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Drug-Resistance Testing

Updated: March 23, 2023

Reviewed: March 23, 2023

Panel's Recommendations
<p>For Initial Treatment of HIV</p> <ul style="list-style-type: none">HIV drug-resistance testing is recommended at entry into care for people with HIV to guide the selection of the initial antiretroviral (ARV) regimen (AII). If antiretroviral therapy (ART) is deferred, repeat testing may be considered at the time of ART initiation (CIII).Genotypic, rather than phenotypic, testing is the preferred resistance testing to guide therapy in ARV-naïve patients (AIII).In people with early (acute and recent) HIV infection, in pregnant people with HIV, or in people who will initiate ART on the day of or soon after HIV diagnosis, ART initiation should not be delayed while awaiting resistance testing results; the regimen can be modified once results are reported (AIII).Standard genotypic drug-resistance testing in ARV-naïve persons involves testing for mutations in the reverse transcriptase and protease genes. If transmitted integrase strand transfer inhibitor (INSTI) resistance is suspected or if the person has used long-acting cabotegravir (CAB-LA) as pre-exposure prophylaxis (PrEP) in the past, providers should ensure that genotypic resistance testing also includes the integrase gene (AIII). <p>For Antiretroviral Therapy–Experienced People</p> <ul style="list-style-type: none">HIV drug-resistance testing should be performed to assist the selection of active drugs when changing ARV regimens in—<ul style="list-style-type: none">People with virologic failure and HIV-RNA levels >200 copies/mL (A for >1,000 copies/mL, AIII for 501–1,000 copies/mL, CIII for confirmed HIV RNA 201–500 copies/mL). For people with confirmed HIV-RNA levels >200 copies/mL but <500 copies/mL, drug-resistance testing may be unsuccessful but should still be considered.People with suboptimal viral load reduction (AII).Reverse transcriptase and protease genotypic resistance testing should be performed on everyone with virologic failure; integrase resistance testing (which may need to be ordered separately) should be performed on individuals experiencing virologic failure while receiving an INSTI-based regimen (AII).For persons taking a non-long-acting ARV regimen, drug-resistance testing in the setting of virologic failure should be performed while the person is still taking their ARV regimen or, if that is not possible, within 4 weeks after discontinuing their ARV regimen (AII). If more than 4 weeks have elapsed since the non-long-acting agents were discontinued, resistance testing may still provide useful information to guide therapy; however, it is important to recognize that previously-selected resistance mutations can be missed due to lack of drug-selective pressure (CIII).Given the long half-lives of the long-acting injectable ARV drugs, resistance testing (including testing for resistance to INSTIs) should be performed in all persons who have experienced virologic failure on a regimen of long-acting CAB and rilpivirine or acquired HIV after receiving CAB-LA as PrEP, regardless of the amount of time since drug discontinuation (AIII).Genotypic testing is preferred over phenotypic-resistance testing to guide therapy in people with suboptimal virologic response or virologic failure while on first- or second-line regimens and in people in whom resistance mutation patterns are known or not expected to be complex (AII).The addition of phenotypic- to genotypic resistance testing is recommended for people with known or suspected complex drug-resistance mutation patterns (BIII).All prior and current drug-resistance test results, when available, should be reviewed and considered when constructing a new regimen for a patient (AIII). <p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Co-receptor Tropism Assays

Updated: October 25, 2018

Reviewed: October 25, 2018

Panel's Recommendations
<ul style="list-style-type: none">• A co-receptor tropism assay should be performed whenever the use of a CCR5 co-receptor antagonist is being considered (AI).• Co-receptor tropism testing is recommended for patients who exhibit virologic failure on a CCR5 antagonist (BIII).• A phenotypic tropism assay is preferred to determine HIV-1 co-receptor usage (AI).• A genotypic tropism assay should be considered as an alternative test to predict HIV-1 co-receptor usage (BII).• A proviral DNA tropism assay can be utilized for patients with undetectable HIV-1 RNA when a CCR5 antagonist is considered for use in a new regimen (e.g., as part of a regimen switch or simplification) (BII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

HLA-B*5701 Screening

Updated: December 1, 2007

Reviewed: January 10, 2011

Panel's Recommendations
<ul style="list-style-type: none">• The Panel recommends screening for HLA-B*5701 before starting patients on an abacavir (ABC)-containing regimen to reduce the risk of hypersensitivity reaction (HSR) (AI).• HLA-B*5701-positive patients should not be prescribed ABC (AI).• The positive status should be recorded as an ABC allergy in the patient's medical record (AII).• When HLA-B*5701 screening is not readily available, it remains reasonable to initiate ABC with appropriate clinical counseling and monitoring for any signs of HSR (CIII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Initiation of Antiretroviral Therapy

Updated: December 18, 2019

Reviewed: December 18, 2019

Panel's Recommendations
<ul style="list-style-type: none">• Antiretroviral therapy (ART) is recommended for all persons with HIV to reduce morbidity and mortality (AI) and to prevent the transmission of HIV to others (AI).• The Panel on Antiretroviral Guidelines for Adults and Adolescents recommends initiating ART immediately (or as soon as possible) after HIV diagnosis in order to increase the uptake of ART and linkage to care, decrease the time to viral suppression for individual patients, and improve the rate of virologic suppression among persons with HIV (AII).• When initiating ART, it is important to educate patients regarding the benefits of ART and to deploy strategies to optimize care engagement and treatment adherence (AIII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Antiretroviral Therapy to Prevent Sexual Transmission of HIV (Treatment as Prevention)

