ based on whether high-risk human papillomavirus (hr-HPV) testing is performed (Figure 1). Note that cervical cancer screening recommendations are not altered in women who have received prior HPV vaccination.

Anal Cancer Screening

Anal cancer risk is higher in people with HIV compared to people without HIV. The incidence of anal cancer in men with HIV who have sex with men is particularly high (about 55 times higher than in the general adult population and 4 to 5 times higher than in women with HIV).[2,10,30,31] Infection with HPV has been implicated in the pathogenesis of most anal malignancies. Anal dysplasia refers to precancerous lesions, including low-grade squamous intraepithelial lesions (LSIL) and high-grade squamous intraepithelial lesions (HSIL). The ANCHOR study, a national randomized clinical trial to determine if the treatment of biopsy-proven anal HSIL reduces the incidence of anal cancer in men with HIV, showed a 57% lower rate of progression to anal cancer in the treatment group compared to the active monitoring group.[32] Recommendations for anal cancer screening in people with HIV are summarized below (Figure 2).[29]

- **General Approach to Anal Cancer Screening**: Based on the high incidence of anal cancer in persons with HIV, the high prevalence of anal HSIL in persons with HIV, high rates of progression of anal HSIL to anal cancer in the absence of treatment, and the efficacy in treating anal HSIL to reduce progression to anal cancer, it is recommended to screen for anal cancer and treat anal HSIL if found. The approach to anal cancer screening is highly dependent on whether clinics have access to high-resolution anoscopy (HRA).
- **Age to Initiate Screening**: When to start screening for anal cancer in asymptomatic individuals with HIV should be based on the overall risk for anal cancer and begins at different ages depending on sex and HIV risk group. Based on the incidence of anal cancer risk, screening for anal precancer and cancer for persons with HIV is recommended to begin at 35 years of age for men who have sex with men and at 45 years of age for all other persons. For men who have sex men younger than 35 years of age and all others with HIV younger than age 45 years, anal symptoms should be evaluated annually, and, if present, a digital anorectal exam (DARE) and standard anoscopy should be performed.
- **Screening Modalities**: There are multiple modalities that can be utilized for routine anal cancer screening, including symptom screening, DARE, standard anoscopy, anal cytology, and hr-HPV, co-testing. The decision of whether to use anal cytology in routine screening depends on whether HRA is available for persons who need further evaluation after abnormal screening cytology results.
- **Symptom Screen**: At a minimum, every person with HIV, regardless of history of anal intercourse, should undergo an annual assessment of anal symptoms (e.g., ask about unexplained itching, anal bleeding, anal pain, and presence of anal or perianal lesions).
- **Screening when HRA is Not Available**: If access to HRA is not available, the recommendation is to assess anal symptoms and perform DARE. Although somewhat dependent on clinician experience, DARE can potentially detect masses associated with anal neoplasm or dysplasia, anal warts, anal discharge that may indicate a sexually transmitted infection, and prostate abnormalities. When HRA is not available, the presence of anal symptoms or an abnormal DARE should be followed by a standard anoscopy examination.
- **Screening when HRA is Available**: If HRA is available, the recommendation is to assess anal symptoms, collect anal cytology specimens, and perform DARE (after collection of the cytology specimen). Screening of anal specimens can occur using anal cytology alone or with high-risk HPV co-testing, which tests for HPV types 16 and 18. The presence of anal symptoms or an abnormal DARE should result in HRA.
- **Management of Abnormal Anal Cytology Test Result**: Management of an abnormal anal cytology result (atypical squamous cells of undetermined significance [ASC-US] or worse) depends on the level of the abnormality on anal cytology and whether hr-HPV co-testing was used.
    - Regardless of hr-HPV co-testing, the presence of LSIL or HSIL should result in HRA.
    - If hr-HPV co-testing was not performed, and cytology results have ASC-US or worse, HRA is needed.
    - If hr-HPV co-testing was performed, and cytology results have ASC-US, management depends on the results of the hr-HPV co-test. If hr-HPV co-testing was performed, and cytology results have LSIL or HSIL, then HRA is needed.

Cardiovascular

Many factors influence and increase cardiovascular disease risk, including hypertension, hyperlipidemia, diabetes mellitus, and smoking. These factors are addressed separately in this Topic Review. This section will briefly address cardiovascular risk and include a discussion of aspirin prevention for cardiovascular disease (CVD) prevention and screening for abdominal aortic aneurysm. Management of hyperlipidemia for the prevention and treatment of CVD is discussed in the Hyperlipidemia section below.

Cardiovascular Risk in People with HIV

Cardiovascular and cerebrovascular disease are of special importance for individuals with HIV, with evidence showing a 1.5- to 2-fold greater risk of CVD in people with HIV when compared with those without HIV.[33,34] The increased CVD risk conferred by HIV has now been demonstrated in the Global Burden of Atherosclerotic Cardiovascular Disease in People Living with HIV, the Kaiser Observational Study, and the Veterans Aging Cohort Study (Figure 3).[33,35,36] Rates of heart failure, stroke, pulmonary hypertension, and sudden cardiac death are also higher for people with HIV, even those taking antiretroviral therapy with suppressed HIV RNA levels.[37] For these reasons, many experts consider HIV an independent CVD risk factor.

Factors Associated with Increased Cardiovascular Risk in Persons with HIV

The increased risk of CVD in persons with HIV is potentially mediated by (1) traditional risk factors, such as dyslipidemia, obesity, and cigarette smoking, (2) metabolic alterations related to antiretroviral therapy (e.g., insulin resistance and dyslipidemia), and (3) factors linked to HIV itself, including immune activation and inflammation.[34,37,38,39]

Cardiovascular Risk and Antiretroviral Therapy

The overall benefits of antiretroviral therapy clearly outweigh any risks.[40] Nevertheless, studies examining individual drug and class effects have raised concerns regarding the contribution of abacavir and protease inhibitors (PIs) to cardiovascular risk, although results have been conflicting.[33,41,42,43,44] Based on existing data, most experts avoid abacavir in persons with CVD.

Cardiovascular Risk Reduction Strategies in People with HIV

Cardiovascular risk reduction in persons with HIV is multifactorial, but general measures based on the available literature include the following:[37,45,46]

- Start antiretroviral therapy as soon as possible after the diagnosis of HIV
- Achieve and sustain suppressed HIV RNA levels
- Encourage smoking cessation
- Promote physical activity
- Manage lipid, blood pressure, and glycemic abnormalities
- Avoid heavy alcohol use
- Adhere to American College of Cardiology (ACC)/American Heart Association (AHA) dietary guidelines

Aspirin for Cardiovascular Disease Prevention in People with HIV

Large randomized studies evaluating aspirin as primary prevention of CVD in people with HIV have not been done.[37] Three large randomized controlled trials involving different populations (HIV was not an exclusion) examined the impact of aspirin 100 mg daily for primary prevention of CVD.[47,48,49] In all three studies, the risk of bleeding outweighed the benefit of preventing CVD (Figure 4).[50]

Recommendations for the use of aspirin for CVD prevention in people with HIV should follow

recommendations issued to the general population.[51,52] The following summarizes the USPSTF and American College of Cardiology/American Heart Association (ACC/AHA) guidelines regarding aspirin use for CVD prevention.[51,52,53]

- **USPSTF**: For all people with a documented history of CVD, aspirin for secondary prevention is strongly recommended. The use of low-dose aspirin as primary prevention in adults 60 years or older is not recommended.[51] For adults 40 to 59 years with a 10-year Atherosclerotic Cardiovascular Disease (ASCVD) risk of 10% or greater, the decision to initiate low-dose aspirin for primary prevention of CVD should be individualized.[51]
- **ACC/AHA**: For all people with a documented history of CVD, aspirin for secondary prevention is strongly recommended.[52,53] The American College of Cardiology/American Heart Association (ACC/AHA) recommends considering aspirin for select adults 40 to 70 years of age who are at higher ASCVD risk but not at increased bleeding risk.[52,53]

Screening for Abdominal Aortic Aneurysm (AAA) in People with HIV

An abdominal aortic aneurysm (AAA) is defined by the abnormal dilation of the abdominal aorta to a maximum diameter of 3 cm or greater.[54] Most AAAs are asymptomatic until they rupture, and when that occurs, the mortality rate is high. The prevalence of AAA is generally greater in older individuals, particularly men, but the most important risk factor for AAA is smoking.[55] The overall risk of AAA among people with or without HIV is approximately the same, but slightly higher in persons with HIV if they have a CD4 cell count of less than 200 cells/mm^3 or an HIV-1 RNA level greater than 500 copies/mL.[56] The AAA screening recommendations are the same for people with HIV as for those without HIV, as shown below.[57]

- **USPSTF**: One-time AAA screening with ultrasonography is recommended for all men 65 to 75 years of age who have ever smoked.[57]

Diabetes Mellitus

In the modern era of HIV treatment, the prevalence of diabetes mellitus in persons with HIV is estimated at 2 to 14%, a prevalence similar to or slightly higher than the diabetes prevalence in the overall United States population.[58,59] Diabetes contributes to significant morbidity, decreased quality of life, rising health care costs, and mortality.[60] Patients with diabetes mellitus require frequent monitoring of laboratory values and for the development of microvascular complications, including kidney disease, retinopathy, neuropathy, and atherosclerotic cardiovascular disease. The following discussion will focus primarily on type-2 diabetes mellitus in adults with HIV, but will also include prediabetes, a term that refers to elevated glucose or hemoglobin A1c levels that do not meet diabetes criteria but fall in an intermediate range between normoglycemia and diabetes.[60]

Screening for Diabetes in People with HIV

Recommendations for screening and diagnosis of diabetes (and prediabetes) in people with HIV, as provided by the American Diabetes Association (ADA) in the Standards of Care in Diabetes—2026, are as follows:[60]

- **Screening Indications for Diabetes and Prediabetes in People with HIV: T**he ADA Guidelines recommend screening for diabetes and prediabetes before starting antiretroviral therapy, at the time of switching antiretroviral therapy, and 3 to 6 months after starting or switching the antiretroviral regimen.[60] Subsequently, individuals with normal screening results should have repeat screening performed annually.[60]
- **Diabetes Screening Method:** For people with HIV, the ADA-recommended diabetes screening test is a fasting plasma glucose level. Fasting is defined as no caloric intake for at least 8 hours. If a random (nonfasting) glucose screen is obtained and is greater than 200 mg/dL, then further testing with a fasting plasma glucose is recommended. The use of HbA1c to screen for diabetes in persons with HIV is generally not recommended, since it may underestimate glycemia and therefore underdiagnose diabetes.[59,60,61]
- **Diabetes Diagnostic Criteria**: The diagnosis of diabetes mellitus can be made using the following criteria for nonpregnant individuals:[60]
    - Fasting plasma glucose greater than or equal to 126 mg/dL (fasting defined as no caloric intake for 8 or more hours), *or*
    - 2-hour plasma glucose greater than or equal to 200 mg/dL during an oral glucose tolerance test using the equivalent of a 75-gram anhydrous glucose load dissolved in water, *or*
    - A random glucose greater than or equal to 200 mg/dL in an individual with classic symptoms of hyperglycemia or hyperglycemia crisis, *or*
    - HbA1c greater than or equal to 6.5%.
- **Definition of Prediabetes**: Individuals who are not pregnant are defined as having prediabetes if screening tests reveal any one of the following:[60]
    - Fasting glucose of 100 to 125 mg/dL, *or*
    - 2-hour plasma glucose level of 140 to 199 mg/dL after an oral glucose tolerance test using the equivalent of a 75-gram anhydrous glucose load dissolved in water, *or*
    - HbA1c of 5.7 to 6.4%.

