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

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Introduction

More than 30 antiretroviral (ARV) drugs in nine mechanistic classes are U.S. Food and Drug Administration (FDA)–approved for treatment of HIV infection. These nine classes include nucleos(t)ide reverse transcriptase inhibitors (NRTIs), non-nucleoside reverse transcriptase inhibitors (NNRTIs), protease inhibitors (PIs), integrase strand transfer inhibitors (INSTIs), a fusion inhibitor, a CCR5 antagonist, a CD4 T lymphocyte (CD4) cell post-attachment inhibitor, a gp120 attachment inhibitor, and a capsid inhibitor. In addition, two drugs—ritonavir (RTV) and cobicistat (COBI)—are used as pharmacokinetic (PK) enhancers (or boosters) to improve the PK profiles of PIs and the INSTI elvitegravir (EVG).

Over time, incremental improvements in potency, tolerability, safety, convenience, drug interactions and genetic barriers to the emergence of drug resistance have led to streamlined recommendations for initial ARV regimens for most people with HIV. The Panel on Antiretroviral Guidelines for Adults and Adolescents (the Panel) now recommends initial ARV regimens based on an oral second-generation INSTI plus two NRTIs—bictegravir (BIC)/tenofovir alafenamide (TAF)/emtricitabine (FTC) **(AI)** or dolutegravir (DTG) plus TAF/FTC or tenofovir disoproxil fumarate (TDF)/ FTC or TDF/lamivudine (3TC) **(AI)**—for most people with HIV. In some people with HIV, the two-drug regimen DTG/3TC can be used **(AI).** When INSTI resistance is possible, such as after exposure to long-acting injectable cabotegravir (CAB-LA) as pre-exposure prophylaxis (PrEP) and/or if INSTI genotype results are not yet available, a boosted PI (boosted darunavir [DRV]) in combination with two NRTIs (TAF or TDF with FTC or 3TC) is recommended **(AIII).** The Panel's recommendations are summarized in Tables 6a and 6b.

Table 6a. Recommended Initial Regimens for Most People With HIV

Selection of antiretroviral therapy (ART) should be based on the regimen's virologic efficacy, potential adverse effects, pill burden, dosing frequency, drug–drug interaction potential, cost, access, resistance test results, and the comorbid condition of the person with HIV. A pregnancy test should be performed in people of childbearing potential, and choice of ART for pregnant individuals should be guided by recommendations from the Perinatal Guidelines. Drug classes and regimens within each class are arranged first by evidence rating and, when ratings are equal, in alphabetical order. Additional initial ARV regimen options for certain clinical scenarios are listed in Table 6b below.

Table 6a. Recommended Initial Regimens for Most People With HIV Recommended regimens are those with demonstrated durable virologic efficacy, favorable tolerability and toxicity profiles, and ease of use. Choice of ART during pregnancy should be guided by recommendations from the Perinatal Guidelines.
For people who do not have a history of using CAB-LA as PrEP, one of the following regimens is recommended[a]: • BIC/TAF/FTC (AI)

Table 6a. Recommended Initial Regimens for Most People With HIV

- DTG plus (TAF or TDF)[b] plus (FTC or 3TC) (AI)
- DTG/3TC (AI), except for individuals with HIV RNA >500,000 copies/mL, HBV coinfection, or in whom ART is to be started before the results of HIV genotypic resistance testing for reverse transcriptase or HBV testing are available.

For people who have a history of CAB-LA use as PrEP, INSTI genotype resistance testing should be performed before starting ART. If ART is to be started before results of genotypic testing results, the following regimen is recommended:

- DRV/c[c] or DRV/r with (TAF or TDF)[b] plus (FTC or 3TC)—pending the results of the genotype test (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, observational cohort studies with long-term clinical outcomes, relative bioavailability/bioequivalence studies, or regimen comparisons from randomized switch studies; III = Expert opinion

[a] Because of the current low rates of transmitted INSTI resistance in the United States, even when there is suspicion that HIV was acquired from a partner with virologic failure while on an INSTI, an INSTI-based regimen can be started pending the results of the INSTI genotype.

[b] TAF and TDF are two forms of TFV 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.

[c] COBI should be avoided in pregnancy because lower concentrations of COBI and DRV have been reported during the second and third trimesters. For further information, refer to the Perinatal Guidelines.

Note: The following are available as coformulated drugs: BIC/TAF/FTC, DRV/c/TAF/FTC, DTG/3TC, TAF/FTC, TDF/3TC, and TDF/FTC.

Key: 3TC = lamivudine; ART = antiretroviral therapy; BIC = bictegravir; CAB-LA = long-acting cabotegravir; COBI = cobicistat; DRV = darunavir; DRV/c = darunavir/cobicistat; DRV/r = darunavir/ritonavir; DTG = dolutegravir; FTC = emtricitabine; HBV = hepatitis B virus; INSTI = integrase strand transfer inhibitor; PrEP = pre-exposure prophylaxis; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; TFV = tenofovir

Table 6b. Other Initial Antiretroviral Regimens for Certain Clinical Scenarios

Several antiretroviral regimens are found to be effective and tolerable as initial regimens but have some disadvantages or have fewer supporting data from randomized clinical trials compared with the recommended regimens listed in Table 6a. However, one of these regimens may be preferred for an individual with HIV in certain clinical situations (also see Table 7). These regimens are listed below.