Updated: December 18, 2019

Reviewed: December 18, 2019

Panel's Recommendations

- All persons with HIV should be informed that maintaining a plasma HIV RNA (viral load) of <200 copies/mL, including any measurable value below this threshold value, with antiretroviral therapy (ART) prevents sexual transmission of HIV to their partners. Patients may recognize this concept as Undetectable = Untransmittable or U=U (**AII**).
- Persons with HIV who are starting ART should use another form of prevention with sexual partners (e.g., condoms, pre-exposure prophylaxis [PrEP] for the HIV-negative sexual partner, sexual abstinence) for at least the first 6 months of treatment and until a viral load of <200 copies/mL has been documented (**AII**). Many experts would recommend confirming sustained suppression before assuming that there is no further risk of sexual HIV transmission (**AIII**).
- When the viral load is ≥ 200 copies/mL, additional methods are needed to prevent transmission of HIV to sexual partners until resuppression to <200 copies/mL has been confirmed (**AIII**).
- Persons with HIV who intend to rely upon ART for prevention need to maintain high levels of ART adherence (**AIII**). They should be informed that transmission is possible during periods of poor adherence or treatment interruption (**AIII**).
- At each visit for HIV care, clinicians should assess adherence to ART and counsel patients regarding the importance of ART to their own health as well as its role in preventing sexual HIV transmission (**AIII**).
- Providers should inform patients that maintaining a viral load of <200 copies/mL does not prevent acquisition or transmission of other sexually transmitted infections (STIs) (**AII**).
- Providers should also routinely screen all sexually active persons with HIV for STIs, both for their own health and to prevent transmission of STIs to others (**AIII**).

Rating of Recommendations: A = Strong; B = Moderate; C = **Weak**

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

What to Start: Initial Combination Antiretroviral Regimens for People with HIV

Updated: September 21, 2022

Reviewed: September 21, 2022

Key Considerations and Recommendations

- An initial antiretroviral (ARV) regimen for a person with HIV generally consists of two nucleoside reverse transcriptase inhibitors administered in combination with a third active ARV drug from one of three drug classes: an integrase strand transfer inhibitor (INSTI), a non-nucleoside reverse transcriptase inhibitor, or a protease inhibitor with a pharmacokinetic enhancer (also known as a booster; the two drugs used for this purpose are cobicistat and ritonavir).
- Data also support the use of the two-drug regimen, dolutegravir (DTG) plus lamivudine (3TC), for initial treatment.
- Before initiating antiretroviral therapy (ART) in a person of childbearing potential, clinicians should discuss the person's intentions regarding pregnancy and a pregnancy test should be performed (AIII). Clinicians should refer to the [Perinatal Guidelines](#) for recommendations on initial ARV treatment around the time of conception and during pregnancy.
- The Panel on Antiretroviral Guidelines for Adults and Adolescents (the Panel) classifies the regimens below (in alphabetical order) as *Recommended Initial Regimens for Most People with HIV*.

For people with HIV who do not have a history of using long-acting cabotegravir (CAB-LA) as pre-exposure prophylaxis (PrEP), the following regimens are recommended:

- Bictegravir/tenofovir alafenamide (TAF)/emtricitabine (FTC) (AI)^a
- DTG/abacavir/3TC—**only** for individuals who are HLA-B*5701 negative and without chronic hepatitis B virus (HBV) coinfection (AI)
- DTG plus (TAF or tenofovir disoproxil fumarate [TDF])^b plus (FTC or 3TC) (AI)
- DTG/3TC (AI)—except for individuals with HIV RNA >500,000 copies/mL, HBV coinfection, or when ART is to be started before the results of HIV genotypic resistance testing for reverse transcriptase or HBV testing are available.

For people with HIV and a history of using CAB-LA as PrEP, INSTI genotypic resistance testing should be done before the start of ART. If treatment is begun prior to results of genotypic testing, the following regimen is recommended:

- Boosted darunavir plus (TAF or TDF)^b plus (FTC or 3TC)—pending the results of the genotype test (AIII).
- To address individual patient characteristics and needs, the Panel also provides a list of *Recommended Initial Regimens in Certain Clinical Situations* (see Table 6 below).
- Given the many excellent options for initial therapy, selection of a regimen for a particular patient should be guided by factors such as virologic efficacy, toxicity, pill burden, dosing frequency, drug–drug interaction potential, resistance-test results, comorbid conditions, access, and cost. For guidance on choosing an ARV regimen based on selected clinical case scenarios, see [Table 7](#). Also see [Table 9](#) for the advantages and disadvantages of different components in an ARV regimen.
- Patients without prior ART use who wish to begin long-acting intramuscular CAB and rilpivirine (RPV) should first achieve viral suppression on another regimen before switching to CAB and RPV (see [Optimizing Antiretroviral Therapy in the Setting of Virologic Suppression](#)).

