

## **IDS** GUIDELINES

# **Primary Care Guidance for Providers of Care for Persons With Human Immunodeficiency Virus: 2024 Update by the HIV Medicine Association of the Infectious Diseases Society of America**

**Michael Horberg<sup>1\*</sup>, Melanie Thompson<sup>2\*</sup>, Allison Agwu<sup>3</sup>, Jonathan Colasanti<sup>4</sup>, Marwan Haddad<sup>5</sup>, Mamta Jain<sup>6</sup>, Grace McComsey<sup>7</sup>, Asa Radix<sup>8</sup>, Natella Rakhmanina<sup>9</sup>, William R. Short<sup>10</sup>, Tulika Singh<sup>11</sup>, Hansel Tookes<sup>12</sup> submitted on behalf of the HIV Medicine Association.**

<sup>1</sup>Mid-Atlantic Permanente Research Institute, Kaiser Permanente Mid-Atlantic Permanente Medical Group, Washington, District of Columbia, USA; <sup>2</sup>Thacker & Thompson, MD, Atlanta, Georgia, USA; <sup>3</sup>Division of Infectious Diseases, Johns Hopkins University School of Medicine, Baltimore, Maryland, USA; <sup>4</sup>Division of Infectious Diseases, Emory University, Atlanta, Georgia, USA; <sup>5</sup>Clinical Health Center Inc., New Britain, Connecticut, USA; <sup>6</sup>UT Southwestern Medical Center & Peter O'Donnell School of Public Health, Dallas, Texas, USA; <sup>7</sup>Case Western Reserve University and University Hospitals of Cleveland, Cleveland, Ohio, USA; <sup>8</sup>Callen-Lorde Community Health Center in New York, New York City, New York, USA; <sup>9</sup>Department of Pediatrics, The George Washington University School of Medicine and Health Sciences, Washington, District of Columbia, USA; <sup>10</sup>Division of Infectious Diseases, Perelman School of

---

\*Authors Horberg and Thompson contributed equally to the manuscript

**Corresponding Author:** Melanie Thompson, MD, Thacker and Thompson MD PC, 619 Rankin Street Northeast, Atlanta, GA 30308, drmt@mindspring.com, (404) 276-7720

© The Author(s) 2024. Published by Oxford University Press on behalf of Infectious Diseases Society of America. All rights reserved. For commercial re-use, please contact reprints@oup.com for reprints and translation rights for reprints. All other permissions can be obtained through our RightsLink service via the Permissions link on the article page on our site—for further information please contact journals.permissions@oup.com. This article is published and distributed under the terms of the Oxford University Press, Standard Journals Publication Model (<https://academic.oup.com/pages/standard-publication-reuse-rights>)

Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, USA; <sup>11</sup>UCIHealth, University of California Irvine, Irvine, California, USA; <sup>12</sup>Miller School of Medicine, University of Miami, Miami, Florida, USA

Advances in antiretroviral therapy (ART) have made it possible for persons with human immunodeficiency virus (HIV) to live a lifespan approaching that of people without HIV, without progressing to AIDS or transmitting HIV to sexual partners or infants. There is, therefore, increasing emphasis on maintaining health throughout the lifespan. To receive optimal medical care and achieve desired outcomes, persons with HIV must be consistently engaged in care and able to access uninterrupted treatment, including ART. Comprehensive evidence-based HIV primary care guidance is, therefore, more important than ever. Creating a patient-centered, stigma-free care environment is essential for care engagement. Barriers to care must be decreased at the societal, health system, clinic, and individual levels. As the population ages and noncommunicable diseases arise, providing comprehensive health care for persons with HIV becomes increasingly complex, including management of multiple comorbidities and the associated challenges of polypharmacy, while also attending to HIV-specific health concerns. Clinicians must address issues specific to preventive health, including cancer screening, providing recommended vaccinations, as well as promoting sexual health, including sexually transmitted infection diagnosis, treatment, and prevention. Clinicians also must address issues for specific populations, including persons of childbearing potential, including during preconception and pregnancy; children; adolescents; and transgender and gender-diverse individuals. This guidance from an expert panel of the HIV Medicine Association of the Infectious Diseases Society of America updates the previous 2020 HIV Primary Care Guidance.

**Keywords:** HIV primary care, HIV care engagement, HIV monitoring, HIV comorbidities, preventive health, sexually transmitted infections

**Topic:** HIV, primary health care, guidelines

## INTRODUCTION

Continuous access to antiretroviral therapy (ART) and engagement in a patient-centered, stigma-free, high-quality care environment are essential to assist people with HIV to achieve their health goals, improve their quality and length of life, and eliminate HIV transmission to sexual partners and infants through viral suppression. As effective ART has become simpler over time, HIV care and the care environment itself have become increasingly complex, and updated HIV primary care guidance is needed. As people with HIV live longer, clinicians must attend to preventing and managing comorbidities and coinfections that often occur earlier and more frequently in people with HIV than people without HIV. This becomes increasingly important as individuals age. Likewise, screening for and addressing substance use and mental health conditions throughout the lifespan is essential to effective HIV care. At the same time, a strained HIV workforce struggles

to provide care to an ever-increasing population of people with HIV, and to do so with diminishing resources. Meanwhile, many people with HIV, like those at increased likelihood of acquiring HIV, disproportionately experience barriers to accessing care and treatment, including income inequality, unstable housing, food insecurity, joblessness, and poor access to transportation. Such barriers are embedded in a social framework interwoven with racism, sexism, and discrimination against those whose race, ethnicity, sexual orientation, or gender identity is in the minority. Increasingly, HIV care must acknowledge and address these issues to end the HIV epidemic in all populations. Ensuring that clinical settings are free of stigma and discrimination is a first, and essential, step. Unfortunately, the U.S. is still far below its goals for ending the epidemic. The most recent available data found that, among all people estimated to be living with HIV (diagnosed or undiagnosed), only 57% had suppressed virus, with lower levels among Black, Hispanic/Latino, and Indigenous populations; people who inject drugs; and heterosexual cisgender men. Only 47% of all people with HIV met the definition for care retention, with even lower rates in many populations [1]. Such disparities demand that HIV care, as well as HIV prevention, be person-centered, inclusive of attention to social determinants of health, and based on equity.

While this Guidance primarily addresses care for people with HIV, a patient-centered and individualized approach to HIV prevention and care is required to end the HIV epidemic. Substantial health disparities driven by societal inequities continue to be seen among those with new HIV diagnoses, and although preexposure prophylaxis (PrEP) is a highly effective tool for HIV prevention, its implementation is not yet equity-based nor centered in the populations who would most benefit [2-4]. Some HIV care providers also provide PrEP, but expansion of both HIV testing and PrEP access is needed using novel service-delivery approaches beyond the traditional clinic visit to improve access. Similarly, the ongoing sexually transmitted infection (STI) epidemic disproportionately affects people with, and vulnerable to, HIV, and STI screening, treatment, and prevention should be included in a syndemic approach to HIV prevention and care.

All of these factors contribute to the need for evolving HIV care recommendations to meet new and intensified challenges. This version of the *Primary Care Guidance for Providers of Care for Persons With Human Immunodeficiency Virus* contains an expanded section devoted to patient-centered optimization of HIV care, including use of tools such as multidisciplinary care teams, telehealth, and street medicine. The Guidance has new sections devoted to immunizations, cancer screening, and STIs, including a focus on mpox (formerly monkeypox) and STI prevention using doxycycline postexposure prophylaxis (doxyPEP). An updated discussion of metabolic diseases now addresses statin use in people with HIV as well as approaches to comorbidity screening and management. A section on children with HIV has been added, along with updated sections on care for adolescents, persons of childbearing potential, and transgender and gender diverse populations, and on COVID-19 and people with HIV.

## **METHODS**

### **Panel composition**

Participants on the panel are HIVMA members who are experts in the care of persons with HIV and who volunteered to participate. Two co-chairs (M.A.H. and M.A.T.) with experience in developing guidelines led the expert panel.

### **Literature Review, Analysis, and Consensus Development of Evidence-Based Recommendations**

The expert panel, with the assistance of a consultant experienced in medical literature reviews, conducted a literature review to identify new contributions to the field from the date of the last guideline publication in 2020 to December 2023, except when noted in the literature cited. In particular, changes to key guidelines and recommendations, and late-breaking data deemed to be practice-changing, were included up to the time of manuscript submission. Panel members responsible for each section evaluated the evidence and developed recommendations accordingly. The entire panel reviewed all recommendations, and decisions on final recommendations were made by consensus, based on the evidence. The full panel participated in reviewing and editing the final document. A medical writer contributed to copy editing and formatting prior to submission.

### **Conflicts of Interest**

All members of the panel complied with the IDSA policy on conflicts of interest, which requires disclosure of any financial or other interest that might be construed as constituting an actual, potential, or apparent conflict. Members of the panel were provided with IDSA's conflict of interest disclosure statement and asked to identify ties to companies that develop products that might be affected by promulgation of the guidance or any other potential conflicts. Information for panel members and spouses was requested regarding employment, consultancies, stock ownership, honoraria, research funding, expert testimony, and membership on company advisory committees. Disclosure of new conflicts of interest was solicited at the beginning of each panel meeting. The panel made decisions on a case-by-case basis as to whether an individual's role should be limited as a result of a conflict or potential conflict. No limiting conflicts were identified.