Type of Regimen	ARV Regimen	For Certain Clinical Scenarios	Other Considerations
INSTI Plus Two NRTIs	DTG/ABC/3TC (BI) (if HLA-B*5701-negative)	When concern about renal- or bone-associated AEs precludes the use of TDF or TAF	Test for HLA-B*5701 before prescribing ABC; do not prescribe if HLA-B*5701-positive. Consider avoiding ABC for people with multiple CV risk factors or known CV disease.

Table 6b. Other Initial Antiretroviral Regimens for Certain Clinical Scenarios

Type of Regimen	ARV Regimen	For Certain Clinical Scenarios	Other Considerations
			Do not use in people with HBV coinfection unless an HBV-active drug, such as entecavir, TAF, or TDF is also used. Do not use following exposure to CAB-LA unless INSTI genotype shows sensitivity.
Boosted PI Plus Two NRTIs	(DRV/c[a] or DRV/r) plus (TAFor TDF[b]) plus (FTC or 3TC) (BI)	To avoid an INSTI-based regimen (e.g., documented INSTI resistance).	Assess for potential RTV- or COBI-related DDIs.
	(DRV/c[a] or DRV/r) plus ABC/3TC (BII) (if HLA-B*5701-negative)	To avoid an INSTI-based regimen (e.g., with suspected or documented INSTI resistance), *and* When concern about renal or bone-associated AEs precludes the use of TDF or TAF	Test for HLA-B*5701 before prescribing ABC; do not prescribe if HLA-B*5701-positive. Consider avoiding ABC for people with multiple CV risk factors or known CV disease. Do not use in people with HBV coinfection unless used with an HBV-active drug other than 3TC. Assess for potential RTV- or COBI-related DDIs.
NNRTI Plus Two NRTIs	DOR/TDF/3TC[b] (BI) or DOR plus TAF/FTC[b] (BIII)	To avoid an INSTI-based regimen (e.g., with suspected or documented INSTI resistance), *and* To avoid a PI-based regimen (e.g., with significant DDIs with concomitant medications)	
	RPV/TAF/FTC (BII) Only if HIV RNA <100,000 copies/mL and CD4 count >200 cells/mm^3	To avoid an INSTI-based regimen (e.g., with suspected or documented INSTI resistance), *and* To avoid a PI-based regimen (e.g., with significant DDIs with concomitant medications), *and* When a single-tablet regimen containing an NNRTI and TAF is desired	Cannot take with PPI; space apart from H2 antagonist. Needs to be taken with a meal.

Table 6b. Other Initial Antiretroviral Regimens for Certain Clinical Scenarios

Type of Regimen	ARV Regimen	For Certain Clinical Scenarios	Other Considerations
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] COBI should be avoided in pregnancy because lower concentrations of COBI and DRV have been observed during the second and third trimesters. For further information, refer to the Perinatal Guidelines.

[b] TAF and TDF are two forms of TFV 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.

Note: The following are available as coformulated drugs: ABC/3TC, DOR/TDF/3TC, DRV/c, DRV/c/TAF/FTC, DTG/ABC/3TC, RPV/TAF/FTC, TAF/FTC, TDF/3TC, and TDF/FTC.

Key: 3TC = lamivudine; ABC = abacavir; AE = adverse event; ARV = antiretroviral; CD4 = CD4 T lymphocyte; COBI = cobicistat; CV = cardiovascular; DDI = drug–drug interaction; DOR = doravirine; DRV/c = darunavir/cobicistat; DRV/r = darunavir/ritonavir; DTG = dolutegravir; FTC = emtricitabine; H2 = histamine type 2; HBV = hepatitis B virus; HLA = human leukocyte antigen; INSTI = integrase strand transfer inhibitor; NNRTI = non-nucleoside reverse transcriptase inhibitor; NRTI = nucleoside reverse transcriptase inhibitor; PI = protease inhibitor; PPI = proton pump inhibitor; RPV = rilpivirine; RTV = ritonavir; TAF = tenofovir alafenamide; TDF = tenofovir disoproxil fumarate; TFV = tenofovir

Supporting Evidence and Rationale Used for the Panel's Recommendations

The Panel's recommendations are primarily based on clinical trial data published in peer-reviewed journals and on data prepared by drug manufacturers for FDA review. In select cases, the Panel considers data from abstracts presented at major scientific meetings. The Panel considers published information from randomized prospective clinical trials with adequate sample size that demonstrate that an ARV regimen produces high rates of viral suppression, increases CD4 count, and has a favorable safety profile to be the strongest evidence on which to base recommendations. Comparative clinical trials of initial treatments generally are not designed to show significant differences in HIV-related clinical endpoints (such as progression to AIDS-defining conditions) or survival. Thus, the assessment of regimen efficacy and safety is primarily based on surrogate marker endpoints (i.e., rates of HIV RNA suppression) and the incidence and severity of adverse events.