Approach to Management of Diabetes in Persons with HIV

In general, the management of diabetes in persons with HIV should occur according to the ADA guidelines.[62,63] For individuals who meet the criteria for type 2 diabetes, pharmacologic therapy, in addition to lifestyle modifications, is warranted.[64] The 2026 ADA Guidelines recommend a person-centered shared decision-making approach to guide the selection of glucose-lowering medications for individuals with type 2 diabetes.[64]

- **Pharmacologic Therapy**: Metformin has historically been the preferred initial pharmacologic agent

in the treatment of type 2 diabetes mellitus as long as it is not contraindicated.[64] The use of metformin with concurrent use of dolutegravir or bictegravir should involve careful monitoring, since these antiviral medications can increase the concentrations of metformin.[65] For persons with diabetes in whom atherosclerotic heart disease, heart failure, or chronic kidney disease predominates, the treatment regimen should include an agent that decreases cardiorenal risk, such as a glucagon-like peptide-1 (GLP-1) receptor agonist or a sodium-glucose cotransporter 2 (SGLT2) inhibitor.[64] Some individuals with diabetes will require additional oral hypoglycemic agents and/or insulin .[64]

- **Monitoring Glycemic Status**: Individuals with HIV who have diabetes should have glycemic status (HbA1c or other glycemic measurement) monitored at least twice a year, with quarterly monitoring recommended with therapy changes and when glycemic goals are not met.[62] The glycemic goal for nonpregnant adults is an HBA1c of less than 7% without significant hypoglycemia; the blood glucose target goal is to have greater than 70% of readings in the target range of 70-180 mg/dL.[62] A less stringent goal (HbA1c less than 8.0%) is considered appropriate for some individuals with diabetes, especially if they have experienced severe hypoglycemia, or other factors are present, such as a short life expectancy or existing major complications from long-standing diabetes.[62]
- **Screening for Complications**: Persons with HIV should undergo screening for complications of type 2 diabetes, including nephropathy, retinopathy, and neuropathy.
    - **Nephropathy**: Screening for chronic kidney disease should consist of urinary albumin (e.g., spot urinary albumin-to-creatinine ratio) and estimated glomerular filtration rate in all persons with type 2 diabetes (regardless of duration of diabetes); the frequency of screening depends on the stage of chronic kidney disease.[66]
    - **Retinopathy**: Comprehensive and dilated eye examinations and determination for follow-up should be conducted by an ophthalmologist or an optometrist. Adults with type 2 diabetes should have an initial dilated and comprehensive eye examination at the time of diagnosis; if the eye examination is normal and glycemic indicators are within the normal range, the eye examination should be repeated every 1 to 2 years thereafter.[67]
    - **Neuropathy**: Adults with type 2 diabetes should be assessed for diabetic peripheral neuropathy starting at diagnosis; thereafter, screening for neuropathy should occur at least annually.[67] Screening for neuropathy should also include screening for distal symmetric polyneuropathy and autonomic neuropathy.[67]
- **Antiretroviral Therapy**: In most individuals, switching the antiretroviral regimen is not beneficial for impaired glucose tolerance. It is, however, important to evaluate potential drug interactions as some antiretroviral medications can indirectly contribute to elevated plasma glucose levels. For example, protease inhibitors and cobicistat can increase drug levels of quetiapine or certain corticosteroids (inhaled or oral) and thus cause hyperglycemia. In addition, as noted above, concurrent use of metformin with either dolutegravir or bictegravir can cause an increase in metformin levels.
- **Prediabetes Counseling**: Individuals with prediabetes should be informed of their increased risk of developing type 2 diabetes and cardiovascular disease, and they should be encouraged to pursue lifestyle modifications, including weight loss and increased physical activity, to lower these risks.[60] Regular monitoring, at least annually, is warranted to evaluate for transition to diabetes.[68]

Cardiovascular Risk Mitigation in People with HIV and Diabetes

- **Use of Aspirin in Persons with Diabetes**: Those with diabetes and a history of ASCVD should receive a daily low-dose aspirin (75 to 162 mg) as a secondary prevention strategy.[69]. Daily low-dose aspirin may be considered for use as a primary cardiovascular disease prevention strategy for individuals with diabetes who have increased cardiovascular risk, but this should be a shared decision-making process weighing the benefits versus the risk of bleeding.[69] In the ASCEND Trial, which included individuals with diabetes, the risk of bleeding still outweighed the benefit of preventing CVD.[47]
- **Treatment of Hypertension in Persons with Diabetes**: For individuals with diabetes and hypertension, the ADA recommends a target blood pressure of less than 130/80 mmHg, if it can safely be attained.[69] This can be achieved with either an angiotensin-converting enzyme (ACE) inhibitor, an angiotensin II blocker (ARB), a thiazide-type diuretic, or a calcium channel blocker. For individuals

with microalbuminuria or coronary artery disease, the first-line choice should be an ACE or ARB.[69]

- **Lipid Screening and Management of Hyperlipidemia**: Lipid screening is advised in adults with type 2 diabetes at baseline and annually thereafter.[69] For persons with diabetes who require treatment for lipid disorders, a lipid profile should be obtained at initiation of lipid-lowering therapy, within 4 to 12 weeks after initiating or changing therapy, and yearly thereafter.[69] Increased LDL should be managed aggressively with statin therapy and in accordance with the 2026 ACC/AHA Guideline on the Management of Dyslipidemia.[69,70]

Hypertension

Hypertension is the most common diagnosis seen in primary care, and untreated hypertension increases the risk of myocardial infarction, stroke, renal failure, and death. As seen in the general population, hypertension is common in people with HIV.[71,72,73] There are no hypertension guidelines specifically for people with HIV.[13,74] Thus, the following will discuss recommendations for initial management of hypertension as outlined in the most recent guidance from the American College of Cardiology (ACC) and American Heart Association (AHA).[75] This section will not address evaluation and management of secondary causes of hypertension, white-coat hypertension, or treatment-resistant hypertension.

Definition of Hypertension

The 2025 ACC/AHA Hypertension Guideline revised the definition of hypertension as any systolic blood pressure of at least 130 mm Hg or any diastolic blood pressure of at least 80 mm Hg (Figure 5).[75]

Baseline Evaluation of Persons with Hypertension

The 2025 ACC/AHA Hypertension Guideline recommends performing all the following baseline evaluation for all persons diagnosed with hypertension:[75]

- Complete blood count
- Serum electrolytes
- Serum creatinine with estimated glomerular filtration rate
- Lipid profile
- Fasting blood glucose or HbA1c
- Thyroid stimulating hormone
- Urinalysis and urine albumin-to-creatinine ratio
- 12-lead electrocardiogram

Guidelines for the Management of Hypertension

The management of hypertension should have a comprehensive approach that includes lifestyle changes, psychosocial approaches, and medical management.[75] Counseling on lifestyle changes and psychosocial approaches should be provided to all persons with hypertension and continued throughout the management of hypertension.[75] Key recommended lifestyle changes include: (1) losing weight if overweight, (2) establishing a heart-healthy eating pattern, such as the Dietary Approach to Stop Hypertension (DASH) eating plan, (3) reducing dietary intake of sodium, (4) increasing dietary intake of potassium, (5) limiting or ideally abstaining from alcohol use, (6) increasing physical activity, and (6) reducing stress.[75] When calculating the cardiovascular disease (CVD) 10-year risk score, use the American Heart Association's Predicting Risk of Cardiovascular Disease EVENTs (PREVENT) equation (see the PREVENT-CVD on-line calculator).[75] The 2025 ACC/AHA Hypertension Guideline recommendations for thresholds to initiate pharmacologic treatment of hypertension are summarized in the following table (Table 2).[75]

Pharmacologic Treatment for Hypertension

The 2025 ACC/AHA Hypertension Guideline recommendations regarding medication treatment for hypertension for adults with hypertension are summarized as follows.[75] Note: when choosing pharmacologic hypertension treatment in people with HIV, clinicians should consider potential drug interactions with antiretroviral medication, particularly with HIV protease inhibitors or pharmacologic boosters (cobicistat or ritonavir).[76,77]

- The recommended agents for first-line initial pharmacotherapy for hypertension are: thiazide-type diuretic, a long-acting calcium-channel blocker, angiotensin-converting-enzyme inhibitor, or

angiotensin-receptor blocker.

- Initial pharmacotherapy for stage 1 hypertension with a single first-line medication is reasonable, followed by dose titration and addition of a second agent, if needed.
- Initial pharmacotherapy for stage 2 hypertension should consist of simultaneous administration of two agents of different classes (thiazide-type diuretic, calcium-channel blocker, angiotensin-converting-enzyme inhibitor, or angiotensin-receptor blocker). Preferably, this is administered as a single fixed-dose combination pill.
- Simultaneous use of an angiotensin-converting-enzyme inhibitor and an angiotensin-receptor blocker is not recommended.
- For adults with hypertension, the recommended blood pressure treatment goal is a systolic BP less than 130 mm Hg and a diastolic BP less than 80 mm Hg, with encouragement to achieve a systolic BP less than 120 mm Hg.
- Special considerations exist for patients with one or more of the following conditions: diabetes, obesity, chronic kidney disease, aortic disease, heart failure, peripheral vascular disease, or stroke. Detailed recommendations for management of hypertension with these conditions are provided in the 2025 ACC/AHA Hypertension Guideline.

Hyperlipidemia

Combined data from the CDC and National Health and Nutrition Examination Survey (NHANES) show that approximately 10% of United States adults 20 years of age and older have elevated total cholesterol (defined as greater than or equal to 240 mg/dL), and approximately 25% had a low-density lipoprotein cholesterol (LDL-C) level greater than or equal to 130 mg/dL.[78] Elevated cholesterol can lead to atherosclerotic cardiovascular disease (ASCVD), the leading cause of preventable death in the United States. People with HIV are estimated to have a 1.5 to 2-fold greater risk of developing ASCVD and at an earlier incident age.[79]

Mechanism of Lipid Disorders Associated with HIV

The pathophysiology of ASCVD and dyslipidemia in HIV is multifactorial—it has been associated with traditional risk factors, such as hypertension, diabetes mellitus, dyslipidemia, family history, and tobacco use, as well as with HIV itself and antiretroviral therapy.[34,80] Effective antiretroviral therapy does not completely nullify the adverse cardiovascular impact from HIV, but it does significantly reduce it.[39] Chronic HIV can lead to abnormalities in lipid levels, vascular stiffness, inflammation, and immune activation, even with effective antiretroviral therapy and virologic suppression.[81] Compared to individuals without HIV, people with HIV have been shown to have a higher prevalence of atypical, high-risk, noncalcified coronary plaques.[34,81]

Effect of Antiretroviral Therapy on Lipids

Different antiretroviral therapies have distinct effects on lipid levels, with protease inhibitors generally causing the greatest increases (especially LDL and triglycerides) and integrase strand transfer inhibitors (INSTIs) exerting the least effect on lipids; within classes, certain agents are recognized to cause more adverse lipid effects than others (Figure 6).[82,83] If an individual with HIV has abnormal lipid levels while taking antiretroviral therapy, a review of the antiretroviral regimen should be performed to identify medications that may be contributing to lipid abnormalities, particularly efavirenz, protease inhibitors, and boosting agents (ritonavir and cobicistat).[37] Modern preferred unboosted INSTI-based antiretroviral regimens generally do not adversely impact lipid parameters, and switching from a boosted-protease inhibitor to an INSTI-based regimen can improve lipids.[84,85] Tenofovir DF, but not tenofovir alafenamide, typically lowers LDL and triglyceride levels.[86] If a decision is made to change a patient's existing antiretroviral therapy regimen to a more "lipid-friendly" regimen, the goal of maintaining viral suppression is paramount, and current and archived resistance mutations must be considered when selecting the new regimen.[83,87]

Routine Monitoring of Lipid Profiles in People with HIV

The following summarizes Adult and Adolescent ARV Guidelines recommendations for monitoring lipid profiles in people with HIV.[88]

- **Entry into Care**: At the time of entry into HIV care, a lipid profile should be ordered; if the test performed was a random lipid profile, and it is abnormal, then a fasting lipid panel should be ordered.
- **Antiretroviral Initiation or Modification**: A lipid profile should be ordered at the time of initiating or changing antiretroviral therapy.
- **After Initiation or Modification of Antiretroviral Therapy**: Consider ordering a lipid profile 4 to 8 weeks after initiating or modifying antiretroviral therapy.
- **Routine Monitoring**: If the lipid profile is abnormal or the person has cardiovascular risk, then monitoring should be conducted every 12 months. If the lipid profile remains normal and there is no cardiovascular risk, then monitoring should be every 5 years.
- **Persons on Lipid-Lowering Therapy**: Persons receiving lipid-lowering therapy should have individualized lipid monitoring, and more frequent monitoring may be needed.

The 2026 ACC/AHA Dyslipidemia Treatment Guideline also introduces the routine use of novel risk

assessment tools to refine clinical decision-making.[70] These recommendations are not specific to people with HIV.[70]

- **Lipoprotein(a) or Lp(a)**: Lipoprotein(a) is a cholesterol-carrying lipoprotein that, at elevated levels, may contribute to vascular plaque buildup. A one-time measurement is recommended for all individuals to identify those at higher risk of ASCVD. Elevations are almost always determined by genetic factors (e.g., *LPA* gene). A lipoprotein(a) value ≥125 nmol/L is considered a risk-enhancing feature and should prompt more intensive LDL-C lowering.
- **Apolipoprotein B (ApoB)**: In adults already on lipid-lowering therapy, ApoB testing can guide treatment goals once LDL-C and non-HDL-C targets are met. ApoB identifies residual lipoprotein-related risk that standard lipid measurements may underestimate; it can also serve as a baseline for guiding therapy before it is initiated.
- **Coronary artery calcium (CAC)**: The coronary artery calcium score is performed using non-contrast-gated cardiac computed tomography (CT). For men older than 40 years of age and women older than 45 years of age, coronary artery calcium scoring can further refine risk assessment regardless of current lipid-lowering therapy status. The calcium score represents the estimated calcified coronary plaque and is reported in Agatson units (AU). The following are the reporting categories: absent (0), minimal (1-9), mild (10-99), moderate (100-299), severe (300-999), and extensive (≥1000). Any value greater than 0 AU, particularly if ≥100 AU or ≥75th standardized percentile, signifies the presence of calcified coronary plaque and should inform lipid-lowering treatment decisions.

Lipid-Lowering Agents

There are multiple classes and options for lipid-lowering therapy that are now available. The following provides a brief overview of these different classes of lipid-lowering agents. For people with HIV (and the general population), statins remain the primary initial drug class used to treat elevated LDL cholesterol.