## **RECOMMENDATIONS FOR THE PRIMARY CARE OF PERSONS WITH HIV**

The following recommendations are based on evidence available to the Panel at the time of publication. Many recommendations throughout this document refer to other guidelines and recommendations, including, but not limited to, those from the Department of Health and Human Services (DHHS), the Centers for Disease Control and Prevention (CDC), and the CDC Advisory Committee on Immunization Practices (ACIP), with the recognition that these sources evolve over

time and that no single primary care guidance publication can fully anticipate these changes. In general, recommendations from the most current versions of guidelines and ACIP recommendations should be followed.

## **SECTION 1: OPTIMIZING CARE ENGAGEMENT, MEDICATION ADHERENCE, AND VIRAL SUPPRESSION**

### **Recommendations**

- All persons with HIV should be provided timely access to routine and urgent medical care via a patient-centered approach, beginning with rapid ART at entry, if feasible.
- Longitudinal low-barrier models, such as extended or nontraditional business hours, walk-in acute or primary care, telehealth, and alternate care venues, including street medicine, should be incorporated as feasible.
- HIV care sites should provide linguistically and culturally appropriate care.
- HIV care sites should maximize diversity of the workforce to represent the patient population served in terms of gender identity, sexual orientation, race, ethnicity, primary language, and meaningful representation of persons with HIV.
- HIV care sites should implement programs that incorporate evidence-based and evidence-informed interventions shown to improve HIV care engagement and viral suppression, including providing gender-affirming and trauma-informed care, addressing structural and social determinants of health, and integrating mental health and substance use treatment with harm reduction and cultural humility at the core.
- HIV care sites should use a multidisciplinary team model but identify a primary clinician with experience and expertise in HIV for each patient and support the development of trusting long-term patient/clinician relationships.
- Because HIV-related stigma and misinformation remain highly prevalent within health care systems, HIV care sites and clinicians should advocate for their patients' rights throughout the health care system to ensure people with HIV are appropriately considered for medical and surgical procedures.
- Surgical and dental decisions for people with HIV should be based on shared decision making between the HIV specialist, surgeon, and patient, weighing all relevant factors, and should not depend on the CD4 cell count or HIV RNA level alone.
- People with HIV should be considered both as solid organ recipients (regardless of donor HIV status) and solid organ donors specifically to people with HIV.

### **Evidence summary**

Initiating ART on the day of or within 7 days of diagnosis is considered Rapid ART [5]. Rapid ART is a pillar of *Ending the HIV Epidemic: A Plan for America* and *The National HIV/AIDS Strategy*, while also being endorsed in each of the major clinical HIV treatment guidelines [6-9]. ART should be offered unless a clinical concern exists that warrants delaying ART initiation, such as cryptococcal or tuberculous meningitis or if the patient expresses a desire to delay therapy. Structural, systemic, or programmatic barriers that would impede Rapid ART should be removed [10]. Eliminating initial linkage to care barriers leads to shorter times to viral suppression. Delays from diagnosis to initial appointment for HIV care has been shown to be one predictor of failure

to engage in care, which Rapid ART mitigates [11]. Persons engaged in Rapid ART programs may need enhanced support to achieve continuous care engagement and viral suppression [12].

The long-term effectiveness of ART is dependent on durable suppression of viral replication. Clinicians should emphasize that viral suppression not only improves the patient's health but prevents HIV transmission to others [13]. "Undetectable = Untransmittable" (U=U) messaging is welcomed and encouraged by communities with HIV and should be part of routine messaging in the clinic to mitigate stigma and encourage ART adherence. Pursuit of viral suppression should ensure that those individuals whose virus is not suppressed do not feel further stigmatized. Conversations should be approached in a nonjudgmental fashion seeking reasons and potential solutions for the adherence challenges that result in viremia. Stigma mitigation is important to optimizing adherence and viral suppression as stigma is a significant driver of care disengagement and adherence challenges [14].

In all spaces where persons with HIV are cared for, People First Language (such as "people with HIV" instead of "HIV-infected people") and gender-affirming language should be used, and appropriate pronouns and names should be used in electronic health records and to address patients directly [15]. Knowledge dissemination is critical to combating stigma in health care settings while many myths about HIV remain [16, 17]. Clinicians should disseminate knowledge regarding scientific advances, including that HIV is a chronic illness in the setting of effective ART; risk of transmission in the health care settings is <1% with no reports of health care transmission in the modern ART and postexposure prophylaxis (PEP) era; and surgical and dental decisions should be based on shared decision making between the HIV specialist, surgeon, and patient weighing all relevant clinical factors. Surgical and dental procedure decisions should not depend on the CD4 cell count or HIV RNA level alone [18, 19]. Furthermore, people with HIV can be considered both as recipients and donors of solid organ transplantation, and HIV alone should not be an exclusionary factor [20-23]. People with HIV can receive organs from all donors while people with HIV can only donate organs to other people with HIV. The HIV Organ Policy Equity Act (HOPE Act), enacted in 2013, reversed a federal ban on use of organs from people with HIV in recipients with HIV and set standards for research and clinical care in solid transplantation among people with HIV. It is important for clinicians to consider referrals for transplantation, and updated lists of approved transplantation centers for people with HIV are accessible through the HRSA Organ Transplantation and Procurement Network webpage [24].

The primary reason for treatment failure, particularly among patients on their first ART regimen, is suboptimal adherence to care or treatment regimens [25, 26]. Medication adherence is essential to achieve and maintain viral suppression with modern ART, although 100% adherence may not always be necessary for optimal viral suppression outcomes [27]. Discussions and education around adherence to ART should employ an empathetic lens with the goal of identifying barriers to adhering to regular medication use and brainstorming feasible solutions. Counseling about the importance of medication adherence should be done carefully and thoughtfully, so as not to perpetuate (or lead to) a sense of self-guilt or anxiety about missed doses. Further, inconsistent

adherence may be linked to other important health outcomes, e.g., cardiovascular disease and increased mortality, even in the setting of viral suppression [28].

Drivers of poor treatment adherence are many and include inconsistent access to medications (including inability to afford medications, limited pharmacy hours, requirements to pick up prescription refills monthly); structural and societal-level barriers (including inadequate transportation, health system barriers to engagement, food or housing insecurity, stigma and discrimination based on HIV status, race, ethnicity, gender identity, sexual orientation, disability, or immigration status); clinic-level barriers (including stigmatizing/discriminatory language or practice by office staff or clinicians, restrictive hours, inaccessible location, lack of a mutually trusting and respectful, collaborative patient–clinician relationship); and patient-level barriers (mental health and substance use issues, pill fear, pill fatigue) [29-34]. Additionally, periods of transition (e.g., postpartum, relocation, employment/insurance changes, incarceration) may lead to disengagement in care. Some populations may warrant dedicated programs and support to assist with care reengagement [35]. All of these factors must be considered when designing systems to improve care engagement.

Adherence to care not only means medication adherence but also medical visit attendance and continual engagement in care [36]. Low adherence to visits and poor engagement in care have been found to predict approximately 50% higher mortality among persons with HIV [37]. Thus, it is critically important that HIV care providers and clinics have evidence-based and evidence-informed strategies to effectively engage and assist patients in staying in care [38]. Interventions that improve care engagement or viral suppression generally achieve one of three things: (1) care coordination through a multidisciplinary team of providers (both physical and behavioral health) and social supports, (2) provision of an essential need such as housing or food assistance, or (3) creation of a care environment that elicits and acknowledges patients' goals, motivations, and care needs. Specific considerations may include physical location, clinic environment, and the biopsychosocial situation of the individual. Inherent in each of these is a strengths-based approach that leverages a patient's strengths as a part of the solutions [39]. While many interventions have demonstrated some impact on care engagement and adherence to medication, none have a very large effect size [38]. Barriers to care are heterogeneous, and therefore programs to overcome those barriers will need to be similarly heterogeneous. Differentiated service delivery, whereby the location, intensity, frequency of the service, and who delivers that service are tailored to individual needs, is a model that factors in heterogeneous needs at a large scale [40].

Components that could provide a foundation for individual care engagement include social engagement programs, reminders around the clinic about the importance of attending appointments, patient navigation (including enhanced personal contacts), financial incentives, nutrition assistance, and mobile health (mHealth) platforms that leverage mobile devices to better engage patients [41-46]. Intake assessments and ongoing assessments of barriers to care should include social and economic factors such as stigma, violence, social support, food insecurity, unstable housing, and transportation challenges. Lack of adequate food or safe housing can impact

the ability to remain adherent to a treatment regimen and even be associated with increased risk of death [47]. Early assessment by a qualified social worker or case manager is essential, and ongoing access to effective case management teams is necessary to overcome barriers to care [48].