Rating of Recommendations: A = Strong; B = Moderate; C = Weak

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials, observational cohort studies with long-term clinical outcomes, relative bioavailability/bioequivalence studies, or regimen comparisons from randomized switch studies; III = Expert opinion

^a Bictegravir should not be initiated in pregnant people due to insufficient data in pregnancy.

^b TAF and TDF are two forms of tenofovir that are approved by the U.S. Food and Drug Administration. TAF has fewer bone and kidney toxicities than TDF, while TDF is associated with lower lipid levels. Safety, cost, and access are among the factors to consider when choosing between these drugs.

Management of the Treatment-Experienced Patient

Virologic Failure

Updated: March 26, 2023

Reviewed: May 26, 2023

Key Considerations and Recommendations

- Assessing and managing a patient who is experiencing antiretroviral therapy (ART) failure can be complex. Expert advice can be critical and should be sought in many instances.
- Evaluation of virologic failure should include an assessment of ART adherence, drug–drug and drug–food interactions, drug tolerability, HIV-RNA level and CD4 T lymphocyte (CD4) cell count trends over time, ART history, and prior and current drug-resistance test results.
- Drug-resistance testing should be performed while the patient is taking the failing antiretroviral (ARV) regimen **(AI)** or within 4 weeks of treatment discontinuation of a non–long-acting ARV regimen **(AII)**. If more than 4 weeks have elapsed since non–long-acting ARV regimens were discontinued, resistance testing still can provide useful information to guide therapy, although it may not detect previously selected resistance mutations **(CIII)**.
- The goal of treatment for ART-experienced patients with drug resistance who are experiencing virologic failure is to establish virologic suppression (i.e., HIV-RNA levels below the lower limits of detection of currently used assays) **(AI)**.
- A new regimen can include two fully active ARV drugs if at least one with a high resistance barrier is included (e.g., dolutegravir or boosted darunavir) **(AI)**. If no fully active drug with a high resistance barrier is available, then every effort should be made to include three fully active drugs **(AI)**.
- In general, adding a single ARV drug to a virologically failing regimen **is not recommended**, because this would rarely result in full virologic suppression and, therefore, may risk the development of resistance to all drugs in the regimen **(BII)**.
- For some rare, highly ART-experienced patients with extensive drug resistance, maximal virologic suppression may not be possible. In this case, ART should be continued **(AI)** with regimens that are designed to maintain CD4 counts, preserve treatment options, delay clinical progression, and minimize toxicity.
- When it is not possible to construct a viable suppressive regimen for a patient with multidrug-resistant HIV, the clinician should consider enrolling the patient in a clinical trial of investigational agents or contacting pharmaceutical companies that may have investigational agents available.
- In patients with virologic failure, it is crucial to provide continuous adherence support before and after ARV regimen changes.
- When switching an ARV regimen in a patient with hepatitis B virus (HBV)/HIV coinfection, the patient should remain on an ARV agent that is active against HBV and has a high resistance barrier to HBV in order to avoid HBV rebound and hepatocellular damage.
- Discontinuing or briefly interrupting therapy may lead to a rapid increase in HIV RNA, a decrease in CD4 count, and an increase in the risk of clinical progression. Therefore, this strategy **is not recommended** in the setting of virologic failure **(AI)**.

Rating of Recommendations: A = Strong; B = Moderate; C = Weak

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Poor CD4 Cell Recovery and Persistent Inflammation Despite Viral Suppression

Updated: June 3, 2021

Reviewed: June 3, 2021

Key Considerations and Recommendations
<ul style="list-style-type: none">• Persistently low CD4 T lymphocyte (CD4) cell counts and immune activation are each associated with increased AIDS- and non-AIDS-related morbidity and mortality among individuals with antiretroviral therapy (ART)-mediated viral suppression.• Adding antiretroviral (ARV) drugs to a suppressive ARV regimen (ART intensification) does not improve CD4 cell recovery or reduce immune activation and, therefore, is not recommended (AI).• In individuals with viral suppression, switching ARV drug classes does not consistently improve CD4 cell recovery or reduce all relevant markers of immune activation and is not recommended (BIII).• Interleukin-2 is not recommended (AI) to increase CD4 cell counts and/or decrease immune activation, because clinical trial data demonstrated no clinical benefit.• Other interventions designed to increase CD4 cell counts and/or decrease immune activation are not recommended outside of a clinical trial, because no current interventions have been proven to decrease morbidity or mortality during ART-mediated viral suppression (AII).• Efforts to decrease morbidity and mortality during ART-mediated viral suppression should focus on addressing modifiable risk factors for chronic disease (e.g., encouraging smoking cessation, a healthy diet, and regular exercise; treating hypertension and hyperlipidemia).• Monitoring markers of immune activation and inflammation is not recommended, because no intervention targeting immune pathways has proven to improve the health of individuals with HIV, and many blood markers that predict morbidity and mortality fluctuate within individuals (AII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Optimizing Antiretroviral Therapy in the Setting of Viral Suppression