In some instances, the Panel recommends regimens that include ARV drugs approved by the FDA based on bioequivalence or relative bioavailability studies that demonstrate that the exposure of the drug(s) in the new formulation or combination is comparable to the exposure of a reference drug(s) that has demonstrated safety and efficacy in randomized clinical trials. When developing recommendations, the Panel may also consider data from randomized switch studies in which a drug in an ARV initial regimen that suppressed patients' viral loads is replaced by a new drug from the same class. Switch trials do not evaluate the ability of a drug or regimen to induce viral suppression; they only examine the drug or regimen's ability to maintain suppression. Therefore, results from switch trials may not be directly applicable to the selection of an initial regimen and should be considered in conjunction with other data, including data from bioavailability/bioequivalence studies and from trials conducted in people taking their first ARV treatment regimen. In this section of the guidelines, the definition of an evidence rating of **II** is expanded to include supporting data from bioavailability/bioequivalence studies or randomized switch studies.

When developing recommendations, the Panel also considers tolerability and toxicity profiles, pill burden and dosing frequency, drug interaction potential, cost and access, postmarketing safety data, observational cohort data published in peer-reviewed publications, the experience of clinicians who are actively engaged in patient care, and the views of community members.

The Panel reviewed the available data to arrive at two classifications for initial ARV treatment regimens: (1) *Recommended Initial Regimens for Most People With HIV* (Table 6a) and (2) *Other Initial Antiretroviral Regimens for Certain Clinical Scenarios* (Table 6b). *Recommended Initial Regimens for Most People With HIV* are those regimens with demonstrated durable virologic efficacy, favorable tolerability and toxicity profiles, and ease of use. The Panel also recognizes that in certain clinical situations, other regimens may be preferred; these options are included in Table 6b. See Table 7 for examples of clinical scenarios in which certain drugs in these regimens may be particularly advantageous.

Many other ARV regimens are effective for initial therapy but have disadvantages when compared with the regimens listed in Tables 6a and 6b. These disadvantages include greater toxicity, higher pill burden, less supporting data from large comparative clinical trials, and limitations for use in certain populations. These regimens are no longer included in Tables 6a and 6b. For people with HIV who have a suppressed viral load and are not experiencing any adverse effects while on a regimen that is not listed, changing to a regimen listed in Table 6a or 6b is not necessary. Clinicians should refer to Optimizing Antiretroviral Therapy in the Setting of Viral Suppression for further guidance if switching to a new regimen is desired.

Several tables in these guidelines provide clinicians with guidance on selecting and prescribing an optimal regimen for a person with HIV. Table 7 provides information on considerations based on specific clinical scenarios and ARV drug characteristics. Table 9 lists the potential advantages and disadvantages of the different ARV drug components. Appendix B, Tables 3–11, lists characteristics of individual ARV agents for initial therapy (e.g., formulations, dosing recommendations, PK, common adverse effects). Appendix B, Table 12 provides ARV dosing recommendations for people who have renal or hepatic insufficiency.

Changes Since the Last Revision of the Guidelines

Since the last revision of these guidelines, the Panel has made several important changes to the recommendations for initial therapy in people with HIV. Among these changes, the following deserve emphasis:

Changes in the Panel's Recommendations for Initial Regimens in Most People With HIV:

- The single-tablet regimen (STR) DTG/abacavir (ABC)/3TC has moved from *Recommended Initial Regimens for Most People With HIV* (Table 6a) to *Other Initial Antiretroviral Regimens for Certain Clinical Scenarios* (Table 6b) due to the necessity of obtaining an HLA-B*5701 assay to avoid ABC-associated hypersensitivity, data suggesting increased risk for cardiovascular events associated with ABC, and the availability of several other options for initial therapy (see the Nucleoside Reverse Transcriptase Inhibitor Options as Part of Initial Therapy section for more information).
- Because of the current low rates of transmitted INSTI resistance in the United States, even when there is suspicion that HIV was acquired from a partner with virologic failure while on an INSTI, an INSTI-based regimen can be started pending the results of the INSTI genotype test.

No Longer Recommended as Initial Antiretroviral Regimens:

- Raltegravir (RAL)-, elvitegravir/cobicistat (EVG/c)-, boosted atazanavir (ATV)-, and efavirenz (EFV)-based regimens and rilpivirine (RPV)/TDF/FTC are no longer recommended as initial therapy due to the following disadvantages compared with other regimens:
  - RAL: Low genetic barrier to resistance and higher pill burden
  - EVG/c: Drug–drug interactions with COBI and low genetic barrier to resistance of EVG
  - Boosted ATV: Toxicities, including hyperbilirubinemia, and drug–drug interactions
  - EFV: Toxicities, including neuropsychiatric effects and suicidality; low barrier to resistance; and drug–drug interactions
  - RPV/TDF/FTC: Availability of doravirine (DOR)/TDF/3TC as an STR, more drug–drug interactions than DOR, food restrictions, and HIV RNA and CD4 restrictions. RPV/TAF/3TC remains an option for those who wish to use an STR containing RPV and TAF
- The two-drug regimens darunavir/ritonavir (DRV/r) plus RAL and DRV/r plus 3TC are no longer recommended for initial therapy.
  - DRV/r plus RAL is not recommended due to the higher rate of virologic failure in people with HIV RNA >100,000 copies/mL, the low genetic barrier to resistance, and the high pill burden of RAL.[1-3]
  - DRV/r plus 3TC is not recommended because it requires a PK booster with accompanying drug interactions, and published clinical trial data are lacking.[4] For further information, see Other Antiretroviral Regimens for Initial Therapy.