At times, how and where care is delivered needs to entirely shift. Accordingly, there are several promising new care models that can help advance access and thus improve health outcomes. Telehealth is a technological innovation widely implemented during the COVID-19 public health emergency that allows clinicians to interface with patients via synchronous audio or video to overcome barriers and improve continuity of care [49]. Telehealth consultations can be leveraged to bring HIV care to a primary care clinic or resource-limited and rural settings, or to address the shortage of HIV clinicians via peer mentoring [50-54]. CMS guidance issued June 2023 requires audio-video technology for most nonbehavioral telehealth and permits audio-only for mental health encounters [55]. A systematic review showed improved physician-defined outcomes with videoconference as opposed to audio-only, but patient outcomes were comparable between videoconference and audio-only so lack of videoconference capability should not be a barrier to telehealth encounters [56]. The benefits of a telehealth care model include enhanced access to a multidisciplinary care team, on-demand care, and flexibility [57]. Despite these benefits, telehealth has the potential to introduce privacy and confidentiality concerns and potentially worsen disparities via the digital divide [58-60]. Telehealth also operates under ambiguous state-by-state piecemeal regulations changing in a dynamic environment. Laboratory and vaccination coordination are additional challenges. Telehealth can, however, bring evidence-based care to resource-limited populations such as incarcerated individuals and people who inject drugs, and Drug Enforcement Agency and Substance Abuse and Mental Health Services Administration rules have approved telehealth as an acceptable modality for medications for opioid use disorder and other co-occurring mental health disorders [61-63]. Further, telehealth provides an opportunity to optimize HIV care through low-barrier models such as harm reduction, an approach to health care guided by the philosophy of “meeting people where they are,” both mentally and physically, and treating them with dignity and respect [64]. Syringe services programs and potential alternative care venues, are the cornerstone of harm reduction, aimed at mitigating the harms associated with injection drug use [65]. Another low-barrier model is street medicine, a rapidly evolving form of harm reduction that sets the traditional health care system aside and physically meets people from vulnerable communities (including persons who are unhoused) at sites accessible to them, such as walk-in clinics and other alternative care venues [66-71]. The incorporation of these innovative modalities into the practice of HIV medicine offers an opportunity to optimize care engagement to diverse and need-to-reach communities.

The quality of the patient–provider relationship is often cited as one of the most important factors in care engagement. Having a provider with whom the patient feels comfortable and can communicate effectively and honestly is key to developing this type of relationship [32, 72, 73]. The multidisciplinary care model for care coordination often helps patients remain in care, identifies unmet care needs, and improves adherence to medications [74-76]. Having an HIV team



that includes a case manager, social worker, or staff with similar responsibilities and skills has been shown to enhance adherence to care and engagement [39]. Other team members may include physicians, HIV clinical pharmacists, nurses, nurse practitioners, physician assistants, mental health professionals, peers, health educators, patient navigators, and nutritionists. Culturally and linguistically competent care is critical to successful care engagement. Stigma mitigation is facilitated by diversifying the workforce to represent the patient population served in terms of gender identity, sexual orientation, race, ethnicity, primary language, and ensuring meaningful representation of persons with HIV. A broad range of components, from having staff of the same race, culture, or lifestyle to having art and reading material in the clinic that reflects the culture of the local community, may be useful in facilitating this goal [77]. Dedicated attention to tailored programs that facilitate care engagement is an essential component of effectively caring for persons with HIV. Ensuring the meaningful involvement of people with HIV in program design and implementation is critical to shaping clinical programs that prioritize access and care engagement.

Ongoing monitoring of care engagement and viral suppression is one element in a comprehensive package of quality and performance measures that can enhance care outcomes for persons with HIV. A national expert panel in which HIVMA and IDSA participate has developed HIV quality-of-care performance metrics [78]. These metrics are endorsed by the National Quality Forum and the Center for Medicare & Medicaid Services and have been adopted by many care organizations. Importantly, mortality decreases when performance measures are met [79].

## **Section 2: initial evaluation and immediate follow-up for persons with hiv**

### ***Recommendations***

- A comprehensive present and past medical history that includes HIV-related information, medication/social/family history (Tables 1 and 2), review of systems, and physical examination (Table 3) should be obtained for all patients upon initiation of care, ideally at the first visit or, if not feasible, as soon as possible thereafter. In particular, in settings of rapid ART initiation, clinicians may initially truncate parts of the comprehensive history and physical and provide a more targeted exam but with close follow-up to complete the essential and more comprehensive assessment.
- As many patients will not be able to recall details of prior treatments and laboratory results, medical records should be requested and reviewed, and the current medical record updated accordingly. Baseline laboratory assessments should be obtained at the initial visit (Table 4).

### **Evidence summary**

#### ***History of the Present Illness, HIV-Related and Other Medical and Surgical History***

Table 1 outlines pertinent elements of the history of present illness (the reason that the patient presents to the clinic) and HIV-related information that should be obtained at the initial assessment. Table 2 outlines pertinent elements of the current and past medical conditions, as well as other pertinent history to be addressed at the initial visit. Because of the high incidence of coinfections

and comorbidities in people with HIV, special attention should be paid to this aspect of the history as well as any risk factors that may contribute to the development of comorbidities.

### ***Family medical history***

A family medical history has become more important now that persons with HIV are living longer and are at increased risk for age- and sex-specific conditions in addition to HIV- and treatment-related complications. Clinicians should ask about family history of conditions that might predispose them to malignancies, neurologic diseases, osteoporosis, and atherosclerotic disease and whether there is a family history of early coronary artery disease.

### ***Social history***

Clinicians should ask how the patient is adjusting to the diagnosis of HIV, whom they have informed of their HIV status, and what support they receive from family and friends. If needed, patients should be offered assistance with the disclosure process. Work and educational histories should be discussed, including whether these have been affected by the diagnosis of HIV. Assessment of access to housing, food, transportation, and other primary social needs is essential. Other pertinent information includes insurance issues, financial status, relationship and family status, and plans for having children.

It is critical to obtain a sexual history in an open, nonjudgmental manner, using a sexual health framework, and asking about the 5 “P’s”: past and current partners & practices; protection from STIs (including past PrEP use) and past history of STIs; and pregnancy intention. Although targeted toward a general population, CDC publishes an excellent step-by-step guide to taking a sexual history [80]. Important considerations for counseling and education are discussed in Section I (Optimizing Care). Very few states require health care providers to notify sex partners, but clinicians should be aware of laws in their own jurisdiction, and advocate for repeal of laws that criminalize HIV status [81]. All clinicians should familiarize themselves with basic discussions about gender identity, including communication about appropriate pronouns, and fundamentals of care for transgender and gender-diverse individuals. See Section 11 for further discussion of gender-affirming care.

As part of the initial evaluation and at periodic intervals thereafter, clinicians should assess the presence of depression, anxiety, post-traumatic stress disorder (PTSD), and sexual or physical abuse, including domestic violence, by means of direct questions or validated screening tools (Patient Health Questionnaire-9 [PHQ-9] and Generalized Anxiety Disorder 2-item [GAD-2]) [82, 83]. Persons with HIV have high rates of adult sexual and physical abuse and of childhood sexual abuse. History of current and past psychoactive drug use, including alcohol and tobacco, and injection drug use should be taken. See Section 3 for more on screening and treatment for mental health and substance use issues.

### ***Allergies and Medications***

A discussion of allergies and intolerances should include questions about hypersensitivity reactions to antibiotics and ART. Clinicians should ask about all current medications, including dietary or herbal supplements, some of which have been shown to interact with ART. All prior ART regimens, including years of use, prior side effects, and reasons for switching, should be recorded. It is also important to assess prior adherence to medications and document viral loads while on each regimen.

### ***Review of Systems***

The review of systems should be comprehensive and include questioning about common HIV-related symptoms (see Table 3). Patients should be questioned about how their current weight compares with their past weights, along with a dietary assessment. Given the high incidence of comorbidities in people with HIV, eliciting a history of comorbidities and their risk factors is essential. Depression, anxiety, and PTSD are common among people with HIV, especially cisgender women and lesbian, gay, bisexual, transgender, queer plus (LGBTQ+) populations, and the review of systems should include questions that focus on changes in mood, libido, sleeping patterns, appetite, concentration, and memory.

### ***Physical examination***

A complete physical examination should be performed at the initial encounter or as soon afterward as possible. In addition to recording all vital signs (including height and weight), persons aged 60 years or older should be assessed for frailty. For all patients, the overall body habitus should be assessed, looking for evidence of wasting, obesity, or, particularly in patients who have received older ART regimens, evidence of drug-related lipohypertrophy (including dorsocervical fat pad, gynecomastia, or visceral abdominal fat accumulation) and/or lipoatrophy (including loss of subcutaneous fat in the face, extremities, or buttocks). All adult patients with advanced HIV disease (CD4 cell count <50 cells/ $\mu$ L) as well as infants and young children with profound immunodeficiency should be referred to an ophthalmologist for a dilated funduscopy examination. Though persistent generalized lymphadenopathy is common among untreated persons with HIV, it does not correlate with prognosis or disease progression. However, focal or rapidly progressive lymphadenopathy may require further evaluation, including biopsy. Additionally, if lymphadenopathy does not quickly resolve with initiation of ART, diagnostic studies should be pursued. Neurology and/or neuropsychology referral for assessment of neurocognitive disorders, dementia, and focal neuropathies may be indicated [84, 85]. Cervical motion and uterine or adnexal tenderness on bimanual pelvic examination suggest pelvic inflammatory disease and should prompt STI testing. An anorectal examination is important to evaluate for anal warts, other STIs, and anal cancer, with age-appropriate screening for prostate abnormalities if assigned male at birth.