Updated: September 21, 2022

Reviewed: May 26, 2023

Key Considerations and Recommendations

- Advances in antiretroviral (ARV) treatment and a better understanding of HIV drug resistance have made it possible to consider switching a person with HIV from an effective ARV regimen to an alternative ARV regimen in some situations.
- The fundamental principle of ARV regimen optimization is to maintain viral suppression without jeopardizing future treatment options.
- Adverse events, drug–drug or drug–food interactions, pill burden, pregnancy, cost, or the desire to simplify a regimen may prompt regimen optimization.
- It is critical to review a patient's full ARV history, including virologic responses, past ARV-associated toxicities and intolerances, and cumulative resistance test results before selecting a new ARV regimen **(AI)**.
- People with HIV who have no history of drug-resistance mutations or virologic failure can likely switch to any regimen that has been shown to be highly effective in ARV-naïve patients **(AI)**.
- For regimen optimization in the setting of existing nucleoside reverse transcriptase inhibitor (NRTI) resistance, two NRTIs—tenofovir alafenamide or tenofovir disoproxil fumarate plus emtricitabine (FTC) or lamivudine (3TC)—should be included in the regimen with a fully active, high resistance barrier drug, such as dolutegravir, boosted-darunavir **(BIII)**, or bictegravir **(CIII)**.
- A long-acting ARV regimen of injectable cabotegravir (CAB) and rilpivirine (RPV) given every 1 or 2 months is an optimization option for patients who are engaged with their health care, virologically suppressed on oral therapy for 3 to 6 months, and who agree to make the frequent clinic visits needed to receive the injectable drugs **(AI)**.
- Pregnant persons who present to care on long-acting CAB and RPV should be switched to a *Preferred* or an *Alternative* three-drug ARV regimen recommended for use in pregnancy per the [Perinatal Guidelines](#) **(AIII)**.
- Monotherapy with either a boosted protease inhibitor or an integrase strand transfer inhibitor has been associated with unacceptable rates of virologic failure and the development of resistance; therefore, monotherapy as a switch strategy **is not recommended (AI)**.
- When switching an ARV regimen in a person with hepatitis B virus (HBV)/HIV coinfection, ARV drugs that are active against HBV should be continued **(AII)** or specific anti-HBV drugs should be initiated. Using 3TC or FTC as the only drug in a regimen with HBV activity **is not recommended (AII)**, because HBV resistance to these drugs can emerge. Discontinuation of HBV drugs may lead to reactivation of HBV, which may result in serious hepatocellular damage.
- Consultation with an HIV specialist is recommended when planning a regimen switch for a patient with a history of resistance to one or more drug classes **(AIII)**.
- Close monitoring to assess tolerability, viral suppression, adherence, and safety is recommended during the first 3 months after a regimen switch **(AIII)**.

Rating of Recommendations: A = Strong; B = Moderate; C = Weak

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Considerations for Antiretroviral Use in Special Patient Populations

Early (Acute and Recent) HIV Infection

Updated: December 06, 2023

Reviewed: December 06, 2023

Panel's Recommendations
<ul style="list-style-type: none">• Antiretroviral therapy (ART) is recommended for all people with HIV, including those with early^a HIV infection (AI). ART should be initiated as soon as possible after HIV diagnosis (AII).• The goals of ART are to suppress plasma HIV RNA to undetectable levels (AI) and to prevent transmission of HIV (AI). Monitoring of plasma HIV RNA levels, CD4 T lymphocyte cell counts, and antiretroviral (ARV) drug-related adverse effects should be done as recommended for people with chronic HIV infection (AII).• A blood sample for genotypic resistance testing should be sent to the laboratory before initiating ART (AIII).• ART can be initiated before drug-resistance test results are available. For those without a history of using long-acting cabotegravir (CAB-LA) as pre-exposure prophylaxis (PrEP), one of the following ARV regimens is recommended (AIII):<ul style="list-style-type: none">○ Bictegravir (BIC)/tenofovir alafenamide (TAF)/emtricitabine (FTC)○ Dolutegravir (DTG) with (TAF or tenofovir disoproxil fumarate [TDF])^b plus (FTC or lamivudine [3TC])○ Boosted darunavir (DRV) with (TAF or TDF)^b plus (FTC or 3TC)• For those with a history of CAB-LA use as PrEP, genotype testing before starting ART should include screening for integrase strand transfer inhibitor (INSTI)–resistance mutations (AIII).<ul style="list-style-type: none">○ A regimen of boosted DRV with (TAF or TDF)^b plus (FTC or 3TC) is recommended —pending the results of the genotype testing (AIII).○ Use of an empiric INSTI-containing regimen is not recommended unless genotype testing shows no evidence of INSTI resistance (AIII). This is because INSTI resistance may be present in those who become infected during and possibly after the use of CAB-LA as PrEP.• Pregnancy testing should be performed in persons of childbearing potential before initiating ART (AIII).• When the results of drug-resistance tests are available, the treatment regimen can be modified if needed (AII).• Providers should inform individuals starting ART of the importance of adherence in achieving and maintaining viral suppression (AIII).
Rating of Recommendations: A = Strong; B = Moderate; C = Weak
Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed non-randomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

^a Early infection represents either acute or recent infection.

^b TAF and TDF are two forms of tenofovir that are approved in the United States. TAF has fewer bone and kidney toxicities than TDF, whereas TDF is associated with lower lipid levels. Safety, cost, and accessibility are among the factors to consider when choosing between these drugs.