Selecting an Initial Antiretroviral Regimen

The goal of ART is to improve health and prolong life for people with HIV and to prevent the transmission of HIV to others by maximizing virologic suppression. This is achieved by initiating therapy with a potent, safe, tolerable, and easy-to-adhere-to ARV regimen as soon as possible after diagnosis. Table 6a provides a list of Panel-recommended ARV regimens for most people with HIV. Some factors listed below may influence the selection of a regimen. See Table 6b and Table 7 for additional regimen recommendations to use in specific clinical scenarios.

Initial Characteristics to Consider in All People With HIV

- Pre-treatment HIV RNA level (viral load)
- Pre-treatment CD4 count
- History of prior exposure to CAB-LA or oral TDF/FTC or TAF/FTC as PrEP, or use of INSTI-based post-exposure prophylaxis (PEP)
- Suspected drug resistance (prior to availability of genotypic testing results)
- HIV genotypic drug resistance test results
  - Genotypic drug resistance testing in people without prior ARV exposure should focus on testing for mutations in the reverse transcriptase and protease genes.

- If transmitted INSTI resistance is a concern, providers should also test for resistance mutations to this class of drugs.

- Individual preferences
- Anticipated adherence to the regimen

Presence of Specific Conditions

- Comorbid conditions: Cardiovascular disease; hyperlipidemia; renal disease; liver disease; osteopenia, osteoporosis, or other conditions associated with bone mineral density loss; psychiatric illness; neurologic disease; substance use disorder requiring narcotic replacement therapy
- Coinfections: Hepatitis B virus (HBV), hepatitis C virus, tuberculosis
- Pregnancy and potential for pregnancy: See below in General Considerations for Persons of Childbearing Potential Initiating Antiretroviral Therapy

Regimen-Specific Considerations

- Regimen's barrier to resistance
- HLA-B*5701 status (only for those considering initiation of ABC). Those who are HLA-B*5701 positive should not receive ABC. See Table 7 for regimens to initiate.
- Potential adverse effects and drug toxicities, including risk for the development of comorbid diseases
- Known or potential drug interactions with other medications (see Drug–Drug Interactions)
- Convenience (e.g., pill burden, dosing frequency, availability of a fixed-dose combination or of STR formulations, food requirements)
- Cost and access (see Cost Considerations and Antiretroviral Therapy)

Considerations for People With Prior Use of Pre- or Post-Exposure Prophylaxis

- For people who acquired HIV after taking oral PrEP with TAF/FTC or TDF/FTC, there is concern for transmitted resistance, especially related to FTC or 3TC with the M184V/I mutation. In a cohort of people in New York City with newly diagnosed HIV, 2% had the M184V/I mutation. People who had used prior oral PrEP were four to seven times more likely to harbor resistance than people who had never used oral PrEP.[5] This reinforces the Panel's recommendation not to initiate DTG/3TC without the results of genotypic resistance testing.
- For people who acquired HIV after exposure to CAB-LA as PrEP, there is concern for INSTI resistance. CAB-LA may remain detectable after treatment discontinuation for up to 3 years in men and 4 years in women.[6] This long PK tail may contribute to the selection of drug-resistant variants in the setting of incident infection. In the HPTN 083 trial of CAB-LA as PrEP in cisgender men and transgender women, 10 of 32 people who acquired HIV after exposure to CAB-LA were found to harbor major INSTI resistance mutations.[7] This is the basis for the Panel's recommendation to obtain INSTI genotypic drug resistance testing in people with prior CAB-LA exposure and not to initiate INSTIs before these results are available and show INSTI

sensitivity. If therapy is initiated before INSTI sensitivity is confirmed, the Panel recommends initiating a boosted DRV regimen with TAF/FTC or TDF/FTC while awaiting INSTI genotype results; once INSTI sensitivity is confirmed by genotypic resistance testing, a switch to an INSTI-based regimen can occur **(AIII).**

- For people with no history of using CAB-LA for PrEP and who acquire HIV despite INSTI-based PEP use, an INSTI genotype should be obtained prior to beginning an INSTI-based regimen. However, because selection of INSTI-resistant virus is likely to be uncommon in this setting, an INSTI-based regimen could be started prior to the return of genotype results **(CIII).** This recommendation is based largely on theoretical concerns that INSTI resistance could occur in the setting of INSTI-based PEP failure, but it is likely to be uncommon. In addition, transmitted INSTI resistance remains low in the United States. For these reasons, the Panel supports using INSTI-based regimens in this setting.