- **Statins (HMG-CoA Reductase Inhibitors)**: The statin class of medication works by inhibiting cholesterol synthesis. Specifically, these medications inhibit 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase, an enzyme that converts HMG-CoA to mevalonic acid—a key step in cholesterol synthesis.[89] In addition, statins also increase the number of low-density lipoprotein (LDL) receptors.[89] For treatment purposes, statins are administered orally and categorized by their impact on lowering LDL cholesterol (LDL-C).[89] Atorvastatin and rosuvastatin are the preferred statins and can be dosed as high intensity (atorvastatin 40–80 mg and rosuvastatin 20–40 mg) or moderate intensity (atorvastatin 10–20 mg and rosuvastatin 5–10 mg).[70] Statins have the potential to cause hepatotoxicity, myopathy, and new onset of diabetes mellitus.
- **Cholesterol Absorption Inhibitors**: Ezetimibe is the only approved medication in this class, and it targets the Niemann–Pick C1–like 1 (NPC1L1) protein and thereby selectively inhibits intestinal and biliary cholesterol absorption. The reduced cholesterol absorption causes decreased delivery of intestinal cholesterol to the liver and lowers circulating levels of cholesterol. This oral medication is also likely to increase the number of LDL receptors. The recommended dose of ezetimibe is 10 mg once daily; it is generally well tolerated, and, when combined with a statin, it lowers LDL cholesterol by an additional 15 to 20% but raises high-density lipoprotein (HDL) cholesterol minimally (about 1 to 2%).[89,90,91] When used, it is typically given in combination with a statin.
- **Bile Acid Sequestrants**: These oral agents are large molecular weight polymers that bind to bile acids and bile salts in the intestines, forming an insoluble complex that is excreted in stool. Commonly used bile acid sequestrants include cholestyramine, colesevelam, and colestipol; these medications lower LDL-C by about 15 to 30%.[89] Since these medications are not systemically absorbed, they are generally considered safe, but they can cause bloating and gastrointestinal discomfort. These medications should not be used in someone with biliary obstruction, severe constipation, or severe hypertriglyceridemia.
- **PCSK9 Inhibitors**: The PCSK9 inhibitors are injectable humanized monoclonal antibodies that bind to proprotein convertase subtilisin–kexin type 9 (PCSK9) and thereby decrease the degradation of LDL receptors.[92,93] At the surface of hepatocytes, the LDL receptors act as binding sites for circulating

LDL cholesterol—a key step for processing and removal of LDL. Within hepatocytes, the LDL receptors undergo a recycling process in which they either return to the cell surface or they are shunted to lysosomes and degraded.[93] The enzyme PCSK9 enhances the movement of the LDL receptors to the lysosome. Accordingly, the PCSK9 inhibitors reduce the impact of PCSK9 on LDL receptors being shunted to lysosomes, effectively creating more LDL receptors at the surface of the hepatocyte.[94] This class of medications includes alirocumab and evolocumab; both of these agents are very potent, lowering LDL cholesterol by about 40 to 60%.[89,95] Although PCSK9 inhibitors are potent, safe, and dosed infrequently, they require subcutaneous injections and are very expensive.[93,95]

- **Bempedoic Acid**: This oral medication acts as an inhibitor of the enzyme adenosine triphosphate (ATP) citrate lyase, an enzyme that catalyzes acetyl-CoA, which is an important early step in cholesterol biosynthesis in the liver.[96,97] Bempedoic acid inhibits cholesterol biosynthesis upstream from the inhibition produced by HMG-CoA) reductase inhibitors (statins).[96,97] Bempedoic acid has been studied as a supplement to statins and in persons with intolerance to statins; it has been shown to lower LDL levels, reduce inflammatory markers, and reduce ASCVD events.[97,98]
- **Fibrates (PPAR Agonists)**: The fibrates—derivatives of fibric acid—exert their action as an agonist of peroxisome proliferator-activated receptor alpha (PPAR-α), a protein that increases gene transcription of proteins that regulate metabolism of triglycerides and HDL.[99,100] Fibrates can lower triglycerides by approximately 40% and increase HDL by 15%, but they have minimal impact on LDL levels. Commonly used fibrates include bezafibrate, clofibrate, fenofibrate, and gemfibrozil.

Guidelines for Statin Therapy in People with HIV

The AIDS Clinical Trials Group (ACTG) Randomized Trial to Prevent Vascular Events in HIV (REPRIEVE) trial was a randomized, double-blind, international trial that enrolled 7,769 participants with HIV and low-to-moderate risk of cardiovascular disease to receive pitavastatin 4 mg or placebo.[101] The major goal of the study was to test whether statin therapy reduces the risk for major adverse cardiovascular events in persons with HIV.[101] The trial was stopped early because persons in the pitavastatin group had 35% fewer adverse cardiovascular events compared with those receiving a placebo after a median follow-up of 5.1 years.[101] Based on these results, the 2026 ACC/AHA Dyslipidemia Treatment Guideline recommended statin initiation as primary prevention for all persons with HIV who are 40–75 years of age.[70] In addition, these guidelines recommend using the American Heart Association's Predicting Risk of Cardiovascular Disease EVENTs (PREVENT) equation (see the PREVENT-CVD on-line calculator) as the preferred ASCVD risk calculator.[70] The Adult and Adolescent ARV Guidelines guidance for the use of statins as primary prevention of ASCVD in nonpregnant adults with HIV now defers to recommendations from the 2026 ACC/AHA Dyslipidemia Treatment Guideline.[70,79] The following summarizes key recommendations for guidance on statin therapy in people with HIV.[70,79]

- **People with HIV Age 40–75 Years**
    - Statin therapy is recommended for primary prevention of ASCVD.

- **People with HIV Age**

Osteoporosis

An estimated 53 million men and women in the United States have osteoporosis or low bone density.[110,111,112,113] Osteoporosis is associated with chronic pain, disability, decreased quality of life, and potential fractures. Lower bone density is more prevalent among people with HIV, likely due to multiple HIV-related factors, including increased inflammation, altered bone metabolism, and toxicities related to antiretroviral medications, particularly tenofovir DF.[114,115,116,117] Individuals with HIV can also have an increased risk of osteoporosis due to traditionally identified factors in people without HIV, including increasing age, low body weight, female sex, postmenopause for women, current tobacco use, excessive alcohol consumption, rheumatoid arthritis, vitamin D deficiency, low calcium intake, receipt of glucocorticoids, and immobilization.[110,112]

Screening Recommendations for People with HIV

There is convincing evidence that screening for osteoporosis has predictive value for osteoporotic fractures in both women and men, and therapies are available to reduce fracture risk. The following summarizes screening recommendations from the HIVMA/IDSA Primary Care Guidance and the Recommendations for Evaluation and Management of Bone Disease in HIV.[13,117] Note that osteoporosis screening recommendations for people with HIV differ from the USPSTF recommendations for the general population.[13,117,118]

- All postmenopausal women with HIV and men 50 years of age and older with HIV should undergo bone mineral density screening with a DXA scan. Bone mineral density should also be assessed with a dual-energy x-ray absorptiometry (DXA) scan in all adults with HIV who have a major risk factor for fragility fracture, including personal history of fragility fracture, chronic glucocorticoid treatment (greater than or equal to 5 mg of prednisone daily or equivalent for at least 3 months), or high risk of falls.
- In men with HIV 40 to 49 years of age and premenopausal women with HIV 40 years of age and older without a major risk factor for osteoporotic fracture, clinicians should assess fracture risk using the Fracture Risk Assessment Tool (FRAX Calculation Tool) specific to their country and the patient's race/ethnicity. Risk assessment should be performed every 2 to 3 years or when a new clinical risk factor develops. When using the FRAX tool, some experts recommend checking the "secondary osteoporosis" box to better adjust the estimate, considering the increased risk of osteoporosis conferred by HIV. A DXA scan should be performed if the FRAX tool indicates a 10-year risk of major osteoporotic fracture to be greater than 10%.
- When interpreting DXA results, use T-scores for postmenopausal women and men 50 years of age and older and use Z-scores for persons younger than 50 years of age.
- Optimal screening intervals (for DXA or FRAX assessment) are not clear for persons with HIV. Consider repeating a DXA scan after 1 to 3 years for individuals who have advanced osteopenia (T-score -2.0 to -2.49) and after 4 to 5 years in those with mild-to-moderate osteopenia (T-score of -1.01 to -1.99); for those who have a normal DXA, guidance on when to repeat screening is not given, though some experts will repeat in 5 to 10 years.

Additional Evaluation for Persons with HIV

- Vitamin D screening is recommended in all individuals with low bone mineral density or a history of a fragility fracture; it should be considered in persons who have any of the major known risk factors for low vitamin D levels. Routine measurement of serum or urine markers of bone turnover or inflammation for screening or treatment monitoring is not recommended for persons with HIV.
- For persons with HIV who have osteopenia or osteoporosis, possible treatable secondary causes for decreased bone mineral density should be identified and addressed. These secondary causes include smoking, alcohol use, sedentary lifestyle, low BMI, exposure to medications associated with bone loss (glucocorticoids, phenytoin, proton pump inhibitors, thiazolidinediones), vitamin D deficiency, renal disease, hyperparathyroidism, thyroid disease, and hypogonadism. If the person has osteopenia and a

reversible secondary cause, the underlying cause should be addressed without a bisphosphonate, if possible, and a repeat DXA should be obtained within 1 year.[13]
- It is important to rule out osteomalacia (softening of the bones due to demineralization, which can be caused by tenofovir DF-induced renal phosphate wasting and/or vitamin D deficiency) before treating with bisphosphonates. Low vitamin D and calcium supplementation can also blunt the response to bisphosphonates and ideally should precede initiation of bisphosphonate therapy.

Management of Osteoporosis in People with HIV

The main goals in the management of osteoporosis are to halt further bone loss, build new bone, and prevent fractures. Management may include diet, lifestyle modifications, calcium and vitamin D supplementation, and pharmacologic therapy.

- All persons with osteoporosis (or at risk of osteoporosis) should, if possible, avoid tenofovir DF and boosted protease inhibitors. In contrast, tenofovir alafenamide does not cause significant loss of bone mineral density and can usually be administered to people with HIV and osteoporosis.[119,120]
- For individuals at high risk for osteoporosis, dietary management strategies should be employed, which include ensuring adequate calcium intake and, if indicated, vitamin D supplementation.
- Vitamin D supplementation should be titrated to a target serum 25-hydroxy vitamin D level of approximately 30 ng/mL or higher.
- Lifestyle modifications for persons with osteopenia or osteoporosis include regular weight-bearing and muscle-strengthening exercises, avoidance of falls, smoking cessation, and reduction in alcohol consumption.

Pharmacotherapy Recommendations

In general, the management of osteopenia or osteoporosis in persons with HIV should follow established guidelines for the general population without HIV; several exceptions exist, as outlined below.[117]

- The use of pharmacologic therapy is recommended when treating postmenopausal women and men older than 50 years of age if any of the following apply:[117]
    - T-score less than -2.5, *or*
    - T-score between -1.0 and -2.5 and FRAX score ≥20% (or ≥3% at the hip), *or*
    - Hip or vertebral fracture
- When pharmacologic therapy for osteoporosis is indicated for people with HIV, the use of bisphosphonate (alendronate or zoledronic acid) is preferred, since these therapies have been studied in persons with HIV.[117] Alendronate is taken orally (daily or weekly depending on the dose), whereas zoledronic acid is administered intravenously once yearly.
- Individuals who receive treatment with a bisphosphonate should have a repeat DXA scan in 2 years and reassess the need for continuation of treatment after 3–5 years.[117]
- Bisphosphonates have been associated with adverse effects, including esophagitis, osteonecrosis of the jaw, and atypical femoral fractures; patients on these medications should be monitored clinically for these outcomes.[121,122]
- Individuals receiving bisphosphonates with evidence of worsening bone mineral density, new fractures, suspected osteomalacia, or intolerance of treatment may benefit from referral to a bone health specialist.
- Drug interactions are not expected with concurrent bisphosphonate and antiretroviral therapy, but caution should be used if calcium supplementation is administered in the form of an antacid such as calcium carbonate, as polyvalent cations can interfere with the absorption of bictegravir, dolutegravir, elvitegravir, and rilpivirine.[65,76,103] Calcium-containing antacids must be taken separately from some antiretroviral medications, and prescribing information for the specific antiretroviral medication should be followed.[65]

Renal Disease

The prevalence of chronic kidney disease (CKD) among adults in the United States older than 20 years is approximately 14%.[123] Renal disease among people with HIV is common, multifactorial, and associated with significant morbidity. Among individuals with untreated HIV, particularly those with a low CD4 cell count, HIV-associated nephropathy (HIVAN) is an important, and potentially reversible cause of renal disease.[124,125] In addition, among people with HIV, the risk of developing chronic kidney disease is higher in individuals who are older in age or have one or more comorbid conditions, such as diabetes, hypertension, or hepatitis C.[126] Certain antiretroviral agents, such as tenofovir DF, can play a role in causing chronic kidney disease in persons with HIV. Indeed, in the current antiretroviral era, most renal disease in people with HIV is caused by hypertension, diabetes, chronic hepatitis C virus (HCV) infection, or use of tenofovir DF.[124,125]

Definitions

The 2024 KDIGO Clinical Practice Guideline defines chronic kidney disease as abnormalities of kidney structure or function present for greater than 3 months and& with implications for health.[127] Historically, in 2002, the National Kidney Foundation–Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) proposed a chronic kidney disease staging system based on glomerular filtration rate (GFR) stages 1 through 5 (Figure 7).[128,129]

KDIGO Classification for Renal Disease

The 2024 KDIGO Clinical Practice Guideline recommends classifying chronic kidney disease by cause, glomerular filtration rate category, and albuminuria category in recognition that GFR and albuminuria are complementary and independent predictors of important clinical outcomes, including CKD progression, end-stage renal disease, and all-cause mortality (Figure 8).[127]

Recommendations for People with HIV

The HIV Medical Association (HIVMA) has provided a comprehensive HIVMA CKD Clinical Practice Guideline that addresses renal disease among persons with HIV, and it provides management recommendations.[126] Staging for chronic kidney disease in the HIVMA CKD Clinical Practice Guideline follows the KDIGO definitions outlined above.[126] The following summarizes key recommendations regarding the evaluation, management, and prevention of renal disease in persons with HIV, with an emphasis on recommendations in the Adult and Adolescent ARV Guidelines and the HIVMA CKD Clinical Practice Guideline.[88,126]

Baseline Evaluation and Routine Monitoring for Renal Disease

- Persons with HIV should have a creatinine-based estimated glomerular filtration rate (eGFR) at the time of HIV diagnosis, when antiretroviral therapy is initiated or changed, and twice a year as long as renal function remains normal.[88,126] The 2024 KDIGO Clinical Practice Guideline recommends that, if cystatin C is available, a combination of cystatin C and serum creatinine should be used to calculate eGFR.[127] A systematic review assessing the use of cystatin C in persons with HIV (who are taking antiretroviral therapy) also suggests a benefit for the use of both cystatin C- and creatinine-based GFRs in monitoring for the development of kidney disease.[130]
- Persons with HIV should have a urinalysis at entry into care.[88] In addition, urine glucose and urine protein should be assessed prior to starting an antiretroviral regimen containing tenofovir DF or tenofovir alafenamide, and monitored while receiving either medication.[88] Proteinuria of 1+ or greater on urinalysis should be quantified with either an albumin-to-creatinine ratio (often called a urine microalbumin test) or a protein-to-creatinine ratio. Both the albumin-to-creatinine ratio and protein-to-creatinine ratio can be obtained from a spot urine sample or from a 24-hour urine collection.