Adolescents and Young Adults with HIV

Updated: June 3, 2021

Reviewed: June 3, 2021

Key Considerations and Recommendations
<ul style="list-style-type: none">• Adolescents and young adults (AYA) with HIV largely belong to two distinct groups: those who acquired HIV in the first decade of life and who may be heavily antiretroviral therapy (ART)–experienced (early-acquired HIV); and those who acquired HIV in or after the second decade of life who may be mostly ART-naïve.• ART is recommended for all AYA with HIV (AI) to reduce HIV-related morbidity, mortality, and transmission.• For AYA with HIV who are at risk for poor clinical outcomes, it is critically important to assess the behavioral and psychosocial context, and their ability to adhere to ART. Efforts should be made to provide youth-friendly support and infrastructure to reduce barriers to adherence and maximize success in achieving sustained viral suppression (AIII).• Pediatric and adolescent care providers should prepare AYA with HIV for the transition into adult care settings. Adult providers should be knowledgeable about this unique patient population and the challenges that frequently accompany the transition into the adult care setting. Consulting and collaborating with pediatric and adolescent HIV care providers is critical to ensure the successful transition of AYA with HIV to adult providers and continued engagement in care (AIII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

HIV-2 Infection

Updated: December 06, 2023

Reviewed: December 06, 2023

Key Considerations and Recommendations

- The clinical course of HIV-2 infection is generally characterized by a longer asymptomatic stage, lower plasma viral loads, and lower mortality rate than HIV-1 infection. However, without treatment, the majority of individuals with HIV-2 will progress to AIDS and death.
- No randomized controlled trials have addressed when a person with HIV-2 should start antiretroviral therapy (ART) or which regimens are most effective for initial or second-line ART when treating HIV-2; thus, the optimal treatment strategy is not well defined.
- Existing data on the treatment of HIV-2, and extrapolation from data on the treatment of HIV-1, suggest that ART should be started at or soon after HIV-2 diagnosis to prevent disease progression and transmission of HIV-2 to others (AIII).
- Quantitative plasma HIV-2 RNA viral load testing for clinical care is available and should be performed before initiating ART (AIII).
- For ART-naïve patients who have HIV-2 mono-infection or HIV-1/HIV-2 coinfection, antiretroviral (ARV) regimens should include an integrase strand transfer inhibitor (INSTI) plus two nucleoside reverse transcriptase inhibitors (NRTIs) (AII). A recommended alternative regimen is a boosted protease inhibitor (PI) that is active against HIV-2 (darunavir or lopinavir) plus two NRTIs (BII).
- HIV-2 is intrinsically resistant to non-nucleoside reverse transcriptase inhibitors (NNRTIs); therefore, NNRTI-based regimens, including long-acting injectable rilpivirine (given with the INSTI cabotegravir), are not recommended for treatment of HIV-2 (AIII).
- Patients with hepatitis B virus (HBV)/HIV-2 coinfection should be prescribed ART that contains drugs with activity against both HIV-2 and HBV (AIII).
- HIV-2 RNA, CD4 T lymphocyte (CD4) cell counts, and clinical status should be used to assess treatment response (AII). Unlike people with HIV-1, people with HIV-2 should continue to undergo periodic CD4 testing even if their viral loads are persistently suppressed, because disease progression can occur despite an undetectable viral load (AIII).
- Resistance-associated viral mutations to INSTIs, PIs, or NRTIs may develop in people with HIV-2 while they are on ART. However, no validated HIV-2 genotypic or phenotypic antiretroviral resistance assays are approved for clinical use.
- In the event of virologic, immunologic, or clinical failure, a new ARV regimen should be constructed in consultation with an expert in HIV-2 management.
- *In vitro* studies demonstrate that HIV-2 is intrinsically resistant to the fusion inhibitor enfuvirtide, and limited data also show that HIV-2 is intrinsically resistant to fostemsavir; therefore, these drugs are not recommended for treatment of people with HIV-2 (AIII).
- For patients with multidrug-resistant virus, ibalizumab and lenacapavir demonstrate *in vitro* potency against HIV-2 and may be considered (BIII).