### ***Baseline laboratory evaluation***

A number of initial laboratory studies are indicated upon presentation with a new HIV diagnosis or for persons who reengage in care (see Table 4). Other tests may be indicated depending on the age and sex of the patient and/or symptoms. In settings where rapid initiation of ART is possible, it is important to obtain baseline laboratory tests, including HIV RNA level, CD4 cell count, resistance testing, viral hepatitis serology, and assessments for safety and general medical condition; however, ART initiation need not be delayed until results are received. The absence of results for human leukocyte antigen subtype B\*5701 (HLA B\*5701), HIV RNA level, HIV genotype, and hepatitis B surface antigen will influence the choice of antiretrovirals for rapid initiation. HIV diagnosis should be confirmed, preferably using a fourth-generation antigen/antibody test with rapid turnaround time if results of HIV screening are not available for review.

### **Recommendations**

#### ***HIV-Specific Tests for All Persons With HIV***

- Patients who have no documentation of their HIV status or who were tested anonymously should have an HIV antigen/antibody screening test performed upon initiation of care. When HIV RNA is obtained in addition to antigen/antibody for HIV screening, an isolated positive HIV RNA should be verified by repeat testing if HIV antibody is negative, especially in the setting of prior use of long-acting cabotegravir as PrEP.
- A CD4 cell count with percentage should be obtained upon initiation of care.
- Measurement of the CD8 cell count and the ratio of CD4 cells to CD8 cells is not considered necessary, as the results are not used in clinical decision making.
- A quantitative HIV RNA level (“HIV viral load”) should be obtained upon initiation of care.
- Patients should be assessed for transmitted drug resistance with a genotype assay for protease and reverse transcriptase mutations upon initiation of care.
- If baseline integrase resistance is suspected, (e.g., transmitted integrase strand transfer inhibitor [INSTI] mutations, or if HIV was acquired after receiving long-acting cabotegravir for PrEP, regardless of the time since drug discontinuation due to the long half-life of injectable drug), genotypic testing for integrase resistance should be obtained.
- Resistance testing should be obtained for patients who reengage in care and who are currently not on ART or who have not had consistent ART access, recognizing that the absence of resistance mutations does not guarantee the absence of resistance when no selective pressure is present.
- Resistance testing, including for integrase mutations, if appropriate, is indicated for patients who are experiencing virologic failure to guide modification of ART and should be performed while the patient is on the failing ART regimen or within 4 weeks of discontinuing the ART regimen.

#### **Evidence summary**

Clinicians should be familiar with the current CDC HIV testing algorithms and interpretation of results based on algorithms and assays used [86]. Confirming an HIV diagnosis is especially important in patients who are asymptomatic and have a normal CD4 cell count and an undetectable or very low viral load. In addition, patients may present to care with misinformation regarding

previous test results. Delayed seroconversion may occur in persons who acquire HIV while taking oral PrEP or, especially, after exposure to cabotegravir as PrEP. If HIV infection is suspected within 3 months of taking oral PrEP or within 12 months following exposure to injectable long-acting cabotegravir (CAB-LA), HIV antibody testing and an HIV RNA level should be obtained. A positive HIV RNA result in the absence of a positive antibody should be verified by repeat testing because of the high rate of false positive HIV RNA results reported in HPTN 083, especially if the last dose of CAB-LA was less than 6 months prior to screening [87, 88]. As new data emerge, CDC guidelines should be consulted for recommendations on screening for HIV in the setting of PrEP use [89].

The initial CD4 cell count is used to stage HIV infection, to help establish the risk of specific HIV-associated complications, and to determine the need for prophylaxis against opportunistic infections. It is important that the clinician and patient be aware of the substantial variation in CD4 cell counts, especially during acute illness. CD4 cell counts may be affected by a variety of medications and intercurrent illnesses, so caution should be applied when interpreting CD4 cell counts during these situations. Although the absolute CD4 cell count is the number most often used in clinical practice, the CD4 cell percentage can also be used to assess immune function and is somewhat less variable than the absolute count. Total CD4 cell counts of 200 and 500 cells/ $\mu$ L generally correspond to CD4 cell percentages of 14% and 29%, respectively. In children aged <5 years, there is more variability in the absolute CD4 cell count; therefore, CD4 percentage is generally preferred for monitoring immune status [86, 90, 91].

The initial HIV RNA level defines the patient's baseline so that response to therapy can be measured. Clinicians should be aware of changes in the type of HIV RNA assay used, the associated variability, and differences in interpretation of results between assays. Thresholds for lower limits of detection for the most commonly used assays range from 20 to 50 copies/mL. Viral load should be measured during the initial evaluation of the untreated patient upon establishing care or when a patient reengages in care. Viral suppression is defined as a viral load persistently below the level of quantification of the assay; however, the threshold for prevention of HIV sexual transmission is considered to be <200 copies/mL [7].

Drug-resistant HIV can be transmitted from one person to another. The purpose of baseline genotypic resistance testing is to assess for resistance (transmitted or acquired) that would influence ART selection. Baseline genotypic resistance testing for protease and reverse transcriptase mutations should be obtained for all persons beginning treatment [7]. Resources are available and frequently updated to assist clinicians in the interpretation of drug resistance mutations [92, 93]. Because transmission of integrase mutations is currently uncommon, baseline integrase genotyping is recommended only when transmission of integrase resistance is suspected, such as when HIV is suspected to have been acquired from an individual known to have been taking a regimen containing an integrase inhibitor [94]. All persons who acquired HIV after using cabotegravir for HIV PrEP should have integrase resistance testing performed due to the long half-life of this drug and the risk of selecting integrase resistance when fully inhibitory drug levels are

no longer present. These individuals should not receive INSTI therapy until an integrase genotype is performed and demonstrates sensitivity [7]. Lack of genotypic testing limits the regimens that may be prescribed, including 2-drug regimens such as dolutegravir/lamivudine fixed-dose combination, which lacks coverage for hepatitis B, and other combinations in which resistance to one drug would result in functional monotherapy [7]. In persons who reengage in care and who have been off therapy for 4 or more weeks, resistance mutations may be absent due to lack of selective pressure rather than absence of resistance, and results should be interpreted with this in mind.

Patients who are taking a failing antiretroviral regimen (HIV RNA level >200 copies/mL) should undergo resistance testing to guide interventions in order to improve viral control. In those with HIV RNA levels between 201 and 500 copies/mL, testing may not be successful but should be considered.

### **HIV-Related Tests in Select Patients**

#### ***Recommendations***

- Co-receptor tropism testing should be performed if the use of a chemokine receptor 5 (CCR5) antagonist is being considered.
- HLA B\*5701 testing should be performed before initiation of abacavir therapy.
- Patients who are positive for the HLA B\*5701 haplotype are at high risk for abacavir hypersensitivity reaction and should never be treated with abacavir (this should be noted appropriately in the medical record).

#### **Evidence summary**

Co-receptor tropism testing is needed to determine which patients are appropriate candidates for initiation or continuation of a CCR5 antagonist [7]. CCR5 antagonists are not effective for patients with X4 or dual/mixed-tropic (D/M) virus. The use of a CCR5 antagonist under these circumstances could increase the risk of virologic failure and the development of resistance to the other drugs in the regimen. Tropism screening may fail to detect X4 or D/M virus present at very low levels, and patients may experience treatment failure with CCR5 antagonists because of the presence of preexisting X4 or D/M virus not detected by the tropism assay. Patients who exhibit virologic failure while taking a CCR5 antagonist may also be considered for tropism testing. Routine tropism testing is not recommended prior to initiation of regimens not containing a CCR5 antagonist. Repeating tropism testing is recommended when considering the use of a CCR5 antagonist as part of the ART regimen even if previously done in the past, unless the previous tropism was X4 or D/M. Tropism may shift from R5 to X4 or D/M during the course of infection, especially with more advanced immunodeficiency (CD4 < 100 cells/ $\mu$ L). A proviral DNA tropism assay can be used in patients with undetectable HIV RNA when considering the use of a CCR5 antagonist in a new regimen [7].

Screening for the HLA B\*5701 haplotype is essential in patients being considered for abacavir therapy in order to identify those who are at high risk for the abacavir hypersensitivity reaction

[7]. A negative test result does not rule out the possibility of a hypersensitivity reaction but makes it extremely unlikely. Patients who have negative test results should still be counseled about a hypersensitivity reaction before being treated with abacavir [7].

## **Laboratory Tests to Assess Safety and General Health**

### ***Recommendations***

- A complete blood count with differential white blood cell count, chemistry panel with electrolytes, glucose, creatinine, calculated creatinine clearance (or estimated glomerular filtration rate [eGFR]), blood urea nitrogen, total protein, albumin, total bilirubin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), and urinalysis should be obtained upon initiation of care.
- Because many antiretroviral drugs, HIV infection itself, and host factors are associated with abnormal cholesterol and triglyceride levels, a lipid profile should be obtained upon initiation of care and repeated fasting, if appropriate.

### **Evidence summary**

Anemia, leukopenia, and thrombocytopenia are common among persons with untreated HIV. The complete blood count also is used to calculate the absolute CD4 cell count. A chemistry panel (including electrolytes, glucose, creatinine, eGFR, blood urea nitrogen, total protein, albumin, total bilirubin, AST, and ALT) is an important tool to assess renal and hepatic function and to look for evidence of preexisting liver injury or hepatitis.