- The HIVMA/IDSA Primary Care Guidance provides a more liberal recommendation by suggesting that the frequency of monitoring for renal function, such as with chemistry panels and urinary abnormalities, depends on the need to monitor for antiretroviral toxicities and the presence of underlying medical conditions that can increase risk of CKD, including diabetes, hypertension, HCV, nephrotoxic medications, genetic predisposition, or advanced HIV disease.[27] In those taking tenofovir DF, biannual monitoring for renal function and urinary abnormalities is recommended. Otherwise, urinalysis should be monitored annually among those at risk for kidney disease.[27]
- Workup for new-onset kidney disease in persons with HIV should include serum chemistry panel, urinalysis, quantitative measure of albuminuria, assessment of glucose and blood pressure control, markers of proximal tubular dysfunction, renal sonogram, and medication review to determine any agents that may be nephrotoxic or require renal dosing.

Referral for Persons with HIV and Renal Impairment

- Persons with HIV should be referred to a nephrologist if GFR declines more than 25% from baseline and to a level less than 60 mL/min/1.73 m^2 that fails to resolve with the removal of any potential nephrotoxic drugs.[126] Additional indications for referral include albuminuria greater than 300 mg/day, hematuria with either proteinuria or elevated blood pressure, and advanced kidney disease with GFR less than 30 mL/min/1.73 m^2.
- Individuals with HIV and end-stage renal disease should undergo evaluation for their potential candidacy for renal transplantation.

HIV-Associated Nephropathy (HIVAN)

All individuals with HIV-associated nephropathy (HIVAN) should receive treatment with effective antiretroviral therapy at diagnosis.[124,126] Antiretroviral therapy should not be withheld due to the severity of renal dysfunction or low CD4 cell count. For refractory HIVAN, treatment may include an ACE inhibitor or ARB, and possibly also corticosteroids.[124,126]

Tenofovir DF-Associated Chronic Kidney Disease

Antiretroviral therapy-related nephrotoxicity, if it occurs, usually results from tenofovir DF, typically involving a proximal tubular nephropathy that can progress to Fanconi syndrome.[124] The risk for tenofovir DF-related kidney injury increases in the setting of older age, lower body weight, diabetes, hypertension, and with concomitant use of a protease inhibitor, particularly ritonavir-boosted protease inhibitors.[126,131] Tenofovir DF should, if feasible, be avoided in persons with a baseline GFR less than 60 mL/min.[126] If tenofovir DF is used in a person with a creatinine clearance of less than 50 mL/min, a dose reduction is required. Tenofovir alafenamide, a prodrug of tenofovir, achieves higher intracellular but lower plasma levels of tenofovir than tenofovir DF. In addition, tenofovir alafenamide is not transmitted into the proximal tubular cells via the organic anion transporters 1 and 3.[124,132] For these reasons, tenofovir alafenamide causes significantly less nephrotoxicity than tenofovir DF.[133] Although tenofovir alafenamide is less nephrotoxic than tenofovir DF, rare cases of nephrotoxicity associated with tenofovir alafenamide have been reported.[134,135,136] Tenofovir alafenamide-emtricitabine is not recommended for persons with a creatinine clearance less than 30 mL/min; tenofovir alafenamide (alone) is not recommended for persons with a creatinine clearance less than 15 mL/min.

Evaluating Tenofovir DF-Associated Nephrotoxicity

For individuals who develop renal dysfunction in the setting of tenofovir DF use, it can be challenging to determine whether tenofovir DF is the cause. Measuring serum or urinary markers of proximal tubular dysfunction may be helpful in this scenario (Figure 9).[126]

- Two indicators are highly specific markers of proximal tubular dysfunction: (1) glycosuria with normal serum glucose and (2) urinary phosphorus wasting with low serum phosphorus. Additional markers

that suggest proximal tubular dysfunction include serum parameters (hypokalemia and decreased serum bicarbonate) and urinary abnormalities (urine albumin-to-protein ratio less than 0.4).

- Phosphorus wasting can be determined by a fractional excretion of phosphate. Normal fractional excretion of phosphate is generally defined as less than 10%, and impaired fractional excretion of phosphate is defined as above 20%. A fractional excretion of phosphate above 20% raises the likelihood of tenofovir toxicity, whereas a result below 10% makes tenofovir toxicity unlikely.[126] See the Fractional Excretion of Phosphate Calculator in the Tools and Calculators section.
- Proteinuria is not specific for proximal tubular dysfunction but should also be included in the workup because data suggest that a lower albumin-to-protein ratio of less than 0.4 may be useful in distinguishing proteinuria due to proximal tubular dysfunction (secondary to tenofovir toxicity) from proteinuria due to glomerular disease.[126]

Criteria for Discontinuing Tenofovir DF

Regardless of the cause, the HIVMA CKD Clinical Practice Guideline states that tenofovir DF should be discontinued in persons with HIV who experience a decline in GFR greater than 25% and to a level less than 60 mL/min/1.73m^2, but this is particularly important when there is evidence that tenofovir DF is the cause (e.g., evidence of proximal tubular dysfunction or new-onset or worsening proteinuria).[126]

Renal Dosing of Antiretroviral Medications

The CKD-Epidemiology Collaboration (CKD-EPI) or Cockcroft-Gault equation should be used to estimate creatinine clearance when dosing antiretroviral therapy or other drugs that may require renal dosing. See the Creatinine Clearance Calculator and the Glomerular Filtration Rate (GFR) Calculator in the Tools and Calculator section of this website.

Medications Used in HIV Care that May Cause Benign Elevations in Serum Creatinine

In contrast to tenofovir DF-induced changes in renal function that generally signify kidney damage, the medications bictegravir, cobicistat, dolutegravir, rilpivirine, and trimethoprim may decrease tubular creatinine secretion and raise serum creatinine without altering actual renal function.[27,126] In these settings, a 10 to 20% elevation (or 0.1 to 0.2 mg/dL increase) in serum creatinine may be expected.[137]. Elevations in serum creatinine typically occur in the first few weeks of therapy and subsequently plateau.[138] The exact additive effect of these medications (e.g., when dolutegravir is combined with rilpivirine) is unclear.[139,140] After initiation of these medications, a repeat serum creatinine should be obtained within one month to establish a new baseline. If the creatinine is elevated beyond the expected level on the first check, repeat the serum creatinine to determine if the initial increase has stabilized.[124,141,142,143]

ASCVD Prevention in Persons with HIV and Renal Disease

- **Aspirin**: Some experts consider people with HIV and chronic kidney disease as candidates for low-dose aspirin (75 to 100 mg/day), though the risk of bleeding and benefits in primary cardiovascular disease prevention should be weighed in the decision process.[126] Note the 2019 ACC/AHA Primary CVD Prevention Guideline recommends against the use of aspirin for primary prevention of ASCVD in adults at any age who are at increased risk of bleeding, including those with chronic kidney disease.[53] In addition, the USPSTF recommends against initiating low-dose aspirin as primary prevention in adults 60 years or older. In adults 40 to 59 years with a 10-year ASCVD risk of 10% or greater, which may be seen in persons with HIV and renal disease, the decision to initiate low-dose aspirin for primary prevention of CVD should be individualized.[51] In contrast to primary prevention, aspirin is recommended for secondary prevention in people with CKD and established ischemic cardiovascular disease.[127]
- **Lipid-Lowering Therapy**: In accordance with the 2026 ACC/AHA Dyslipidemia Treatment Guideline, chronic kidney disease is considered an ASCVD risk enhancer.[70] Accordingly, many persons with HIV and kidney disease will receive statin therapy. Although there are no studies of statin therapy in

persons with both HIV and chronic kidney disease, the HIVMA CKD Clinical Practice Guideline cites evidence of statin benefit in persons without HIV who have chronic kidney disease.[126] There is also accumulating evidence that statin therapy slows kidney function decline in persons with HIV on antiretroviral therapy.[144] Because studies of patients with end-stage renal disease (ESRD) on hemodialysis have not shown a reduction in cardiovascular events or mortality from statin therapy, statins are not recommended in this group (regardless of HIV status).

Testosterone Deficiency

In the United States, testosterone deficiency is common among adult males, occurring in approximately 10% of males 18 years of age and older.[145] Available data suggest that men with HIV have a prevalence of testosterone deficiency that is roughly twice as high as in men without HIV.[146,147,148,149] In men with HIV, low testosterone concentrations have been associated with a number of complications, including loss of muscle mass, frailty, weight loss, depression, and reduced exercise capacity.[150]

Screening Recommendations for Persons with HIV

The following summarizes the HIVMA/IDSA Primary Care Guidance and 2018 Endocrine Society Testosterone Therapy Guidelines recommendations for testosterone screening in people with HIV.[13,150]

- Screening for testosterone deficiency in men with HIV should only be performed if the individual has symptoms of testosterone deficiency. Symptoms suggestive of testosterone deficiency include a decrease in libido, infrequent spontaneous erections, erectile dysfunction, fatigue, or depression. Signs suggestive of testosterone deficiency include gynecomastia, loss of pubic hair, small testes, low bone mineral density, decreased muscle mass, or incomplete or delayed sexual development.
- The laboratory evaluation for testosterone deficiency should include a total testosterone level and a free testosterone level; the rationale for obtaining a free testosterone level is that HIV is associated with increased sex hormone binding globulin concentrations, which can lead to falsely elevated total testosterone levels. The testosterone assay used should be one that has been certified with an accuracy-based standardization or quality control program.
- Blood samples to evaluate testosterone levels should be obtained in the morning, ideally between 8 and 10 A.M., as testosterone levels peak in the morning and tend to wane over the course of the day. A fasting blood draw is ideal, as food intake or glucose may suppress testosterone concentrations, leading to falsely decreased testosterone levels.
- A testosterone level should not be checked during an acute illness or in those who are taking certain medications (e.g., opioids or anabolic steroids) that may suppress testosterone concentrations.
- All screening samples that are below the limit of normal should be confirmed with a repeat testosterone level. A laboratory diagnosis of testosterone deficiency is made when a person has two documented decreased morning fasting serum testosterone levels. Since low testosterone concentrations often occur without clinical symptoms or signs of testosterone deficiency, a low testosterone level alone does not establish a clinical diagnosis of hypogonadism.
- If an individual with HIV has low testosterone confirmed on two samples, measurement of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) levels should be obtained to distinguish between primary (testicular) and secondary (pituitary-hypothalamic) hypogonadism. An elevated LH and FSH suggest primary hypogonadism, whereas a low or inappropriately normal LH and FSH suggest secondary hypogonadism.

Testosterone Replacement Therapy in People with HIV

The following summarizes the HIVMA/IDSA Primary Care Guidance and 2018 Endocrine Society Testosterone Therapy Guidelines recommendations for testosterone replacement therapy in men with HIV.[13]

Indications to Start Testosterone Therapy

Testosterone replacement therapy for men should be prescribed with caution and only in those with symptomatic hypogonadism and documented decreased testosterone levels, given the potential long-term side effects that can occur with chronic testosterone use, particularly potential erythrocytosis and cardiac adverse effects. Prior to starting testosterone, baseline studies should include a hematocrit and screening for prostate cancer in men older than 40 years with a prostate-specific antigen (PSA) and digital rectal examination.