Rating of Recommendations: A = Strong; B = Moderate; C = Weak

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

HIV and the Older Person

Updated: December 18, 2019

Reviewed: December 18, 2019

Key Considerations and Recommendations When Caring for Older Persons with HIV

- Antiretroviral therapy (ART) is recommended for all people with HIV regardless of CD4 T lymphocyte cell count **(AI)**. ART is especially important for older individuals because they have a greater risk of serious non-AIDS complications and potentially a blunted immunologic response to ART.
- Given that the burden of aging-related diseases is significantly higher among persons with HIV than in the general population, additional medical and social services may be required to effectively manage both HIV and comorbid conditions.
- Adverse drug events from ART and concomitant drugs may occur more frequently in older persons with HIV than in younger individuals with HIV. Therefore, the bone, kidney, metabolic, cardiovascular, cognitive, and liver health of older individuals with HIV should be monitored closely.
- Polypharmacy is common in older persons with HIV; therefore, there is a greater risk of drug-drug interactions between antiretroviral drugs and concomitant medications. Potential for drug-drug interactions should be assessed regularly, especially when starting or switching ART and concomitant medications.
- The decline in neurocognitive function with aging is faster in people with HIV than in people without HIV. HIV-associated neurocognitive disorder (HAND) is associated with reduced adherence to therapy and poorer health outcomes including increased risk of death. For persons with progressively worsening symptoms of HAND, referral to a neurologist for evaluation and management or a neuropsychologist for formal neurocognitive testing may be warranted **(BIII)**.
- Mental health disorders are a growing concern in aging people with HIV. A heightened risk of mood disorders including anxiety and depression has been observed in this population. Screening for depression and management of mental health issues are critical in caring for persons with HIV.
- HIV experts, primary care providers, and other specialists should work together to optimize the medical care of older persons with HIV and complex comorbidities.
- Early diagnosis of HIV and counseling to prevent secondary transmission of HIV remains an important aspect of the care of older people with HIV.

Rating of Recommendations: A = Strong; B = Moderate; C = **Weak**

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Substance Use Disorders and HIV

Updated: June 3, 2021

Reviewed: June 3, 2021

Key Considerations and Recommendations
<ul style="list-style-type: none">• Substance use disorders (SUDs) are prevalent among people with HIV and contribute to poor health outcomes; therefore, screening for SUDs should be a routine part of clinical care (AII).• The most commonly used substances among people with HIV include alcohol, benzodiazepines, cannabinoids, club drugs, opioids, stimulants (cocaine and methamphetamines), and tobacco.• Health care providers should be nonjudgmental when addressing substance use with their patients (AIII).• People with HIV and SUDs should be screened for additional mental health disorders (AII).• People with HIV and SUDs should be offered evidence-based pharmacotherapy (e.g., opioid agonist therapy, tobacco cessation treatment, alcohol use disorder treatment; see Table 13 below) as part of comprehensive HIV care in clinical settings (AI).• Ongoing substance use is not a contraindication to antiretroviral therapy (ART) (AI). People who use substances can achieve and maintain viral suppression with ART.• Substance use may increase the likelihood of risk-taking behaviors (e.g., risky sexual behaviors), the potential for drug-drug interactions, and the risk or severity of substance-associated toxicities (e.g., increased hepatotoxicity or an increased risk of overdose).• Selection of antiretroviral (ARV) regimens for individuals who practice unhealthy substance and alcohol use should take into account potential adherence barriers, comorbidities that could impact care (e.g., advanced liver disease from alcohol or hepatitis viruses), potential drug-drug interactions, and possible adverse events associated with the medications (AII).• ARV regimens with once-daily dosing of single-tablet regimens, high barriers to resistance, low hepatotoxicity, and low potential for drug-drug interactions are preferred (AIII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Transgender People with HIV

Updated: September 21, 2022

Reviewed: September 21, 2022

Panel's Recommendations
<ul style="list-style-type: none">• Antiretroviral therapy (ART) is recommended for all transgender people with HIV to improve their health and to reduce the risk of HIV transmission to sexual partners (AI).• HIV care services should be provided within a gender-affirmative care model to reduce potential barriers to ART adherence and to maximize the likelihood of achieving sustained viral suppression (AII).• Prior to ART initiation, a pregnancy test should be performed for transgender individuals of childbearing potential (AIII).• Some antiretroviral drugs may have pharmacokinetic interactions with gender-affirming hormone therapy. Clinical effects and hormone levels should be routinely monitored with appropriate titrations of estradiol, testosterone, or androgen blockers, as needed (AIII).• Gender-affirming hormone therapies are associated with hyperlipidemia, elevated cardiovascular risk, and osteopenia; therefore, clinicians should choose an ART regimen that will not increase the risk of these adverse effects (AIII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Women with HIV

Updated: September 21, 2022

Reviewed: September 21, 2022

Panel's Recommendations
<ul style="list-style-type: none">• Antiretroviral therapy (ART) is recommended for all people with HIV to improve their health and to reduce the risk of HIV transmission to sexual partners without HIV (AI).• When prescribing antiretroviral (ARV) drugs for women with HIV, clinicians should consider that some ARV drugs have significant pharmacokinetic (PK) interactions with hormonal contraceptives (AII) and hormone replacement therapy (BIII). Consult Tables 24a, 24b, 24d, and 24e for detailed recommendations and a summary of available data when selecting ARV and hormone combination therapy (AIII).• Clinicians should consider the possibility of weight gain in women when initiating or changing ART, because women in general and Black women in particular experience greater weight gain with ART over time than men (AI).• A pregnancy test should be performed for women of childbearing potential before initiation of ART, and the choice of ART should be guided by recommendations from the Perinatal Guidelines (AII).• When selecting or evaluating an ARV regimen for women with HIV of childbearing potential, clinicians should consider the regimen's effectiveness, the woman's hepatitis B status, the teratogenic potential of the drugs in the ARV regimen, and the possible adverse outcomes for the mother and the fetus (AII).• During pregnancy, an additional goal of ART is to maintain a viral load below the limit of detection throughout pregnancy in order to reduce the risk of HIV transmission to the fetus and newborn (AI).• When selecting an ARV regimen for a pregnant woman, clinicians should consider the available safety, efficacy, and PK data on the use of each agent during pregnancy. The risks and benefits of ARV use during pregnancy should be discussed with all individuals of childbearing potential (AIII), and clinicians should consult the Perinatal Guidelines when designing a regimen (AIII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Considerations for Antiretroviral Use in Patients with Coinfections