Kidney function is abnormal in up to 30% of persons with untreated HIV, and HIV-associated nephropathy is a relatively common cause of end-stage renal disease, especially in Black persons with HIV, although both rates and mortality have declined with more effective ART [95, 96]. A calculated creatinine clearance or eGFR should be obtained to further assess baseline renal function. The eGFR assists in prescribing antiretroviral agents and other commonly used medications that require renal dosing. Clinicians should be aware that some medications such as cobicistat, dolutegravir, bictegravir, and trimethoprim may affect creatinine secretion and elevate serum creatinine without affecting renal function [97]. A screening urinalysis for proteinuria should be considered at initiation of care and annually thereafter, especially in patients who are at increased risk for developing kidney disease (including those with CD4 cell counts  $<200$  cells/ $\mu$ L or HIV RNA  $>4000$  copies/mL and those with diabetes mellitus, hypertension, or hepatitis C virus [HCV] coinfection) [7]. Patients with proteinuria of grade  $\geq 1$  by dipstick analysis or reduced kidney function can be referred to a nephrologist for consultation and should undergo additional studies, including quantification of proteinuria, renal ultrasound, and possible renal biopsy. As discussed in Section 7, screening for glucose intolerance and diabetes mellitus is recommended because of the increased prevalence in this population. Among adults and children with HIV, fasting blood studies are more problematic because of feeding schedules in children and work schedules in adults, and clinicians should obtain fasting levels when nonfasting levels are abnormal [7]. The lipid profile is important because of high rates of cardiovascular disease in this population

and the importance of managing risk factors. Additionally, several antiretrovirals affect lipid levels or have drug interactions with statins (see Section 7).

## Screening for Coinfections

### *Recommendations*

- Upon initiation of care, persons with HIV without a history of tuberculosis or a prior positive tuberculosis screening test should be screened for *Mycobacterium tuberculosis* infection using either a tuberculin skin test (TST) or an interferon-gamma release assay (IGRA). Those with positive test results should be treated for latent *M. tuberculosis* infection after active tuberculosis has been excluded.
- Persons with HIV who are close contacts of persons with infectious tuberculosis should be treated for latent *M. tuberculosis* infection regardless of their TST or IGRA results, age, or prior courses of tuberculosis treatment; active tuberculosis should be excluded first.
- Persons with HIV should be screened for evidence of hepatitis B virus (HBV) infection upon initiation of care by detection of hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (HBsAb), and antibody to hepatitis B total core antigen (anti-HBc or HBcAb). If HBsAg is positive, HBV viral load should be ordered.
- Persons with HIV should be screened for evidence of immunity to hepatitis A virus (HAV) with HAV immunoglobulin G (IgG).
- Persons with HIV should be screened for HCV antibody upon initiation of care. If positive, HCV RNA should be ordered to assess for active HCV infection. Curative therapy should be offered to all who are diagnosed with active HCV. HCV RNA testing is indicated  $\geq 12$  weeks post-completion of anti-HCV treatment to check for successful and sustained treatment. HCV RNA should be used for screening if HCV infection within the last 6 months is suspected or there is a history of prior HCV infection that has cleared due to spontaneous resolution or curative treatment. HCV RNA should be considered in persons with advanced immunosuppression (CD4 cell count  $< 200$  cells/ $\mu$ L).
- Infants born to persons with HBV and/or HCV should be tested for HBV and HCV transmission.
- Persons who are not immune to HAV and HBV should be immunized according to current national guidelines.
- All persons with HIV born in 1957 or after should be tested for immunity to measles, mumps, and rubella (MMR) by measuring antibodies.
- MMR vaccine should be given to protect against measles, mumps, and rubella if persons were born in 1957 or after and have not received this vaccine or do not have immunity to these infections.
- Serologic screening for varicella zoster virus (VZV) may be considered for persons who have not had chickenpox or shingles and who have not been previously vaccinated (see Section 4).
- Screening for toxoplasma IgG is recommended for asymptomatic persons with CD4 cell count  $< 200$  cells/ $\mu$ L, and for those with symptoms suggestive of toxoplasmosis.
- Testing for serum cryptococcal antigen is indicated in persons with CD4 cell count  $< 100$  cells/ $\mu$ L or in symptomatic patients, but is not routinely recommended in asymptomatic persons if CD4 count  $\geq 100$  cells/ $\mu$ L.

### **Evidence summary**

All persons with HIV should be tested for *M. tuberculosis* infection using TST or IGRA upon initiation of care [7, 98, 99]. A TST or IGRA should be performed any time there is concern of a recent exposure. For those with CD4 cell count  $\leq 200/\mu$ L, testing should be repeated after the CD4



cell count increases to >200 cells/ $\mu$ L following initiation of ART. For a person with HIV, induration of >5 mm by TST is considered a positive result and should prompt chest radiography and other evaluation, as warranted, to rule out active tuberculosis [100]. Annual testing should be considered for those who have negative results by TST or IGRA but are at ongoing risk for exposure [7, 101]. Routine cutaneous anergy testing is not recommended because of lack of standardization of reagents and poor predictive value and because prophylaxis provided to anergic persons has been shown to prevent few cases of tuberculosis [102]. The QuantiFERON-TB Gold<sup>®</sup> in-tube test (Cellestis Limited) and the T-SPOT TB<sup>®</sup> test (Oxford Immunotech) are approved by the FDA as aids for detecting latent *M. tuberculosis* infection.

A large meta-analysis suggests that IGRAs perform similarly to TST when identifying persons with HIV with latent tuberculosis infection [103]. However, prior vaccination with Bacillus Calmette-Guerin (BCG) vaccine may result in a positive TST result, whereas there is less cross-reactivity with IGRA. IGRAs that are reported as indeterminate should be repeated, as follow-up testing may be negative. The CDC states that use of an IGRA is preferred over TST in patients with a history of BCG vaccination and in patients with a low likelihood of returning to have their skin test read. Advanced immunosuppression may be associated with false-negative results in all types of immunologically based tests used for detection of *M. tuberculosis* infection. The routine use of IGRA in children, especially those aged <5 years, is currently not recommended due to limited data and some evidence of lower sensitivity.

Screening for and prevention of HAV, HBV, and HCV are critical in the management of people with HIV. Those who have HBV and/or HCV coinfection should be managed according to the most current published guidelines [98, 104-106]. Hepatitis A vaccination is especially important in persons with unstable housing, for persons who inject drugs (PWID), and for those with chronic liver disease due to recent outbreaks in certain communities [107]. Prevacination screening for HAV infection is cost-effective when there is a seroprevalence of >30% in the patient population [108]. Because of worse outcomes for persons with HIV and HBV coinfection, persons with HIV who also have HBV should be adequately treated for HBV [7]. Because many persons with HIV may be treated with tenofovir-based ART that also suppresses HBV, stopping tenofovir-based ART may result in a flare of HBV, especially when changing ART to a two-drug regimen that does not contain tenofovir. Persons with HBV are at higher risk for hepatocellular carcinoma (HCC) even in the absence of cirrhosis. Screening for HCC in persons with HBV should be conducted according to the American Association for the Study of Liver Diseases guidelines [104]. Persons not immune to HAV and HBV should be immunized according to guidelines (see Section 4).

Persons with HIV should be screened for HCV antibody upon initiation of care. If positive, HCV RNA should be ordered to assess for active HCV infection. HCV RNA should be used in persons with a negative HCV antibody if infection within the last 6 months is expected and in persons with history of prior HCV infection that has cleared due to spontaneous resolution or curative treatment. HCV RNA should be considered in persons with advanced immunosuppression (CD4 cell count

<200 cells/ $\mu$ L), especially in persons who are HCV-seronegative with a history of injection drug use or with unexplained increased serum transaminases because approximately 2-4% of persons with HIV/HCV coinfection have false-negative HCV antibody results, and this occurs primarily among those with advanced immunosuppression [98]. The rate of mother-to-infant HCV transmission is up to 3-fold higher among women with HIV, according to multiple studies, and pregnant people with HIV should be tested for HCV with each pregnancy [106, 109]. Infants can be tested for HCV RNA after age 2 months or for HCV antibody after age 18 months [110]. All persons diagnosed with chronic HCV should be offered curative treatment. Eradication of HCV reduces but does not eliminate the risk of HCC in persons with cirrhosis; therefore, ongoing HCC screening in this group is warranted. Screening for HCC is recommended in all patients with cirrhosis due to hepatitis B or C or other nonviral etiologies (including alcohol use, fatty liver disease) [111].

Acceptable evidence of immunity against measles includes at least one of the following: written documentation of adequate vaccination, laboratory evidence of immunity, laboratory confirmation of measles, or birth in the United States before 1957 [112, 113]. It is advisable to determine anti-varicella IgG levels for patients who are unable to give a history of chickenpox or shingles [114, 115]. STI screening should be obtained as part of the initial assessment. See Section 6.

In spite of a high prevalence of toxoplasma IgG in the population, toxoplasma encephalitis occurs among those with advanced immune deficiency. Screening for toxoplasma IgG, therefore, is indicated for asymptomatic persons with CD4 count <200 cells/ $\mu$ L and for those with a clinical presentation suggestive of toxoplasmosis. Testing for serum cryptococcal antigen is indicated in persons with CD4 cell count <200 cells/ $\mu$ L or in symptomatic individuals [98].