Contraindications for Testosterone Therapy

As recommended in the 2018 Endocrine Society Testosterone Therapy Guidelines, prior to initiating testosterone therapy, the clinician should carefully review the medical history and laboratory studies to determine if the patient has any of the following contraindications for testosterone therapy.[150]

- Very High Risk of Serious Outcomes
  - Metastatic prostate cancer
  - Breast cancer
- Moderate to High Risk of Serious Outcomes
  - Unevaluated prostate nodule or induration
  - Prostate PSA greater than 4 ng/mL (or a PSA level greater than 3 ng/mL in a man with increased risk of prostate cancer)
  - Elevated hematocrit greater than 48% (greater than 50% for men living at high altitude)
  - Severe obstructive lower urinary tract symptoms associated with benign prostatic hypertrophy
  - Uncontrolled or poorly controlled congestive heart failure
  - Those planning fertility in the near term

Testosterone Replacement Therapy

Individuals with HIV should be treated with the same testosterone preparations and doses as in persons without HIV, using any of the suggested regimens based on personal preference, pharmacokinetics of the formulation, treatment burden, and cost. Of note, testosterone is a controlled substance, and testosterone patches are no longer manufactured in the United States. The FDA-approved testosterone replacement therapy options in the United States include intramuscular injections (testosterone enanthate, cypionate, or undecanoate; transdermal gels and solutions, nasal gels, buccal mucoadhesive tablets, and pellet implants (Table 3).[150]

Monitoring After Initiation of Testosterone Replacement Therapy

Monitoring to assess symptom response should take place 3 to 12 months after treatment initiation and then annually thereafter. Recommended laboratory monitoring is as follows:[150]

- Obtain testosterone concentrations 3 to 6 months after initiation of testosterone replacement therapy, with the aim of achieving testosterone concentrations in the mid-normal range. Ideally, the timing of obtaining the measurement for testosterone concentration is adjusted based on the testosterone preparation and last dose.
  - Injectable T enanthate or cypionate: Assess midway between injections.
  - Injectable long-acting T undecanoate: Assess at the end of dosing interval just prior to the next injection
  - Transdermal gels: Assess 2–8 hours after gel application.
  - Buccal bioadhesive tablet: Assess immediately before or after application of fresh system.
  - T pellets: Assess at the end of the dosing interval.
- Check hematocrit and hemoglobin levels 3 to 6 months after starting treatment and then annually.
- Monitor for prostate cancer risk during the first year after initiating testosterone replacement therapy (including checking a PSA level 3 to 12 months after starting testosterone and continuing with routine prostate cancer screening after 1 year).
- Urological consultation is recommended if, during the first 12 months of testosterone treatment, the PSA increases more than 1.4 ng/mL above baseline, any single PSA level is greater than 4.0 ng/mL, or a prostatic abnormality is detected on digital rectal examination.

Summary Points

- Among persons with HIV, Kaposi's sarcoma, non-Hodgkin’s lymphoma, and lung cancer are the most common cancers. Since 2003, the number of non-AIDS-defining cancers has exceeded the number of AIDS-defining cancers.
- Colon cancer, breast cancer, and prostate cancer screening recommendations are the same for persons with HIV as for the general population. Due to enhanced risks of developing cervical and anal cancer among individuals with HIV, these cancers warrant different screening protocols.
- Cardiovascular diseases are an area of special concern to people with HIV, and cardiovascular risk reduction should be a priority.
- Hypertension in persons with HIV should be managed based on the same guidelines used for people without HIV, except that calcium channel blockers should be avoided with concomitant use of protease inhibitors or cobicistat.
- For people with HIV who are taking suppressive antiretroviral therapy and who would benefit from statin therapy, the preferred options are atorvastatin, rosuvastatin, and pitavastatin. Simvastatin and lovastatin should be avoided due to drug interactions with certain antiretroviral medications.
- People with HIV should undergo regular screening for the development of diabetes mellitus.
- People with HIV at increased risk for kidney disease should have routine laboratory monitoring of renal function. The risk of developing renal disease is higher for individuals with a CD4 count of less than 200 cells/mm^3, elevated HIV RNA levels, older age, diabetes mellitus, hypertension, and receipt of tenofovir DF.
- All postmenopausal women and all men 50 years of age and older should receive DXA scans to screen for osteoporosis.

Citations

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Figures

Figure 1 (Image Series) - Cervical Cancer Screening Algorithms for Women with HIV (Image Series) - Figure 1 (Image Series) - Cervical Cancer Screening Algorithms for Women with HIV Image 1A: Women Aged 21 to 29 Years

*See Opportunistic Infections Guidelines for HPV testing in Women aged 25-29 years. Abbreviations: ASC-US = atypical squamous cells of undetermined significance; LSIL: low-grade squamous intraepithelial lesion.

Source: Panel on Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the prevention and treatment of opportunistic infections in adults and adolescents with HIV: recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. Human papillomavirus disease. July 9, 2024.

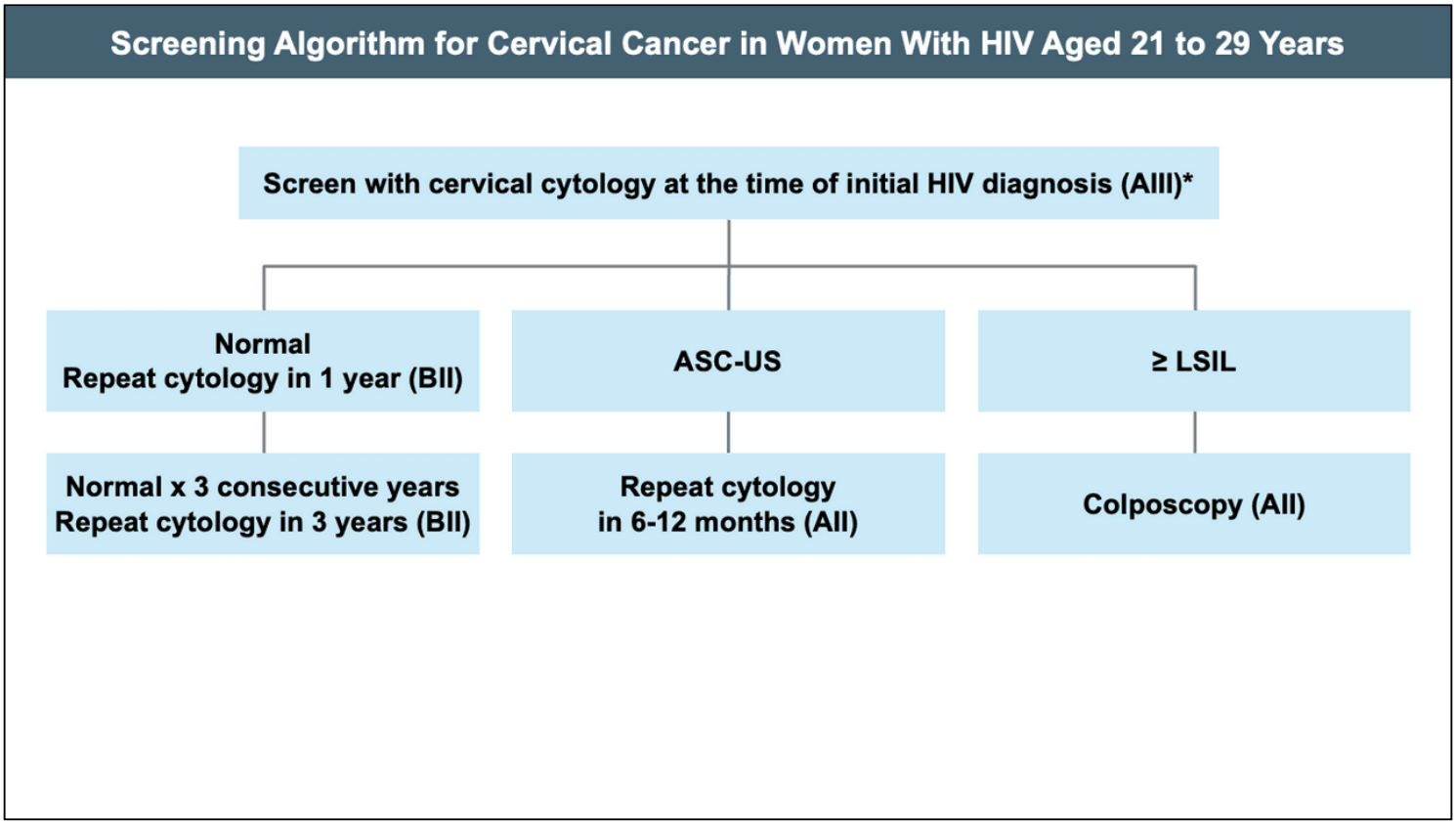

Figure 1 (Image Series) - Cervical Cancer Screening Algorithms for Women with HIV
Image 1B: Women Aged 30 Years and Older: hr-HPV Testing Performed

^If at repeat testing either cytology is ≥ASC-US or any hr-HPV is detected, refer for colposcopy (AII).
Abbreviations: hr-HPV = high-risk human papillomavirus; ASC-US = atypical squamous cells of undetermined significance; LSIL: low-grade squamous intraepithelial lesion

Source: Panel on Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the prevention and treatment of opportunistic infections in adults and adolescents with HIV: recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. Human papillomavirus disease. July 9, 2024.

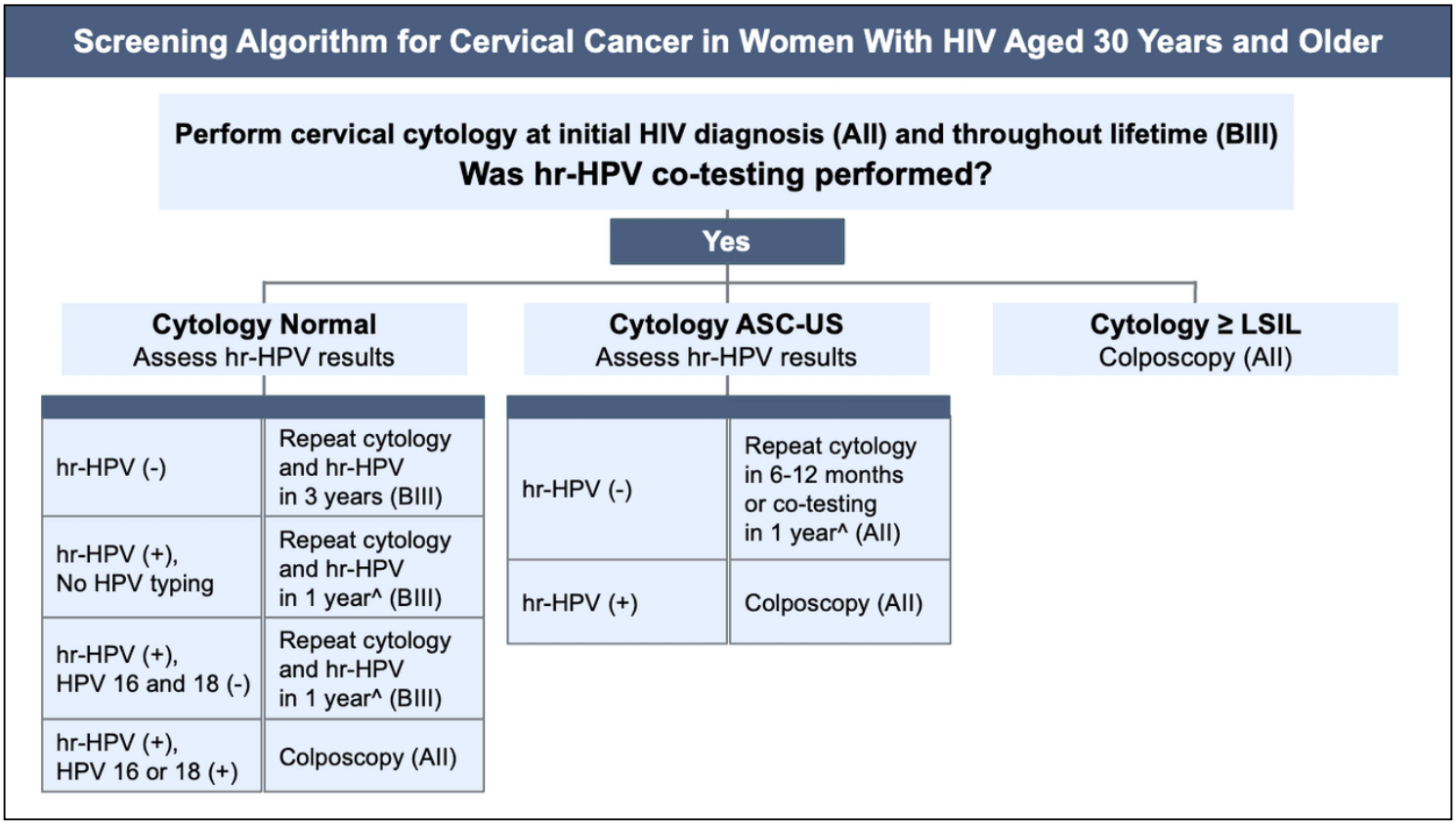

Figure 1 (Image Series) - Cervical Cancer Screening Algorithms for Women with HIV
Image 1C: Women Aged 30 Years and Older: hr-HPV Testing NOT Performed

Abbreviations: hr-HPV = high-risk human papillomavirus; ASC-US = atypical squamous cells of undetermined significance; LSIL: low-grade squamous intraepithelial lesion

Source: Panel on Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the prevention and treatment of opportunistic infections in adults and adolescents with HIV: recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. Human papillomavirus disease. July 9, 2024.