General Considerations for Persons of Childbearing Potential Initiating Antiretroviral Therapy

- A pregnancy test should be performed before initiating ART.
- Clinicians should discuss intentions regarding pregnancy with all persons of childbearing potential.
- People with HIV should attain maximum viral suppression before attempting conception in order to protect their own health, prevent sexual HIV transmission to partners without HIV, and minimize the risk of perinatal HIV transmission to the infant.
- For individuals who are trying to conceive, the Panel recommends initiating a regimen designated as a *Preferred* regimen during pregnancy, as detailed in the Perinatal Guidelines.

General Considerations for INSTI-, PI-, or NNRTI-Based Regimens

Except when HIV is acquired after exposure to CAB-LA as PrEP and results from INSTI genotypic resistance testing are not available, INSTIs (specifically BIC and DTG) are recommended for initial therapy in most people because of their demonstrated efficacy, high barrier to resistance, tolerability, low potential for drug–drug interactions, convenience, and better adverse effects profile compared with NNRTIs and boosted PIs (see Tables 7 and 9).

INSTI-Based Regimens

The Panel's *Recommended Initial Regimens for Most People With HIV*, as listed in Table 6a, include one of two INSTIs: BIC coformulated with TAF/FTC **(AI);** or DTG plus TAF or TDF plus FTC or 3TC **(AI);** or coformulated DTG/3TC **(AI)** for people who have not had exposure to CAB-LA as PrEP. In those with prior exposure to CAB-LA as PrEP, these regimens should not be initiated unless a recent genotype test result showing no INSTI resistance mutations is available. If an INSTI-based regimen is initiated and viral suppression is not achieved in 8 to 12 weeks, genotypic resistance testing should be repeated, including for INSTIs.

For most people, these INSTI-containing regimens will be highly effective and have relatively infrequent treatment-limiting adverse effects and few drug interactions. In several head-to-head comparisons between boosted PI- and INSTI-containing regimens, the INSTI-based regimens were better tolerated and caused fewer treatment discontinuations.[8-10]

The Panel recommends a two-drug regimen of DTG/3TC for initial therapy if certain criteria are met. Data from two randomized trials showed that, in terms of virologic efficacy, DTG plus 3TC was non-inferior to a three-drug regimen of DTG plus TDF/FTC. No treatment-emergent resistance was seen in either the two-drug or the three-drug group.[11] Based on these data, DTG/3TC is not currently recommended for rapid ARV initiation as initial therapy before the availability of HBV serology, HIV RNA level, and an HIV genotypic test demonstrating sensitivity to 3TC.

Among the INSTI-based regimens, BIC- and DTG-containing regimens have a higher barrier to resistance than the first-generation INSTI-based regimens containing EVG or RAL and do not require a PK booster. Transmitted resistance to BIC or DTG is rare. Treatment-emergent resistance has been reported in individuals who failed three-drug DTG-based therapy[12-15] and BIC-based regimens.[16-19] Because of this high barrier to resistance and tolerability, BIC- and DTG-containing regimens may be used in people who have not previously used CAB-LA for PrEP and plan to start ART before resistance testing results are available (e.g., with rapid initiation of ART after diagnosis). BIC-based regimens have been shown to be non-inferior to DTG-based regimens in clinical trials.[20-22]

There are data suggesting greater weight gain after initiating therapy with certain INSTI-based regimens and TAF than with other ARV drugs. The reasons for differences in weight gain are unclear and should not be a reason to withhold an INSTI- or TAF-based regimen.[23-30]

EVG- and RAL-based regimens have the disadvantage of having lower barriers to resistance than DTG- or BIC-containing regimens and therefore are no longer recommended as initial therapy. Additionally, the pill burden with RAL is higher than for other INSTI-based regimens whereas EVG-based regimens have a greater potential for drug interactions because EVG is combined with COBI, a strong cytochrome P3A4 inhibitor (see Table 7).

PI-Based Regimens

In the setting of HIV acquisition following CAB-LA exposure, an RTV- or COBI-boosted DRV regimen containing TAF or TDF plus FTC or 3TC is recommended as initial therapy if a genotypic drug resistance test indicating INSTI sensitivity is not available at the time of ART initiation **(AIII),** if resistance to INSTI is confirmed **(BI),** or in certain clinical situations, such as when INSTIs must be avoided **(BI).** DRV/c/TAF/FTC is available as an STR. Large observational cohorts found an association between some PIs, including DRV/r, and an increased risk of cardiovascular events; however, further study is needed.[31-36] COBI-boosted regimens should not be initiated during pregnancy because of inadequate drug levels. Boosted ATV is no longer recommended as initial therapy due to frequent adverse events (e.g., hyperbilirubinemia) and high rates of drug–drug interactions, including with tenofovir and acid-suppressive therapy.

Boosted ATV is no longer recommended as initial therapy due to frequent adverse events, such as hyperbilirubinemia and higher rates of drug–drug interactions (including with tenofovir and acid-suppressive therapy) compared to boosted DRV.