### **Tests that may be performed under certain circumstances**

#### ***Recommendations***

- A baseline chest radiograph should be obtained in all persons with HIV who have a positive tuberculosis screening test result in order to rule out active tuberculosis. It may also be useful in other patients who are likely to have preexisting lung abnormalities, including those who smoke or have a history of injecting drugs.
- Screening for glucose-6-phosphate dehydrogenase (G6PD) deficiency is recommended in individuals, particularly those assigned male at birth of African, Mediterranean, or Asian descent before starting therapy with oxidant drugs such as dapsone and primaquine. Sulfonamides should be used with caution without prior screening.
- Persons of childbearing potential should have a pregnancy test upon initiation of care or reengagement in care.
- In general, routine testosterone testing is not recommended among cisgender males with HIV. However, morning serum testosterone levels are recommended in adult cisgender men with decreased libido, erectile dysfunction, reduced bone mineral density or low trauma fractures, hot flashes, or sweats.
- Obtaining testosterone levels in cisgender women at baseline in non-research settings is not

recommended.

## **Evidence summary**

In general, all persons with HIV do not require a baseline chest x-ray. However, persons with HIV are susceptible to a variety of pulmonary complications. A radiograph obtained at baseline in these individuals as well as in persons with a history of pulmonary disease or smoking may be useful for comparison in the evaluation of future respiratory complaints. People who inject drugs are especially likely to have radiographic abnormalities that may be mistaken for infiltrates; therefore, careful clinical history and physical assessment are warranted to guide subsequent medical decision making. For discussion of cancer screening in persons who smoke, see Section 5. G6PD deficiency is a genetic condition that may result in hemolysis after exposure to oxidant drugs. Persons assigned male at birth and individuals of African, Mediterranean, and Asian descent have higher likelihood of these genetic variants. Dapsone and primaquine are often used to treat persons with HIV and can lead to hemolysis in the presence of G6PD deficiency. Sulfonamides also should be used with caution without prior screening [116, 117].

The pregnancy status of all persons of childbearing potential should be assessed at the initial visit. In addition, the intent to have children, intent or ability to use consistent birth control, and timing of potential conception should be discussed. Although preliminary data suggested that neural tube defects were associated with dolutegravir use during conception, updated data found no statistical significance and dolutegravir is now a recommended drug for treatment during conception as well as pregnancy [118, 119]. The DHHS perinatal guidelines provide ART recommendations for pregnant individuals [120]. The DHHS ART guidelines provide recommendations for individuals who are planning to conceive or those unable to use reliable contraception [7]. (See Sections 8 and 9.)

Cisgender men with HIV, especially those with advanced disease, are at risk for hypogonadism. Interpretation of testosterone values must be made in clinical context, as all currently available assays (including measures of total, free, and bioavailable testosterone) are associated with technical issues that may result in significant variability. Testing should be performed on a specimen obtained in the morning (ideally before 10 a.m.) and confirmed with repeat testing if the result is below the lower limit of normal. Recommendations differ regarding the optimal assay to use for initial testing in the setting of HIV. Because testosterone circulates primarily bound to plasma proteins (including sex hormone-binding globulin and albumin), if total testosterone is used for initial testing, a determination of sex hormone-binding globulin and/or free testosterone is strongly recommended when alterations of binding proteins are suspected (including patients with cirrhosis and hepatitis, hyper- or hypothyroidism, nephrotic syndrome). Free testosterone may be obtained by equilibrium dialysis (most reliable but most expensive) or determined using the free online testosterone calculator, developed by the Hormonology Department, University Hospital of Ghent, Belgium [121]. So-called direct free testosterone (analogue) assays are unreliable and should not be used. If a diagnosis of hypogonadism is established, measurement of luteinizing hormone and follicle-stimulating hormone is recommended to determine whether the

source of dysfunction is primary (testicular) or central (pituitary or hypothalamic) in origin. Hypogonadism should be treated by clinicians familiar with monitoring patients on androgen replacement therapy (see Section 4). For recommendations pertaining to age-appropriate cancer screening, see Section 5.

## **Tests Not Recommended for General Screening Purposes**

### ***Recommendations***

- Routine testing for herpes simplex virus (HSV) IgG, cytomegalovirus (CMV) IgG, and biomarkers of inflammation is not recommended.

### **Evidence Summary**

Routine screening for HSV is not recommended [122]. Routine screening for CMV IgG is not generally useful because CMV seroprevalence is extremely high and generally not actionable [98]. Testing for CMV IgG may be considered, however, if blood transfusion is contemplated in a person at low risk for CMV exposure. The identification of seronegativity would prompt the use of CMV-negative or leukocyte-reduced blood products when transfusions are needed, thus reducing the risk of iatrogenic infection. There are no data supporting the use of inflammatory biomarkers for risk assessment of comorbidities [123].

## **SECTION 3: ROUTINE HEALTH CARE MAINTENANCE CONSIDERATIONS FOR PEOPLE WITH HIV**

Effective HIV primary care requires regular health maintenance, including HIV-related lab monitoring, mental health and substance use screenings, oral health examination, and patient education and counseling. Health assessments that are recommended for the general population (age and gender guided) as well as those specific for people with HIV should be reviewed and addressed at least annually with patients with HIV, whether performed in one or more visits. (Table 5).

### **HIV-Specific Monitoring Following the Initial Assessment**

#### ***Recommendations***

- After initiation of ART, HIV RNA should be rechecked after 2 to 4 weeks but no later than 8 weeks, and then every 4 to 8 weeks, until suppression is achieved. Afterward, viral load should be monitored every 3 to 4 months to confirm maintenance of suppression below the limit of assay detection. This interval may be prolonged to every 6 months for patients whose viral load has been suppressed for more than 1 year and whose clinical and immunologic status is stable. Viral load should be monitored more frequently after reinitiating or changing ART, preferably within 2 to 4 weeks, with repeat testing every 4 to 8 weeks until viral load becomes undetectable. More frequent testing may be considered in other clinical scenarios such as pregnancy and/or breastfeeding.
- If HIV RNA results are above the limit of assay detection but <200 copies/mL, referred to as “blips”, assessing and addressing medication adherence, tolerability, and drug–drug interactions is warranted

with an earlier repeat of HIV RNA testing.

- CD4 cell count should be monitored to determine the need for prophylaxis against opportunistic infections and to aid in generating appropriate differential diagnoses. CD4 cell counts should generally be monitored every 3 to 6 months for the first 2 years or if the virus is not suppressed. After 2 years, for patients on suppressive ART regimens with CD4 cell counts 300–500/ $\mu\text{L}$ , CD4 cell count can be monitored every 12 months unless there are changes in the patient’s clinical or virologic status. If the CD4 cell count rises above 500 cells/ $\mu\text{L}$ , CD4 monitoring is optional.
- Repeat HIV genotypic resistance testing for mutations in the reverse transcriptase and protease genes, including in the integrase genes when there is history of INSTI use, should be performed if virologic failure occurs and when clinically indicated. If ART initiation has been delayed, repeat genotype testing prior to ART initiation should be considered.

### **Evidence summary**

Frequency of HIV RNA monitoring depends on the response to therapy and duration and consistency of viral suppression. Once ART has been initiated, HIV RNA is monitored to confirm response to therapy and attainment and maintenance of viral suppression. After HIV RNA has become undetectable, monitoring is approximately quarterly but can be every 6 months for persons with at least 1 year of continuous suppression and stable clinical and immune status [7]. Testing may be warranted more frequently during pregnancy and/or breastfeeding, and recommendations from the HHS Perinatal Antiretroviral Guidelines should be followed [120].

After virologic suppression has been achieved, if a viral load “blip” (isolated increase in HIV RNA above the limit of assay detection but  $<200$  copies/mL that is followed by spontaneous suppression) or persistent low-level viremia with HIV RNA  $<200$  copies/mL occur, medication adherence should be assessed and any identified barriers should be addressed. Medication tolerability should be reviewed, and side effects should be managed. Potential drug–drug interactions, including with over-the-counter medications and supplements, should also be reviewed. Earlier HIV RNA testing, e.g., after 2–4 weeks, to ensure no virologic failure (two consecutive HIV RNA levels  $>200$  copies/mL) has occurred is recommended [6]. If low-level viremia occurs, HIV viral load should be checked at least every 3 months to ensure that virologic failure has not occurred. As discussed in Section 1, assessing adherence regularly, ideally through a multidisciplinary team approach, is essential for identifying and addressing barriers with a goal of preventing loss of virologic suppression and promoting improved adherence after such loss. Once ART is initiated and sustained virologic suppression is achieved, CD4 cell count can be monitored less frequently. Once the virus is suppressed for at least 2 years and CD4 cell count rises above the levels associated with risk for opportunistic diseases, monitoring can occur annually, or not at all if  $>500/\mu\text{L}$  [7].

The recommended frequency of HIV RNA and CD4 monitoring is not the only determinant of how frequently patients should be seen for overall health care needs. Patients with concurrent medical conditions may need to be seen more frequently, as may those needing ancillary services, such as treatment adherence counseling, mental health and substance use treatment services, STI screening, HIV education, case management services, or harm reduction counseling.

If virologic failure occurs, genotypic resistance testing for mutations in reverse transcriptase, protease, and integrase (if indicated) genes should be performed to guide choice of the next treatment regimen. Repeat resistance testing also may be considered prior to initiating ART, if ART initiation has been substantially delayed [7].