Hepatitis B Virus/HIV Coinfection

Updated: September 21, 2022

Reviewed: September 21, 2022

Panel's Recommendations
<ul style="list-style-type: none">• Before initiation of antiretroviral therapy (ART), all patients who test positive for hepatitis B surface antigen (HBsAg) should be tested for hepatitis B virus (HBV) DNA using a quantitative assay to determine the level of HBV replication (AIII).• Because emtricitabine (FTC), lamivudine (3TC), tenofovir disoproxil fumarate (TDF), and tenofovir alafenamide (TAF) have activity against both HIV and HBV, an antiretroviral (ARV) regimen for patients with both HIV and HBV should include (TAF or TDF) plus (3TC or FTC) as the nucleoside reverse transcriptase inhibitor (NRTI) backbone of a fully suppressive ARV regimen (AI).• In people with HBV/HIV coinfection, using 3TC or FTC as the only drug in a regimen with HBV activity is not recommended (AII), because HBV resistance to these drugs can emerge.• If TDF or TAF cannot be safely used, the alternative recommended HBV therapy is entecavir, in addition to a fully suppressive ARV regimen (BI). Entecavir has weak activity against HIV; its use for HBV treatment without ART in patients with dual infection may result in the selection of the M184V mutation that confers HIV resistance to 3TC and FTC. Therefore, entecavir must be used in addition to a fully suppressive ARV regimen when given to patients with HBV/HIV coinfection (AII). Peginterferon alfa monotherapy also may be considered in certain patients (CII).• Other HBV treatment regimens, including adefovir alone or in combination with 3TC or FTC and telbivudine, are not recommended for patients with HBV/HIV coinfection (CII).• Discontinuation of agents with anti-HBV activity may cause serious hepatocellular damage resulting from reactivation of HBV; patients should be advised against stopping these medications, and they should be carefully monitored during interruptions of HBV treatment (AII).• When switching "or modifying" an ARV regimen in a person with HBV/HIV coinfection, ARV drugs that are active against HBV should be continued (AII) or specific anti-HBV drugs should be initiated.• HBV reactivation has been observed in people with HBV infection during interferon-free hepatitis C virus (HCV) treatment. For that reason, all patients initiating HCV therapy should be tested for HBV. People with HCV/HIV coinfection and active HBV infection (determined by a positive HBsAg test) should receive ART that includes two agents with anti-HBV activity prior to initiating HCV therapy (AIII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Hepatitis C Virus/HIV Coinfection

Updated: March 23, 2023

Reviewed: March 23, 2023

Panel's Recommendations
<ul style="list-style-type: none">• All people with HIV should be screened for hepatitis C virus (HCV) infection (AIII). Patients at high risk of HCV infection should be screened annually and whenever incident HCV infection is suspected (AIII).• Antiretroviral therapy (ART) may slow the progression of liver disease by preserving or restoring immune function and reducing HIV-related immune activation and inflammation. For most patients with HCV/HIV coinfection, including those with cirrhosis, the benefits of ART outweigh concerns regarding drug-induced liver injury. Therefore, ART should be initiated in all patients with HCV/HIV coinfection, regardless of CD4 T lymphocyte cell count (A1).• Initial antiretroviral (ARV) regimens that are recommended for most patients with HCV/HIV coinfection are the same as those recommended for people with HIV who do not have HCV infection. However, when treatment for both HIV and HCV is indicated, the ARV and HCV treatment regimens should be selected with special consideration for potential drug–drug interactions and overlapping toxicities (AIII) (see discussion in the text below and in Table 18).• All patients with HCV/HIV coinfection should be evaluated for HCV therapy, which includes assessing their liver fibrosis stage to guide the duration of therapy and to predict subsequent risk of hepatocellular carcinoma and liver disease complications (AIII).• Patients with chronic HCV/HIV coinfection should be screened for active and prior hepatitis B virus (HBV) infection by testing for the presence of hepatitis B surface antigen (HBsAg) and antibodies to hepatitis B surface (HBsAb) and hepatitis B core (HBcAb; total or Immunoglobulin G). Persons who are not immune to HBV infection (HBsAb negative) should receive anti-HBV vaccination (AIII).• HBV reactivation has been observed in people with HBV infection during HCV treatment with direct-acting antivirals. Accordingly, before initiating HCV therapy, patients with HCV/HIV coinfection and active HBV infection (HBsAg positive) should receive ART that includes two agents with anti-HBV activity (AIII).
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed, nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>