NNRTI-Based Regimens

NNRTI-based regimens are not recommended for initial therapy in most people with HIV, but selected regimens may be useful in some circumstances. The NNRTI-based regimens that are currently recommended by the Panel to be used in certain clinical scenarios include DOR/TDF/3TC **(BI),** DOR plus TAF/FTC **(BIII),** and RPV/TAF/FTC **(BII).** The emergence of drug resistance at the time of virologic failure has been reported with all NNRTIs, which generally have a lower barrier to resistance than INSTIs or boosted PIs.

DOR is available both as a single-drug tablet to be used with two NRTIs and as part of an STR with TDF/3TC. In randomized trials, DOR was non-inferior to both EFV and DRV/r when either of these drugs was taken in combination with two NRTIs,[37,38] but DOR has not yet been compared against INSTIs. DOR has fewer central nervous system (CNS) side effects than EFV and more favorable lipid effects than both DRV/r and EFV. DOR also has fewer potential drug interactions than EFV or RPV, and unlike RPV, the virologic efficacy of DOR is not compromised in people with high HIV RNA levels and low CD4 counts.

RPV has fewer adverse effects than EFV, and RPV/TAF/FTC is available as one of the smallest tablet sizes among STRs. However, RPV has lower virologic efficacy in people with baseline HIV RNA levels >100,000 copies/mL and CD4 counts <200 cells/mm^3 and is subject to numerous drug–drug interactions.[39] EFV is no longer recommended for initial therapy due to a relatively high rate of CNS-related side effects, reported suicidality, high rates of drug discontinuation, and numerous drug–drug interactions.

Regimens When Abacavir, Tenofovir Alafenamide, and Tenofovir Disoproxil Fumarate Cannot Be Used or Are Not Optimal

In people in whom ABC, TDF, or TAF cannot be used or are not optimal, only DTG/3TC is recommended by the Panel **(AI).** Several other NRTI-sparing/limiting two-drug regimens have been evaluated in clinical trials but are not currently recommended for initial therapy due to insufficient data. For more information on these regimens, see Other Antiretroviral Regimens for Initial Therapy. Two-drug ARV options **should not be used** in pregnancy due to insufficient data, or in those with known pre-existing resistance to any of the ARVs in the combination. Tenofovir-sparing regimens **should not be used** in individuals with HBV coinfection unless a drug with HBV activity (i.e., entecavir) is also used.

References

1. Taiwo B, Zheng L, Gallien S, et al. Efficacy of a nucleoside-sparing regimen of darunavir/ritonavir plus raltegravir in treatment-naive HIV-1-infected patients (ACTG A5262). *AIDS.* 2011;25(17):2113-2122. Available at: https://pubmed.ncbi.nlm.nih.gov/21857490.

2. Bedimo RJ, Drechsler H, Jain M, et al. The RADAR study: week 48 safety and efficacy of RAltegravir combined with boosted DARunavir compared to tenofovir/emtricitabine combined with boosted darunavir in antiretroviral-naive patients. Impact on bone health. *PLoS One.* 2014;9(8):e106221. Available at: https://pubmed.ncbi.nlm.nih.gov/25170938.

3. Raffi F, Babiker AG, Richert L, et al. Ritonavir-boosted darunavir combined with raltegravir or tenofovir-emtricitabine in antiretroviral-naive adults infected with HIV-1: 96 week results from the NEAT001/ANRS143 randomised non-inferiority trial. *Lancet.* 2014;384(9958):1942-1951. Available at: https://pubmed.ncbi.nlm.nih.gov/25103176.

4. Figueroa MI, Sued O, Cecchini D, et al. Dual therapy based on coformulated darunavir/ritonavir plus lamivudine for initial therapy of HIV infection: the ANDES randomized controlled trial. *Int. J. Antimicrob. Agents.* 2024:107301. Available at: https://www.sciencedirect.com/science/article/pii/S0924857924002176.

5. Misra K, Huang JS, Udeagu C-CN, Forgione L, Xia Q, Torian LV. Pre-exposure prophylaxis use history in people with antiretroviral resistance at HIV diagnosis: findings from New York City HIV Surveillance and Partner Services, 2015–2022. *Clin Infect Dis.* 2023;78(5):1240-1245. Available at: https://doi.org/10.1093/cid/ciad699.

6. Landovitz RJ, Li S, Eron JJ, Jr., et al. Tail-phase safety, tolerability, and pharmacokinetics of long-acting injectable cabotegravir in HIV-uninfected adults: a secondary analysis of the HPTN 077 trial. *Lancet HIV.* 2020;7(7):e472-e481. Available at: https://pubmed.ncbi.nlm.nih.gov/32497491.

7. Marzinke MA, Fogel JM, Wang Z, et al. Extended analysis of HIV infection in cisgender men and transgender women who have sex with men receiving injectable cabotegravir for HIV prevention: HPTN 083. *Antimicrob Agents Chemother.* 2023;67(4):e0005323. Available at: https://pubmed.ncbi.nlm.nih.gov/36995219.

8. Lennox JL, Landovitz RJ, Ribaudo HJ, et al. Efficacy and tolerability of 3 nonnucleoside reverse transcriptase inhibitor-sparing antiretroviral regimens for treatment-naive volunteers infected with HIV-1: a randomized, controlled equivalence trial. *Ann Intern Med.* 2014;161(7):461-471. Available at: http://www.ncbi.nlm.nih.gov/pubmed/25285539.