## **Other lab monitoring**

### ***Recommendations***

- Complete blood count should be monitored every 12 months or when clinically indicated.
- A chemistry panel including glucose, creatinine, eGFR, electrolytes, AST/ALT, and total bilirubin should be done 1-2 months after ART initiation or change. Otherwise, it should be done every 6 months and when clinically indicated. If the patient is not on ART, a chemistry panel should be done every 6-12 months.
- Urinalysis should be monitored annually among those at risk for kidney disease and when clinically indicated. Urinalysis should be monitored before and during treatment with tenofovir disoproxil fumarate (TDF) or tenofovir alafenamide (TAF).
- Tuberculosis screening should be performed annually for persons at risk for infection. Repeat testing is recommended in patients with advanced HIV disease who initially had negative TST or IGRA results but subsequently experienced an increase in the CD4 cell count to >200 cells/ $\mu$ L on ART and who may thus have developed sufficient immune competence to mount a positive reaction.
- HCV screening with HCV antibody should be repeated for persons at increased likelihood of exposure every 12 months or when clinically indicated. Screening with HCV RNA rather than HCV antibody is indicated for persons with suspected HCV infection within the past 6 months and previous HCV infection that has cleared due to spontaneous resolution or curative treatment. Screening with HCV RNA instead of HCV antibody should be considered for persons with severe immunodeficiency (CD4 count <200 cells/ $\mu$ L).
- Consider repeating hepatitis B serology, including HBsAb, HBsAg, and HBcAb, in persons not infected with nor immune to HBV who are switching to an ART regimen not containing tenofovir and when clinically indicated, including before starting HCV treatment with direct-acting antiviral (DAA) medication.
- Pregnancy testing for hepatitis B in people with HIV of childbearing potential should be performed prior to ART initiation or modification and when clinically indicated.

### **Evidence summary**

Complete blood count and chemistry panels should be monitored on a regular basis as needed to assess medication toxicity and to monitor potential or existing comorbid conditions (e.g., chronic kidney disease, hepatitis). The frequency of monitoring depends on the presence of underlying medical conditions and the need to monitor for ART toxicities, depending upon the regimens chosen [6, 7, 124]. Persons with co-occurring diabetes, hypertension, HCV, nephrotoxic medication such as tenofovir, genetic predisposition, or advanced HIV disease are at increased likelihood of kidney disease and should be monitored for renal function at least every 6 months and urinalysis at least annually. Urinalysis should be monitored before and during treatment with tenofovir-containing compounds [6, 7, 124].

Annual tuberculosis screening should be considered for those who have negative results for latent tuberculosis but are at ongoing risk for exposure such as through incarceration, congregate settings, homelessness, and travel to high-TB incidence countries [98, 101]. A TST or IGRA should be performed any time there is concern of a recent exposure or after an increase of CD4 cell count to >200 cells/ $\mu$ L following initiation of ART. Routine cutaneous anergy testing is not recommended.

HCV screening should be repeated at least annually in persons who are at increased likelihood of exposure such as persons who inject drugs, cisgender men who have sex with cisgender men, and transgender women [98, 125-128]. HCV RNA testing is indicated for screening when HCV infection within the past 6 months is suspected and in people who have previous HCV infection that has cleared spontaneously or through treatment. HCV RNA testing should be considered when a person has severe immunodeficiency with CD4 count <200 cells/ $\mu$ L, especially if the person has a history of injection drug use or an ALT level above the upper limits of normal [7, 129]. Repeating HCV RNA after confirmed curative therapy (undetectable HCV RNA at least 12 weeks post-completion of treatment) is not necessary unless there is a clinical indication such as evidence of unexplained liver injury or ongoing exposure [106].

Persons who have negative hepatitis B serology should be vaccinated (see Section 4). Persons who test positive for HBV infection (with presence of HBsAg or HBV DNA) should have TDF or TAF and FTC or 3TC included in the ART regimen. People who test positive only with HBcAb may have resolved HBV infection with loss of HBsAb, and HBV DNA testing can be performed to confirm. If the HBV DNA test is negative, the person should then be vaccinated. Hepatitis B virus reactivation can occur in patients during and after treatment with HCV DAA medication, and repeat hepatitis B screening (including with HBV DNA testing if indicated) should be considered in patients not infected with or immune to HBV, especially those with isolated HBcAb, prior to treatment with HCV DAAs [7, 130-132].

A pregnancy test should be performed in persons of childbearing potential prior to initiating or modifying ART. Clinicians should discuss the benefits of ART to the patient and the infant as well as regimens that are recommended during pregnancy and their potential toxicities. Shared decision making with the patient should occur regarding the choice of ART for initiation, continuation, or modification.

## **Screening and Treatment for Mental Health and Substance Use Issues**

### ***Recommendations***

- Screening for depression using a validated screening tool should be conducted on every adult patient at least once, with frequency of screening based on risk. Annual screening is reasonable given the elevated risk of depression in people with HIV.
- Screening for anxiety using a validated screening tool should be conducted on every adult patient under the age of 65 years, with frequency of screening based on risk. Annual screening is reasonable given the elevated risk of anxiety in people with HIV.

- Screening for tobacco use should be done for every person with HIV at every visit. Current smokers should be advised of the benefits of quitting and offered options to assist with smoking cessation, including pharmacotherapy and connection to behavioral interventions.
- Screening for unhealthy alcohol use and substance use using validated screening tools should be done on every adult patient at least once with frequency of screening based on need. Annual screening is reasonable given the elevated risk of unhealthy alcohol and substance use in people with HIV. Individuals diagnosed with an alcohol or substance use disorder should be offered treatment including pharmacotherapy (such as methadone or buprenorphine for opiate use disorder) and connection to behavioral health interventions.
- Individuals who inject drugs should be counseled on safer injection and substance use practices in preventing viral hepatitis and other infectious diseases and injection-related conditions such as endocarditis, osteomyelitis, cellulitis, and abscesses. They should be educated on PrEP and PEP for injection partners and provided information on syringe services programs where available.
- All individuals with substance misuse or use disorders should be provided with life-saving medications like naloxone for overdose prevention.

### **Evidence summary**

People with HIV have high rates of depression; anxiety; and tobacco, alcohol, and substance use disorders. After initial screening, optimal screening intervals for mental health and substance use disorders are not known. Repeat screening on a regular basis, such as annually, is reasonable because of the high prevalence of these conditions among people with HIV [133-136]. Screening for depression and anxiety should include the use of validated screening tools such as Patient Health Questionnaire-2 (PHQ-2), PHQ-9, and GAD-2 [82, 83, 137, 138]. People with HIV should be screened for drug and alcohol use with validated screening tools like the Alcohol Use Disorders Identification Test (AUDIT) and the Drug Abuse Screening Test (DAST) [134, 136, 139]. Self-reported substance use screening tools can be incorporated into electronic health records [140]. Those who are found to have alcohol or substance misuse or use disorders should be offered or referred for pharmacotherapy, such as buprenorphine or methadone for opioid use disorder and naltrexone for alcohol or opioid use disorder, and/or behavioral health treatment provided within a harm reduction model of care. Education on safer injecting practices and drug use, syringe services programs, and overdose prevention provides people with choices on how to minimize health risks such as injection-related infections and where to access services if and when they are ready. Naloxone should be provided for overdose prevention. Co-location of substance use treatment with HIV care is ideal [141]. Brief interventions that include use of motivational interviewing can be provided by trained health care personnel [142].

Tobacco use is a major cause of decreased life expectancy and poor health outcomes in people with HIV, including cardiovascular disease and lung cancer [143-146]. People with HIV should be asked about tobacco use at every visit [147-149]. This can be accomplished, for example, by making it part of vital signs. People who do smoke tobacco should be counseled on the benefits of quitting, offered pharmacotherapy, especially varenicline, and connected to behavioral health interventions [150, 151]. See Section 5 for cancer screening in smokers.

### **Other health maintenance considerations**



## **Recommendations**

- All persons with HIV, regardless of sexual orientation and gender identity, should be asked about their pregnancy intentions. Persons of childbearing potential should be routinely asked about their pregnancy intentions, especially prior to treatments that may affect the ability to have children or the outcome of pregnancy.
- Patient education should be tailored at every visit based on the patient's current needs. In particular, the clinician should evaluate the need for education on
  - The importance of medication adherence in achieving viral load suppression to maximize personal health and eliminate HIV transmission to sexual partners (U=U);
  - Optimizing sexual health of the patient and their sexual partners by informing patients about PrEP, PEP, barrier methods, and other strategies for HIV and STI prevention; and
  - Safer use of recreational drugs and their potential side effects and known drug interactions.
- All persons with HIV should have regular oral health examinations, at least every 6-12 months.

## **Evidence summary**

Pregnancy intention and family planning are important to discuss with every patient, especially prior to prescribing medication or treatments that may affect pregnancy or fertility such as ART or hormone therapy for gender-affirming care. Education should include U=U and ability to become pregnant without risk of HIV transmission as well as available options on preserving sperm/ova for future family planning prior to certain treatments. Every patient should also be informed of their possibility of becoming or getting their partner pregnant and, if desired, options for birth control should be reviewed and offered. (See Section 8.)

Barriers to adherence and care engagement should be repeatedly assessed. Clinicians should engage in effective patient education in a respectful and nonjudgmental manner for maintenance of physical, emotional, spiritual, and sexual health. Providing information on medication adherence, sexual health, and recreational drug use is critical in engaging and retaining patients in care. (See Section 1.)