Tuberculosis/HIV Coinfection

Updated: June 3, 2021

Reviewed: June 3, 2021

Key Considerations and Recommendations

- Selection of tuberculosis (TB)-preventive treatment for individuals with HIV and latent tuberculosis infection (LTBI) should be based on the individual's antiretroviral (ARV) regimen as noted below.
 - With daily isoniazid alone for 6 or 9 months, any ARV regimen can be used **(AIII)**.
 - With once-weekly isoniazid plus rifapentine for 3 months:
 - Efavirenz (EFV) 600 mg once daily or raltegravir 400 mg twice daily (in combination with either abacavir/lamivudine [ABC/3TC] or tenofovir disoproxil fumarate/emtricitabine [TDF/FTC]) can be used **(AII)**.
 - Dolutegravir (DTG) 50 mg once daily may be used for those in whom once-daily DTG is appropriate **(BII)**. This 3-month regimen **is not recommended** for patients who require twice-daily DTG therapy (e.g., those with certain integrase strand transfer inhibitors [INSTI]-associated resistance substitutions or clinically suspected INSTI resistance) **(AIII)**.
 - With once-daily isoniazid and rifapentine for 1 month:
 - EFV 600 mg once daily (in combination with either ABC/3TC or TDF/FTC) can be used without dose adjustment **(AI)**.
 - If rifampin or rifapentine is used to treat LTBI, clinicians should review Tables [24a](#) through [24e](#) to assess the potential for drug-drug interactions among different ARV drugs and the rifamycins **(AII)**.
- All patients with HIV and active TB who are not on antiretroviral therapy (ART) should be started on ART as described below.
 - **CD4 T lymphocyte (CD4) cell counts <50 cells/mm³**: Initiate ART as soon as possible, but within 2 weeks of starting TB treatment **(AI)**.
 - **CD4 counts ≥50 cells/mm³**: Initiate ART within 8 weeks of starting TB treatment **(AI)**.
 - **During pregnancy, regardless of CD4 count**: Initiate ART as early as feasible for treatment of the person with HIV and to prevent HIV transmission to the infant **(AIII)**.
 - **With TB meningitis**: When initiating ART early, patients should be closely monitored, as high rates of adverse events and deaths have been reported in a randomized trial **(AI)**.
- For patients with active TB who are receiving ART, the ARV regimen should be assessed with particular attention to potential drug-drug interactions between ARVs and TB drugs. Rifamycin antibiotics (rifabutin, rifampin, and rifapentine), in particular, have considerable potential for drug-drug interactions. The ARV regimen may need to be modified to permit use of the optimal TB treatment regimen (see Tables [24a](#) through [24e](#) for drug interaction data and dosing recommendations). **(AII)**

Rating of Recommendations: A = Strong; B = Moderate; C = **Weak**

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Limitations to Treatment Safety and Efficacy

Adherence to the Continuum of Care

Updated: September 21, 2022

Reviewed: September 21, 2022

Key Considerations and Recommendations
<ul style="list-style-type: none">• Linkage to care and adherence to both antiretroviral therapy (ART) and clinic appointments should be regularly assessed.• An individual's barriers to adherence to ART and appointments should be assessed before or shortly after the initiation of ART and regularly thereafter.• Rapid access to ART has become a pillar of the United States plan to end the HIV epidemic, and delays in access to ART should be addressed and treatment initiated as soon as possible.• People with HIV having ART adherence problems should be placed on regimens with high genetic barriers to resistance, such as dolutegravir, bictegravir, or boosted darunavir. Side effects, out-of-pocket costs, convenience, and patient preferences also need to be considered.• Adherence to ART should be regularly assessed by self-report at every clinic visit.• People with HIV having difficulties with adherence to appointments or ART should be provided additional adherence support using a constructive, collaborative, nonjudgmental, and problem-solving approach.• The approach taken to improve adherence should be tailored to each person's needs and barriers to care. Approaches could include, but are not limited to—<ul style="list-style-type: none">○ Changing ART to simplify dosing or to reduce side effects○ Allowing flexible appointment scheduling○ Finding resources to assist with treatment costs to maintain uninterrupted access to both ART and appointments○ Linking patients to resources to assist with unmet social and economic needs, such as transportation, food, housing, and support services○ Linking patients to counseling to overcome stigma, substance use, or depression• Multidisciplinary approaches to finding solutions to problems of adherence to ART and appointments are often necessary, including collaborations with nursing, pharmacy, social work, and case management (to the extent available). The clinician's role is to help the patient understand the importance of adherence to the continuum of care, identify the barriers to adherence and address those that are within their purview, and link the patient to resources to overcome other barriers.• Single-tablet regimens are generally recommended when clinically appropriate, but high-quality evidence to definitively recommend them is lacking, and shared decision-making with patients is essential (BIII).• At this time, evidence does not support the use of financial incentives to engage patients in ongoing routine care.• Methods to estimate adherence based on drug levels measured in plasma, dried blood spots, urine, and hair samples are available. Measuring adherence with these methods has not been shown in randomized studies to improve outcomes. However, if these methods are used, it should be in a collaborative manner to avoid promoting an adversarial relationship between the provider and patient.• The Panel on Antiretroviral Guidelines for Adults and Adolescents recommends against the use of long-acting ART in people who have detectable viral load due to suboptimal adherence to ART and in people who have ongoing challenges with retention in HIV care, except in a clinical trial (AIII).• A summary of best practice interventions to improve linkage, retention, and adherence can be found at the Centers for Disease Control and Prevention's Compendium of Evidence-Based Interventions and Best Practices for HIV Prevention.
<p>Rating of Recommendations: A = Strong; B = Moderate; C = Weak</p> <p>Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion</p>