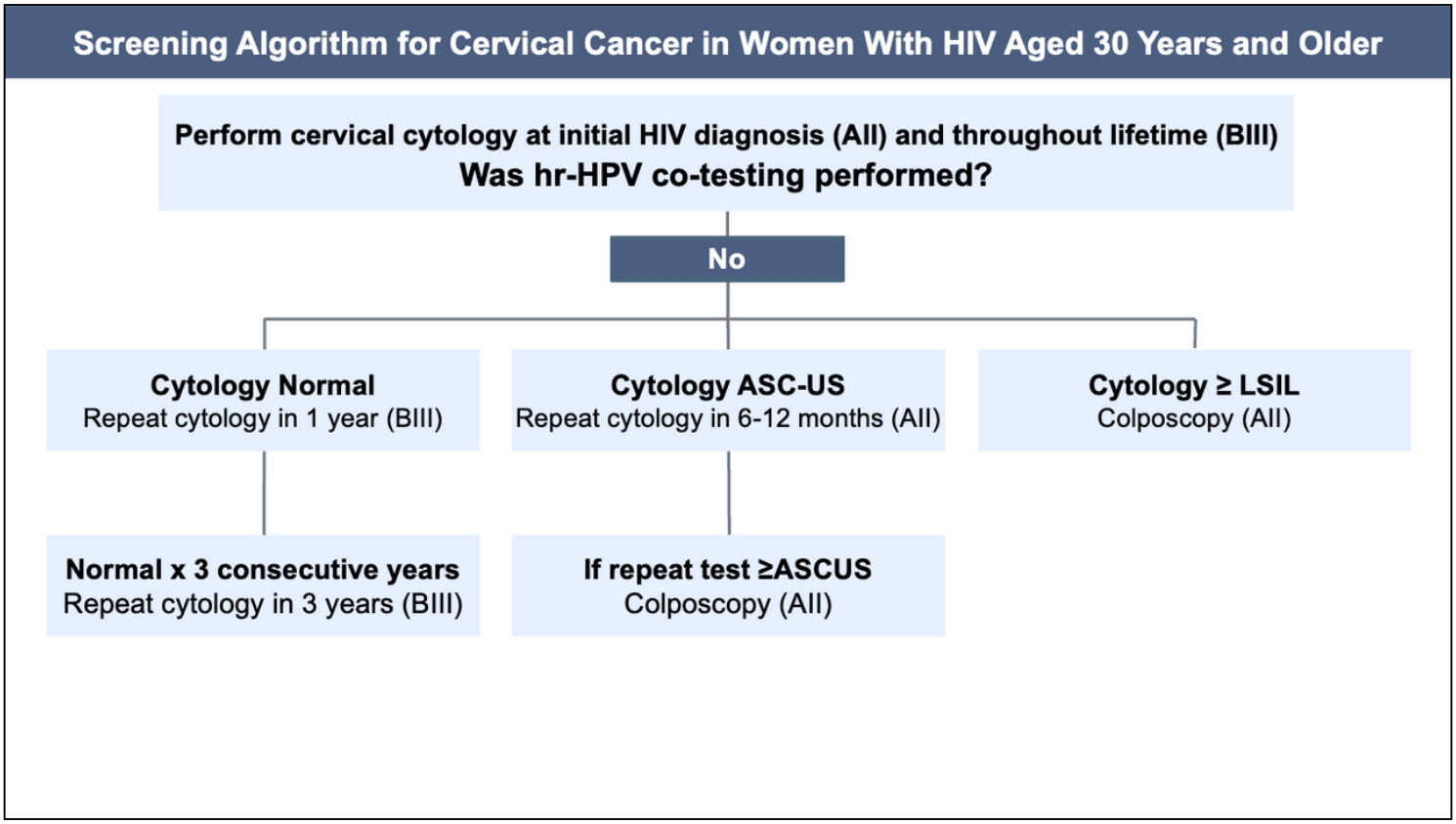

Figure 2 (Image Series) - Anal Cancer Screening Algorithms for People with HIV (Image Series) - Figure 2 (Image Series) - Anal Cancer Screening Algorithms for People with HIV
Image 2A: Anal Cancer Screening in Asymptomatic People With HIV

*No specimen collected. Abbreviation: HRA = high resolution anoscopy; DARE = digital anorectal examination; HPV = human papillomavirus; hr-HPV = high-risk HPV; LSIL = low-grade squamous intraepithelial lesion

Source: Panel on Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the prevention and treatment of opportunistic infections in adults and adolescents with HIV: recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. Human papillomavirus disease. July 9, 2024.

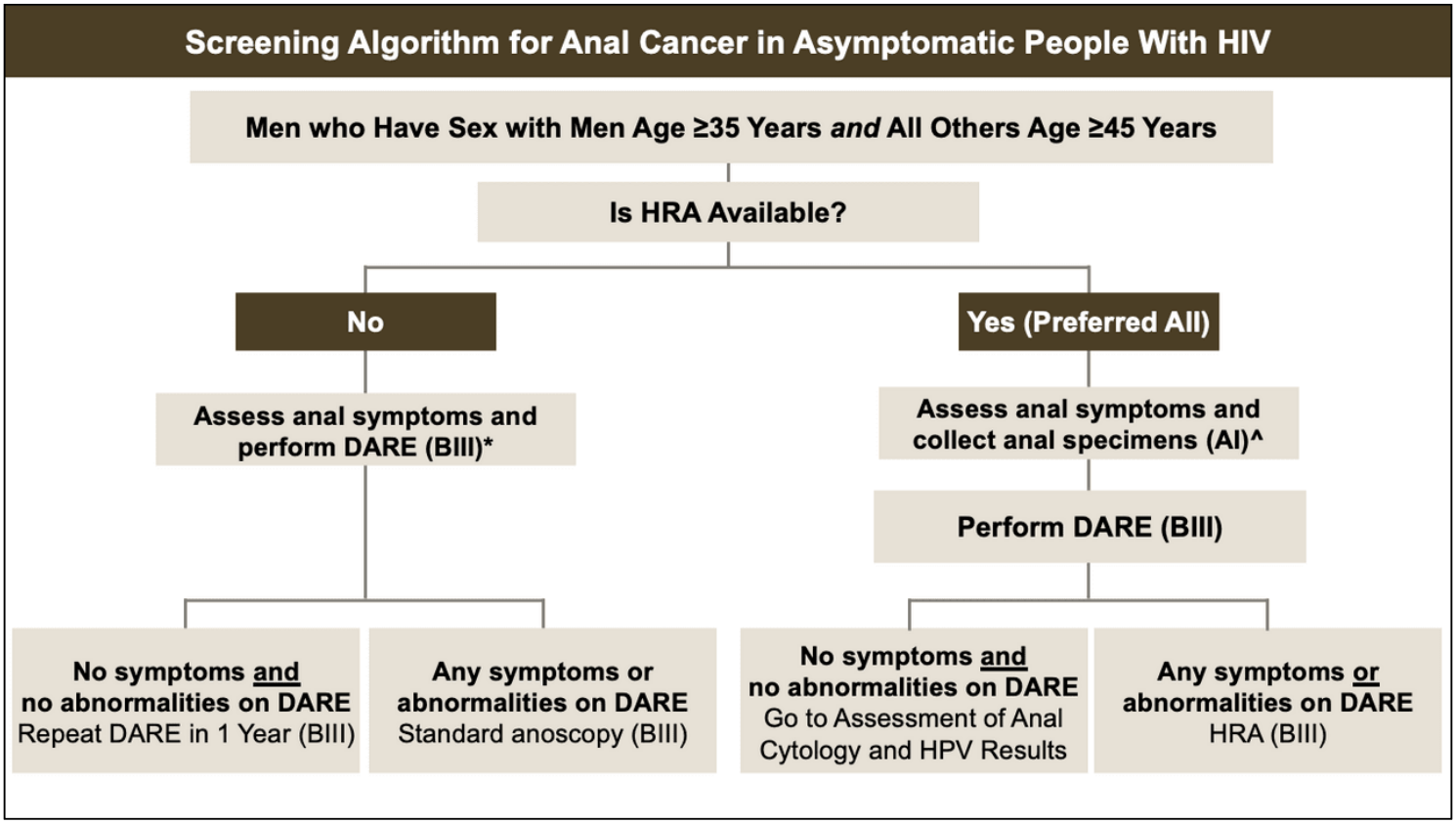

Figure 2 (Image Series) - Anal Cancer Screening Algorithms for People with HIV
Image 2B: Assessment of Anal Cytology and HPV Results: hr-HPV Co-Testing NOT Performed

Abbreviation: hr-HPV = high-risk human papillomavirus; ASC-US = atypical squamous cells of undetermined significance

Source: Panel on Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the prevention and treatment of opportunistic infections in adults and adolescents with HIV: recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. Human papillomavirus disease. July 9, 2024.

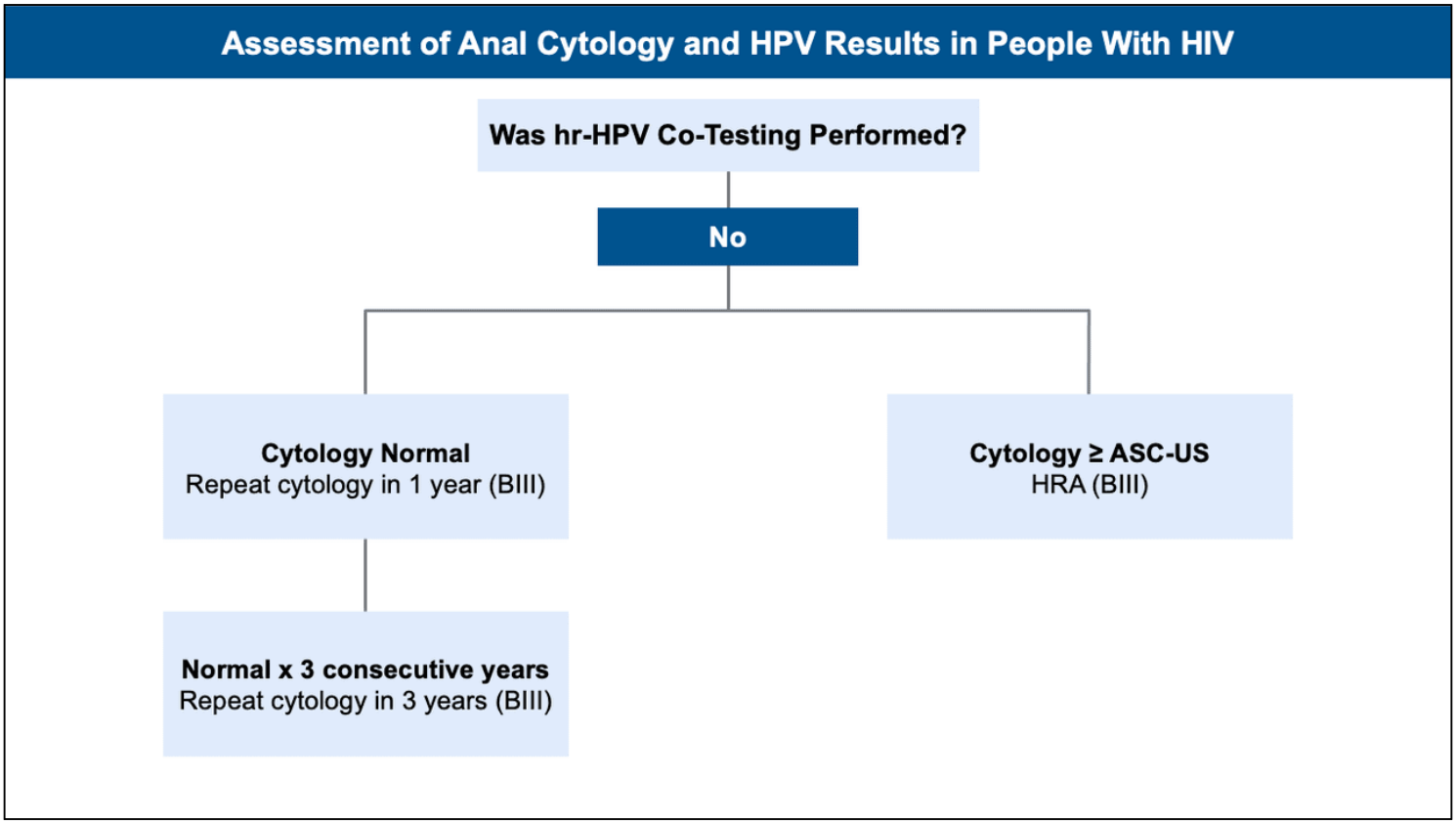

Figure 2 (Image Series) - Anal Cancer Screening Algorithms for People with HIV
Image 2C: Assessment of Anal Cytology and HPV Results: hr-HPV Co-Testing Performed

^If at repeat testing either cytology is ≥ASC-US or any hr-HPV is detected, refer for colposcopy (AII)
Abbreviations: HPV = human papillomavirus; hr-HPV = high-risk HPV; ASC-US = atypical squamous cells of undetermined significance; LSIL = low-grade squamous intraepithelial lesion

Source: Panel on Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the prevention and treatment of opportunistic infections in adults and adolescents with HIV: recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. Human papillomavirus disease. July 9, 2024.