9. Molina JM, Clotet B, van Lunzen J, et al. Once-daily dolutegravir versus darunavir plus ritonavir for treatment-naive adults with HIV-1 infection (FLAMINGO): 96 week results from a randomised, open-label, phase 3b study. *Lancet HIV.* 2015;2(4):e127-136. Available at: http://www.ncbi.nlm.nih.gov/pubmed/26424673.

10. Squires K, Kityo C, Hodder S, et al. Integrase inhibitor versus protease inhibitor based regimen for HIV-1 infected women (WAVES): a randomised, controlled, double-blind, phase 3 study. *Lancet HIV.* 2016;3(9):e410-e420. Available at: https://www.ncbi.nlm.nih.gov/pubmed/27562742.

11. Cahn P, Madero JS, Arribas JR, et al. Durable efficacy of dolutegravir plus lamivudine in antiretroviral treatment-naive adults with HIV-1 infection: 96-week results from the GEMINI-1 and GEMINI-2 randomized clinical trials. *J Acquir Immune Defic Syndr.* 2020;83(3):310-318. Available at: https://pubmed.ncbi.nlm.nih.gov/31834000.

12. Fulcher JA, Du Y, Zhang TH, Sun R, Landovitz RJ. Emergence of integrase resistance mutations during initial therapy containing dolutegravir. *Clin Infect Dis.* 2018;67(5):791-794. Available at: https://www.ncbi.nlm.nih.gov/pubmed/29933437.

13. Pena MJ, Chueca N, D'Avolio A, Zarzalejos JM, Garcia F. Virological failure in HIV to triple therapy with dolutegravir-based firstline treatment: rare but possible. *Open Forum Infect Dis.* 2019;6(1):ofy332. Available at: https://www.ncbi.nlm.nih.gov/pubmed/30631792.

14. Lubke N, Jensen B, Huttig F, et al. Failure of dolutegravir first-line ART with selection of virus carrying R263K and G118R. *N Engl J Med.* 2019;381(9):887-889. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31461601.

15. Loosli T, Hossmann S, Ingle SM, et al. HIV-1 drug resistance in people on dolutegravir-based antiretroviral therapy: a collaborative cohort analysis. *Lancet HIV.* 2023;10(11):e733-e741. Available at: https://pubmed.ncbi.nlm.nih.gov/37832567.

16. Lozano AB, Chueca N, de Salazar A, et al. Failure to bictegravir and development of resistance mutations in an antiretroviral-experienced patient. *Antiviral Res.* 2020;179:104717. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31982483.

17. DeKoven S, Naccarato M, Brumme CJ, Tan DHS. Treatment-emergent reverse transcriptase resistance during antiretroviral therapy with bictegravir, tenofovir alafenamide, and emtricitabine: a case series. *HIV Med.* 2023;24(11):1137-1143. Available at: https://pubmed.ncbi.nlm.nih.gov/37317505.

18. Nasreddine R, Florence E, Yombi JC, et al. Efficacy, durability, and tolerability of bictegravir/emtricitabine/tenofovir alafenamide for the treatment of HIV in a real-world setting in Belgium. *HIV Med.* 2023;24(8):914-924. Available at: https://pubmed.ncbi.nlm.nih.gov/37038245.

19. Chamberlain N, Mena L, Brock JB. Case report: emergent resistance in a treatment-naive person with human immunodeficiency virus under bictegravir-based therapy. *Open Forum Infect Dis.* 2021;8(6). Available at: https://doi.org/10.1093/ofid/ofab297.

20. Stellbrink HJ, Arribas JR, Stephens JL, et al. Co-formulated bictegravir, emtricitabine, and tenofovir alafenamide versus dolutegravir with emtricitabine and tenofovir alafenamide for initial treatment of HIV-1 infection: week 96 results from a randomised, double-blind, multicentre, phase 3, non-inferiority trial. *Lancet HIV.* 2019;6(6):e364-e372. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31068272.

21. Wohl DA, Yazdanpanah Y, Baumgarten A, et al. Bictegravir combined with emtricitabine and tenofovir alafenamide versus dolutegravir, abacavir, and lamivudine for initial treatment of HIV-1 infection: week 96 results from a randomised, double-blind, multicentre, phase 3, non-inferiority trial. *Lancet HIV.* 2019;6(6):e355-e363. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31068270.

22. Sax PE, Arribas JR, Orkin C, et al. Bictegravir/emtricitabine/tenofovir alafenamide as initial treatment for HIV-1: five-year follow-up from two randomized trials. *eClinicalMedicine.* 2023;59:101991. Available at: https://pubmed.ncbi.nlm.nih.gov/37200995.

23. Bhagwat P, Ofotokun I, McComsey GA, et al. Changes in waist circumference in HIV-infected individuals initiating a raltegravir or protease inhibitor regimen: effects of sex and race. *Open Forum Infect Dis.* 2018;5(11):ofy201. Available at: https://www.ncbi.nlm.nih.gov/pubmed/30465010.