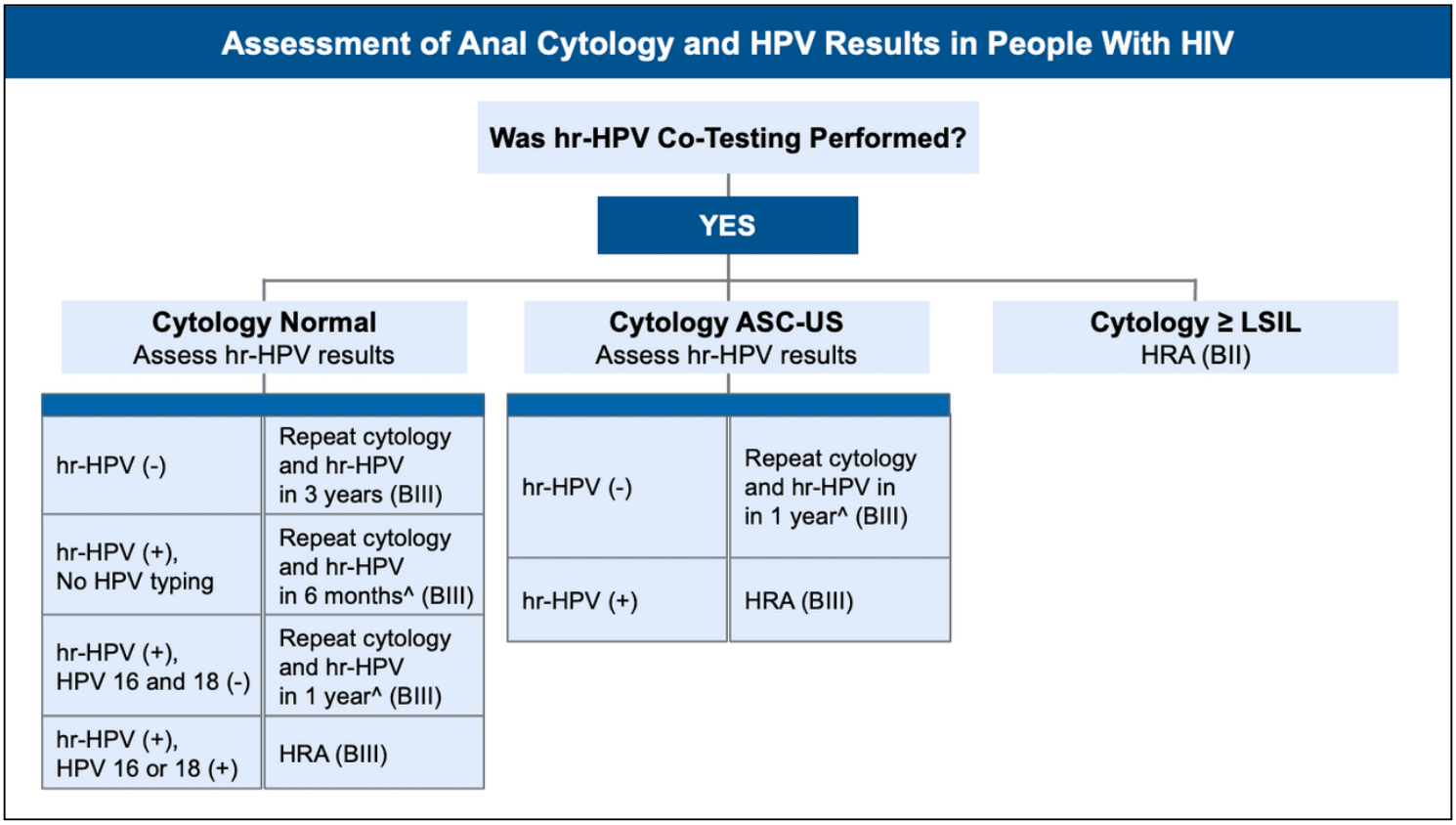

Figure 3 (Image Series) - Cardiovascular Risk in Persons with HIV (Image Series) - Figure 3 (Image Series) - Cardiovascular Risk in Persons with HIV
Image 3A: Kaiser Observational Study (1996-2001): Coronary Heart Disease Hospitalization and Myocardial Infarction

Source: Klein D, Hurley LB, Quesenberry CP Jr, Sidney S. Do protease inhibitors increase the risk for coronary heart disease in patients with HIV-1 infection? J Acquir Immune Defic Syndr. 2002;30:471-7.

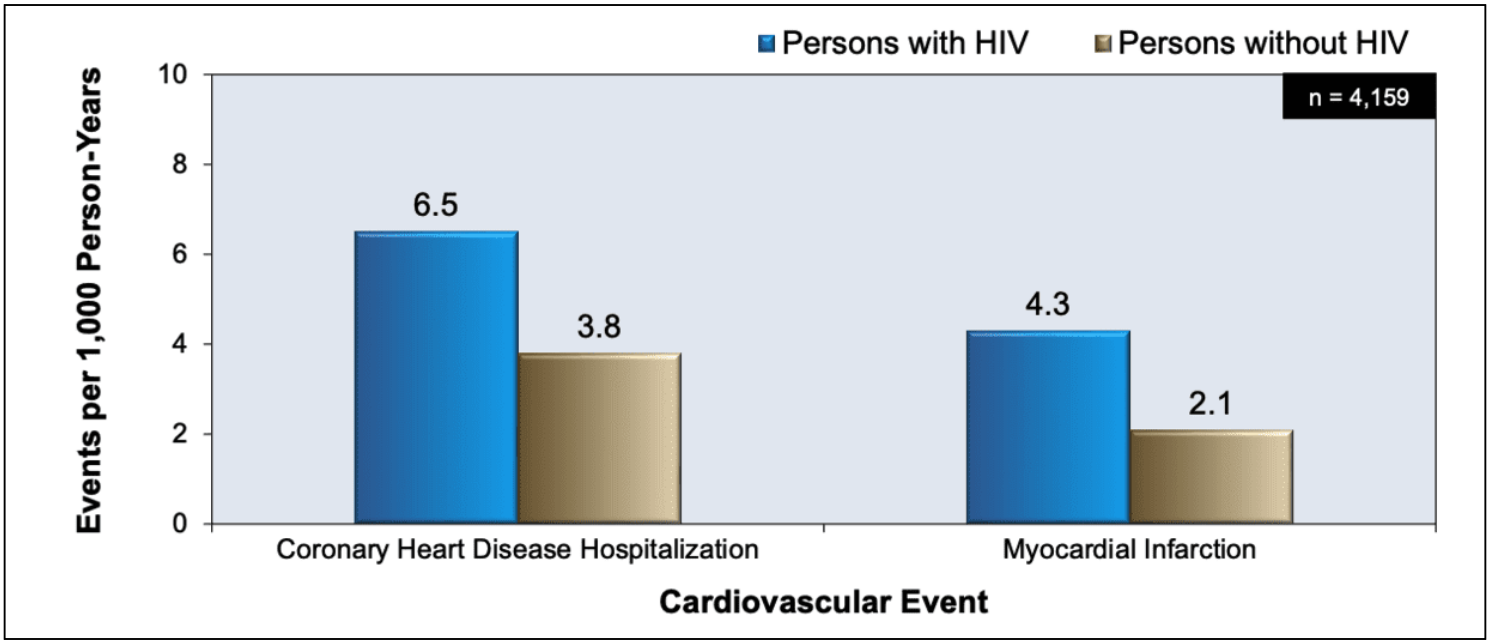

Figure 3 (Image Series) - Cardiovascular Risk in Persons with HIV
Image 3B: Veterans Aging Cohort: Rates of Acute Myocardial Infarction by HIV Status and Age Group

Source: Freiberg MS, Chang CC, Kuller LH, et al. HIV infection and the risk of acute myocardial infarction. JAMA Intern Med. 2013;173:614-22.

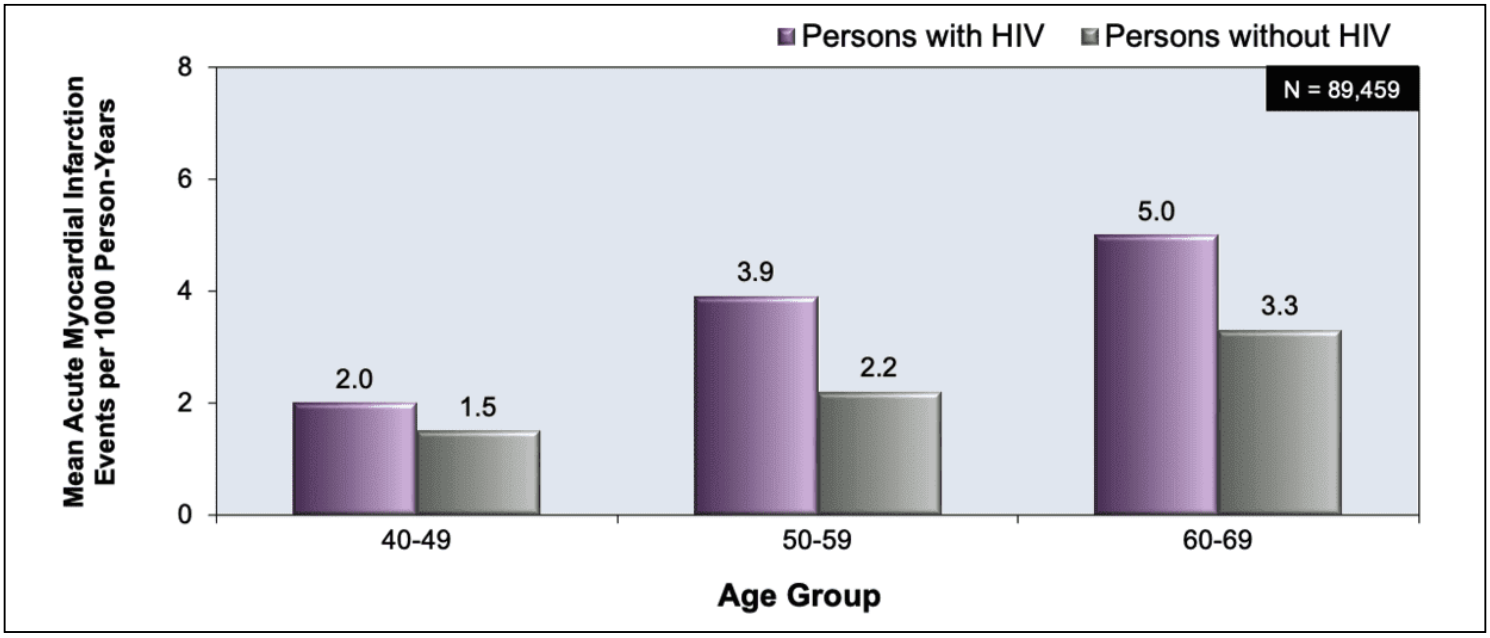

Figure 4 Summary of Three Aspirin Trials for Primary Prevention of Cardiovascular Disease

Source: Knickelbine T, Miedema MD. Aspirin for primary prevention of cardiovascular disease: is it time to move on? Curr Opin Cardiol. 2019;34:510-13.

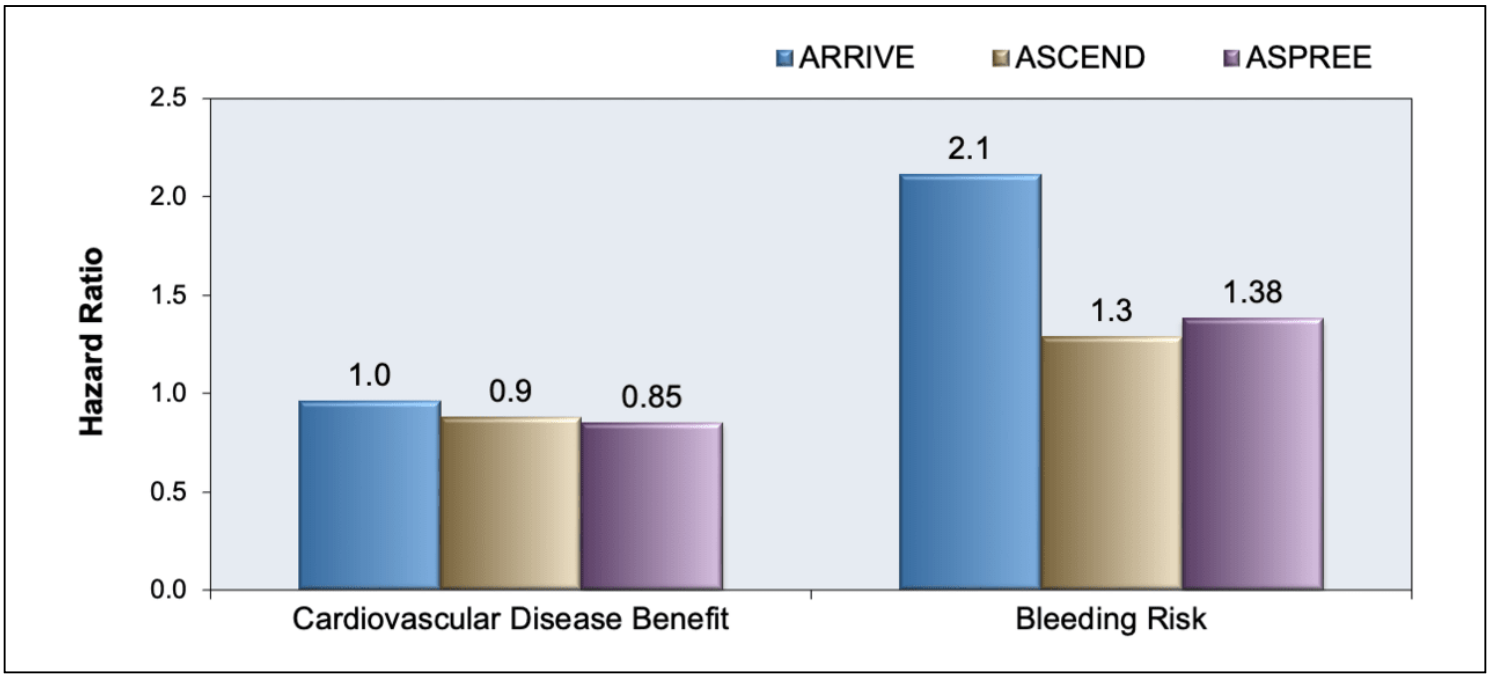

Figure 5 2025 Hypertension Guidelines: Categories of Blood Pressure for Adults

Source: Jones DW, Ferdinand KC, Taler SJ, et al. 2025 AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/NMA/PCNA/SGIM Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Hypertension. 2025;82:e212-e316.

2025 American College of Cardiology/American Heart Association Hypertension Guidelines
Categories of Blood Pressure for Adults*

Blood Pressure Category	Systolic BP		Diastolic BP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120 – 129 mm Hg	and	<80 mm Hg
Hypertension: Stage 1	130 – 139 mm Hg	or	80 – 89 mm Hg
Hypertension: Stage 2	≥140 mm Hg	or	≥90 mm Hg

*Individuals with Systolic BP and Diastolic BP in 2 different categories should be designated to the higher BP category.

Figure 6 Impact of Antiretroviral Medications on Lipid Levels

Source: Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. Department of Health and Human Services. Limitations to treatment safety and efficacy: adverse effects of antiretroviral agents. October 28, 2018.

Impact of Antiretroviral Medication on Lipids

Class	Impact on Lipids
NRTIs	• Stavudine > Zidovudine > Abacavir: ⇧TG and ⇧LDL • Tenofovir alafenamide: ⇧TG, ⇧LDL, ⇧HDL (no change in TC:HDL ratio) • Tenofovir DF has been associated with lower lipid levels than abacavir or tenofovir alafenamide
NNRTIs	• Efavirenz: ⇧TG, ⇧LDL, ⇧HDL
PIs	• All ritonavir- or cobicistat-boosted PIs: ⇧TG, ⇧LDL, ⇧HDL • Lopinavir-ritonavir and Fosamprenavir > Darunavir + Ritonavir and Atazanavir + Ritonavir: ⇧TG
INSTIs	• Elvitegravir-Cobicistat: ⇧TG, ⇧LDL, ⇧HDL
EIs	• N/A

Abbreviations: NRTIs = nucleoside reverse transcriptase inhibitors; NNRTIs = nonnucleoside reverse transcriptase inhibitors; PIs = protease inhibitors; INSTIs = integrase strand transfer inhibitors; EIs = entry inhibitors

Figure 7 GFR Categories in Chronic Kidney Disease

Source: National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Am J Kidney Dis. 2002;39:S1-266.

GFR Categories in Chronic Kidney Disease		
Stage	**GFR (mL/min/1.73 m²)**	**Terms**
G1	>90	Normal or high
G2	60-89	Mildly decreased
G3a	45-59	Mildly to moderately decreased
G3b	30-44	Moderately to severely decreased
G4	15-29	Severely decreased
G5	<15	Kidney Failure

Figure 8 Prognosis of Chronic Kidney Disease by GFR and Albuminuria Categories: KIDGO 2024

Green = low risk (if no other markers of kidney disease, no CKD). Yellow = moderately increased risk. Orange = high risk. Red = very high risk
Abbreviations: GFR = glomerular filtration rate

Source: Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int. 2024;105:S117-S314.

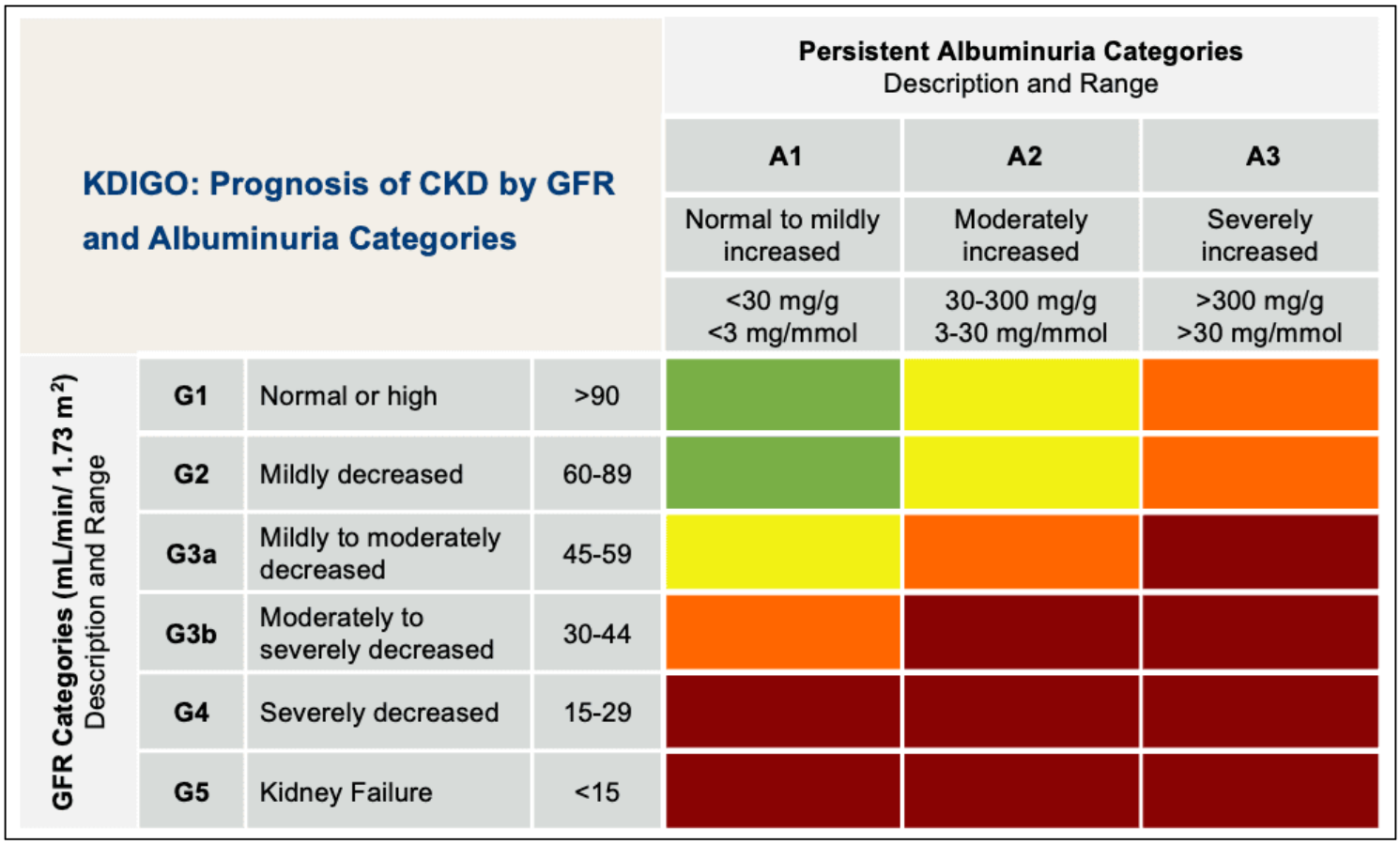

Figure 9 Common Laboratory Indicators of Proximal Tubular Dysfunction

Source: Lucas GM, Ross MJ, Stock PG, et al. Clinical Practice Guideline for the Management of Chronic Kidney Disease in Patients Infected With HIV: 2014 Update by the HIV Medicine Association of the Infectious Diseases Society of America. Clin Infect Dis. 2014;59:e96-e138.

Common Laboratory Indicators of Proximal Tubular Dysfunction	
Abnormality	**Definition of Abnormality**
Serum Abnormalities	
Hypokalemia	Serum potassium concentration below laboratory reference range
Low serum bicarbonate	Serum bicarbonate concentration below laboratory reference range
Hypophosphatemia	Serum phosphorous concentration below laboratory reference range
Urine Abnormalities	
Urine glucose on dipstick	Glycosuria in the absence of diabetes, or in diabetics with well-controlled blood glucose
Fractional excretion of phosphate	<10% is normal and >20% is abnormal
Tubular maximum for phosphate corrected for GFR	Lower than reference value (normal, 2.8–4.4 mg/dL)
Fractional excretion of uric acid	<15% is normal and >20% is abnormal
Urine albumin-to-protein ratio	uAPR <0.4 suggests predominantly tubulointerstitial disease, whereas uAPR >0.4 suggests predominantly glomerular disease
Abbreviations: GFR = glomerular filtration rate; uAPR, urine albumin-to-protein ratio;	

Figure 10 Effectiveness and Abstinence Rates for Various Medications at 6 Months after Quitting

Source: U.S. Public Health Service. A clinical practice guideline for treating tobacco use and dependence: 2008 update. A U.S. Public Health Service report. Am J Prev Med. 2008;35:158-76.

Medication	Estimated Abstinence Rate* (95% CI)
Placebo	13.8
Monotherapy	
Varenicline 2 mg/day	33.2
Bupropion SR	24.2
Nicotine spray	26.7
Nicotine gum (> 14 weeks)	26.1
Nicotine inhaler	25.4
Nicotine patch (> 14 weeks)	23.7
Combination Therapy	
Patch + nicotine gum or spray	36.5
Patch + bupropion SR	28.9

*Abstinence rate 6 months post quit

Table 1. U.S. Multi-Society Task Force Colorectal Cancer Screening Test Rankings

Ranking of Colorectal Cancer Screening Tests	**Tier 1** • Colonoscopy every 10 years • Annual fecal immunochemical test (FIT)
	Tier 2 • CT colonography every 5 years • FIT-fecal DNA every 3 years • Flexible sigmoidoscopy every 10 years (or every 5 years)
	Tier 3 • Capsule colonoscopy every 5 years
	Available Tests Not Currently Recommended • Septin 9

Source:

- Rex DK, Boland CR, Dominitz JA, et al. Colorectal Cancer Screening: Recommendations for Physicians and Patients From the U.S. Multi-Society Task Force on Colorectal Cancer. Gastroenterology. 2017;153:307-23. [PubMed Abstract]

Table 2. BP Treatment Threshold and CVD Risk Estimation to Guide Hypertension Treatment

2025 Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

BP Treatment Threshold and CVD Risk Estimation to Guide Hypertension Treatment

Systolic BP (Average)	Diastolic BP (Average)	Cardiovascular Disease (CVD)	Recommendatio
≥140 mm/Hg	≥90 mm/Hg	With or without clinical CVD	Initiate medicat events and tota
≥130 mm/Hg	≥80 mm/Hg	With clinical CVD	Initiate medicat events and tota
≥130 mm/Hg	≥80 mm/Hg	Without clinical CVD	Initiate medicat events and tota • Diabetes • Chronic • Estimate
≥130 mm/Hg	≥80 mm/Hg	Without clinical CVD	In persons with PREVENT*, initia damage and mi • Average ≥80 mm interven

Abbreviations: BP = blood pressure; CVD = cardiovascular disease
*PREVENT = Predicting Risk of Cardiovascular Disease EVENTs

Source:

- Jones DW, Ferdinand KC, Taler SJ, et al. 2025 AHA/ACC/AANP/AAPA/ABC/ACCP/ACPM/AGS/AMA/ASPC/NMA/PCNA/SGIM Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Hypertension. 2025;82:e212-e316. [PubMed Abstract]

Table 3. Testosterone Formulations and Starting Dose for Replacement Therapy

Testosterone Preparation	Brand Name	Starting Dose
Testosterone enanthate	*Xyosted*	150–200 mg IM every 2 weeks or 75–10 week
Testosterone cypionate	*Azmiro* *Depo-Testosterone* *Testone CIK*	150–200 mg IM every 2 weeks or 75–10 week
Testosterone undecenoate (long-acting)	*Aveed*	750 mg IM on day 1, then at week 4, the weeks; administer in the gluteus mediu
Testosterone transdermal 1% gel	*AndroGel*	Apply 50 mg once daily (in the morning) intact skin on the shoulders, upper arms
Testosterone transdermal 1.62 % gel	*AndroGel*	Apply 40.5 mg once daily (in the mornin intact skin on the shoulders or upper ar
Testosterone 2% axillary solution	*Axiron*	Apply 30 mg once daily (in the morning) axilla for a total daily dose of 60 mg
Testosterone nasal gel	*Natesto*	Apply 11 mg in each nostril three times
Testosterone buccal system (mucoadhesive)	*Striant*	Apply one buccal system (30 mg) in the region (and hold in place for 30 seconds adhesion) every 12 hours
Testosterone pellets	*Testopel*	Implant 2–6 pellets subcutaneously (eac mg) for a total dose of 150 mg to 450 m 6 months