24. Sax PE, Erlandson KM, Lake JE, et al. Weight gain following initiation of antiretroviral therapy: risk factors in randomized comparative clinical trials. *Clin Infect Dis.* 2020;71(6):1379-1389. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31606734.

25. Venter WDF, Moorhouse M, Sokhela S, et al. Dolutegravir plus two different prodrugs of tenofovir to treat HIV. *N Engl J Med.* 2019;381(9):803-815. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31339677.

26. Bourgi K, Rebeiro PF, Turner M, et al. Greater weight gain in treatment naive persons starting dolutegravir-based antiretroviral therapy. *Clin Infect Dis.* 2020. Available at: https://www.ncbi.nlm.nih.gov/pubmed/31100116.

27. Venter WDF, Sokhela S, Simmons B, et al. Dolutegravir with emtricitabine and tenofovir alafenamide or tenofovir disoproxil fumarate versus efavirenz, emtricitabine, and tenofovir disoproxil fumarate for initial treatment of HIV-1 infection (ADVANCE): week 96 results from a randomised, phase 3, non-inferiority trial. *Lancet HIV.* 2020;7(10):e666-e676. Available at: https://www.ncbi.nlm.nih.gov/pubmed/33010240.

28. Calmy A, Tovar Sanchez T, Kouanfack C, et al. Dolutegravir-based and low-dose efavirenz-based regimen for the initial treatment of HIV-1 infection (NAMSAL): week 96 results from a two-group, multicentre, randomised, open label, phase 3 non-inferiority trial in Cameroon. *Lancet HIV.* 2020;7(10):e677-e687. Available at: https://www.ncbi.nlm.nih.gov/pubmed/33010241.

29. Aldredge A, Lahiri CD, Summers NA, et al. 980. Effects of integrase strand-transfer inhibitor use on lipids, glycemic control, and insulin resistance in the Women's Interagency HIV Study (WIHS). *Open Forum Infect Dis.* 2019;6. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6808914.

30. Chandiwana NC, Siedner MJ, Marconi VC, et al. Weight gain after HIV therapy initiation: pathophysiology and implications. *J Clin Endocrinol Metab.* 2024;109(2):e478-e487. Available at: https://pubmed.ncbi.nlm.nih.gov/37437159.

31. Lang S, Mary-Krause M, Cotte L, et al. Impact of individual antiretroviral drugs on the risk of myocardial infarction in human immunodeficiency virus-infected patients: a case-control study nested within the French Hospital Database on HIV ANRS Cohort CO4. *Arch Intern Med.* 2010;170(14):1228-1238. Available at: https://www.ncbi.nlm.nih.gov/pubmed/20660842.

32. Worm SW, Sabin C, Weber R, et al. Risk of myocardial infarction in patients with HIV infection exposed to specific individual antiretroviral drugs from the 3 major drug classes: the data collection on adverse events of anti-HIV drugs (D:A:D) study. *J Infect Dis.* 2010;201(3):318-330. Available at: https://www.ncbi.nlm.nih.gov/pubmed/20039804.

33. Monforte AD, Reiss P, Ryom L, et al. Atazanavir is not associated with an increased risk of cardio or cerebrovascular disease events. *AIDS.* 2013;27(3):407-415. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23291539.

34. Ryom L, Mocroft A, Kirk O, et al. Association between antiretroviral exposure and renal impairment among HIV-positive persons with normal baseline renal function: the D:A:D study. *J Infect Dis.* 2013;207(9):1359-1369. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23382571.

35. LaFleur J, Bress AP, Rosenblatt L, et al. Cardiovascular outcomes among HIV-infected veterans receiving atazanavir. *AIDS.* 2017;31(15):2095-2106. Available at: https://www.ncbi.nlm.nih.gov/pubmed/28692532.

36. Ryom L, Lundgren JD, El-Sadr W, et al. Cardiovascular disease and use of contemporary protease inhibitors: the D:A:D international prospective multicohort study. *Lancet HIV.* 2018;5(6):e291-e300. Available at: https://pubmed.ncbi.nlm.nih.gov/29731407.

37. Orkin C, Squires KE, Molina JM, et al. Doravirine/lamivudine/tenofovir disoproxil fumarate is non-inferior to efavirenz/emtricitabine/tenofovir disoproxil fumarate in treatment-naive adults with human immunodeficiency virus-1 infection: week 48 results of the DRIVE-AHEAD trial. *Clin Infect Dis.* 2019;68(4):535-544. Available at: https://www.ncbi.nlm.nih.gov/pubmed/30184165.

38. Molina JM, Squires K, Sax PE, et al. Doravirine versus ritonavir-boosted darunavir in antiretroviral-naive adults with HIV-1 (DRIVE-FORWARD): 48-week results of a randomised, double-blind, phase 3, non-inferiority trial. *Lancet HIV.* 2018;5(5):e211-e220. Available at: https://www.ncbi.nlm.nih.gov/pubmed/29592840.

39. Cohen CJ, Molina JM, Cassetti I, et al. Week 96 efficacy and safety of rilpivirine in treatment-naive, HIV-1 patients in two Phase III randomized trials. *AIDS.* 2013;27(6):939-950. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23211772.