People with HIV have frequent oral health complications, especially if the CD4 cell count is low [152]. Any oral health complication identified should be addressed immediately. In addition, every patient should have regular oral health exams and, given the risks for oral complications, biannual examination for people with HIV is reasonable.

## **SECTION 4: IMMUNIZATIONS FOR PERSONS WITH HIV**

Vaccinations are routinely delivered as part of primary care visits, and HIV primary care providers play a unique and trusted role in providing counseling and guidance on immunizations. However, due to the time required for counseling, it is advisable to consider using standing orders and delegate routine vaccinations, which do not require shared decision making, to other members of the health care team, such as qualified nursing or pharmacy staff. Shared decision making is a collaborative process often used when there is uncertainty regarding the benefits of a specific

treatment for a particular population [153, 154]. The health care provider shares clear and understandable information about the health condition, explains the necessary decisions and available options, and allows the patient to express their preferences and values. Together, the patient and provider discuss the pros and cons, including risks, resulting in a collaborative decision that respects the patient's autonomy. Studies have shown that when shared decision making is not required, computerized standing orders are more effective than computerized reminders, especially for offering influenza and pneumococcal vaccination [153, 155]. Immunizations are increasingly regarded as a measure of health care quality, and all members of the health care team can collectively contribute to achieving these quality metrics. Current immunization recommendations are included in Table 6, but recommendations change frequently and HHS opportunistic infection guidelines and ACIP recommendations should be checked frequently [98, 110, 156].

### **Pneumococcus, influenza, meningococcus, tetanus-diphtheria-pertussis**

#### ***Recommendation***

- Vaccination against infection with pneumococcus, influenza, tetanus-diphtheria-whooping cough, and meningococcus should be offered to all people with HIV.

#### **Evidence summary**

Evidence of increased invasive disease due to 7 serotypes not covered in pneumococcal conjugate vaccine (PCV)-13 (Prevnar13<sup>®</sup>) and the approval of new vaccines with broader coverage have led to revised recommendations for pneumococcal vaccination. The use of PCV20 (Prevnar 20<sup>®</sup>; Vaxneuvance<sup>®</sup>) alone or a combination of PCV15 plus 23-valent pneumococcal polysaccharide vaccine (PPSV23; Pneumovax23<sup>®</sup>) given at least 8 weeks later are now recommended for all individuals aged  $\geq 65$  years or for those between 19 and 64 years with underlying conditions (such as HIV) who are unvaccinated or whose vaccination status is unknown (See Figure 1). Although there are no clinical outcome data in people with HIV, no additional PPSV23 doses are needed when PCV20 is used, making this a simple and preferred regimen [157, 158]. For those who have received both PCV13 and PPSV23 and are  $< 65$  years, one dose of PCV20 can be administered at least 5 years after the last dose of PPSV23 to complete the series or a second dose of PPSV23 can be administered at least 5 years after the prior dose, with a third and final dose administered at age 65 years or later, but at least 5 years after the last PPSV23 dose. For persons at least 65 years of age at the time of a PPSV23 dose, no further doses are needed. Those who have only received PPSV23 can be given PCV20 with no additional vaccinations, or they can be given PCV15 followed by PPSV23 after 8 weeks. Those who have received only PCV13 can be given PCV20 at least 1 year later to complete the series, or PPSV23 at least 8 weeks later, with subsequent PPSV23 doses to complete the series. Individuals who do not have access to PCV15, PPSV23, or PCV20 should use whatever is available to offer protection. For those who are younger than 65 years and received PCV20 or PCV15 with PPSV23 at least 8 weeks later, no additional pneumococcal vaccine is needed at age 65. It is recommended to engage in shared decision making when considering PCV20 for adults aged  $\geq 65$  years who completed their series with other

vaccines. If the decision to administer is made, it should be administered at least 5 years after the last PPSV23 dose. PCV21 (Capvaxive<sup>®</sup>) also has been approved by FDA and could be substituted for PCV20 in adults in whom a dose of PCV20 is currently recommended [159]. At time of publication of this guidance, no specific data are available for PCV21 in people with HIV.

All people with HIV should receive annual influenza vaccination, but they should not receive live vaccination via nasal spray (LAIV4 Flumist<sup>®</sup>). Those ages >65 years should receive one of three high-dose, adjuvanted, or recombinant influenza vaccines: HD-IIV4 (Fluzone<sup>®</sup>), aIIV4 (Fluad<sup>®</sup>), or RIV4 (Flublok<sup>®</sup>) [160, 161]. Recommendations for tetanus toxoid, reduced diphtheria toxoid, and reduced acellular pertussis (Tdap; Adacel<sup>®</sup>, Boostrix<sup>®</sup>) are the same as for the general population. Pregnant individuals should receive Tdap during each pregnancy between 26- and 37-weeks' gestation [162]. Adults with HIV should receive a 2-dose quadrivalent meningococcal conjugate vaccine primary series of serogroup A, C, W, and Y (Menveo<sup>®</sup>, MenQuadfi<sup>®</sup>) at least 2 months apart if not previously vaccinated. After the primary series, revaccination should occur every 5 years. Serogroup B meningococcal vaccine (Bexsero<sup>®</sup>, Trumenba<sup>®</sup>) is not routinely recommended but may be given to persons aged 16–23 years and in certain circumstances [163]. Although there are no specific data in people with HIV, a new pentavalent meningococcal vaccine containing antigens from serogroups ACWY and B (Penbraya<sup>®</sup>) may be given when both vaccines are indicated at the same time [156].

## Hepatitis A and B (HAV, HBV)

### *Recommendations*

- Vaccination for HAV is recommended for all nonimmune individuals with HIV, especially those with indications for hepatitis A vaccine (including PWID, those unstably housed, those with current or prior incarceration, gay and bisexual men or transgender persons with chronic liver disease, travelers to countries with high endemicity, or persons who have hepatitis B and/or C).
- HAV IgG antibody testing should be repeated 1–2 months or at the next scheduled visit after the second vaccine to assess for immunogenicity. A repeat vaccine series is recommended in those who remain seronegative.
- Individuals susceptible to infection should be vaccinated against HBV.
  - The adjuvant recombinant vaccine (HepB-CpG; Heplisav-B<sup>®</sup>) 2 doses at 0, 1 month is preferred.
  - Alternative regimens can be used if HepB-CpG is not available, including: double doses of the recombinant hepatitis B vaccines Engerix-B<sup>®</sup> 40 mcg (two 20-mcg doses) or Recombivax-HB<sup>®</sup> 20 mcg (two 10-mcg doses) or standard doses of the combined hepatitis A and recombinant hepatitis B vaccine (Twinrix<sup>®</sup>) given at 0, 1, and 6 months.
- HBsAb levels should be checked 1–2 months after completion of the primary immunization series. If HBsAb < 10 mIU/mL, revaccinate with a full vaccine series. Three doses of HepB-CpG may be considered.
- Vaccination should be recommended for nonimmune sexual partners of persons who are positive for HBsAg.
- Persons who are negative for HBsAg and HBsAb but positive for HBcAb should receive vaccination.

### **Evidence summary**

Responses to both HAV and HBV vaccines are reduced in patients with CD4 cell count <200 cells/ $\mu$ L and those with quantifiable HIV RNA levels. An interim analysis of ACTG study A5379 of adjuvanted recombinant HepB-CpG (Heplisav-B<sup>®</sup>) given at 0, 1, and 6 months to unvaccinated people with HIV who had viral suppression and a median CD4 of 625 cells/ $\mu$ L (range 149–1562) showed 100% developing seroprotective titers of HBsAb >10 mIU/mL at 28 weeks (4 weeks after a three-dose vaccine series). At 24 weeks (after two doses and prior to the third dose), 98.5% had seroprotective titers. In addition, at 28 weeks (4 weeks after the third dose), 83.8% had titers above 1000 mIU/mL [164]. These data are promising, but durability of such high titers is unknown and will be assessed in the ongoing A5379 study [164]. In a person with a high CD4 cell count, a two-dose HepB-CpG series is seroprotective, but the high titers achieved after a third dose in persons with high CD4 and suppressed virus, as well as improved responses after a third dose in persons without HIV but who had chronic kidney disease, suggest that those with low CD4 cell counts might achieve a more robust response with three doses. Until additional data is available, if a titer >10 mIU/mL is not achieved, consider the patient a nonresponder and a full revaccination series is recommended [98].

Vaccines that can be used if HepB-CpG is not available include two recombinant hepatitis B vaccine (Engerix-B<sup>®</sup> or Recombivax-HB<sup>®</sup>) using a double dose at 0, 1, and 6 months or combined hepatitis A and hepatitis B recombinant vaccine at 0, 1, and 6 months. PreHevbrio<sup>®</sup> is a third recombinant vaccine for which insufficient data exist in people with HIV. Patients who fail to respond to an initial series can be revaccinated with a full series of double-dose Engerix-B<sup>®</sup> or Recombivax-HB<sup>®</sup> (at 0, 1, and 6 months) or a complete two-dose series of HepB-CpG. Initial data from ACTG 5379 look promising for two or three doses of HepB-CpG in people with HIV who did not achieve seroprotection from an initial vaccination series. In these individuals, either two or three doses of HepB-CpG was superior to three single-strength doses of Engerix-B<sup>®</sup>, with seroprotective responses of 93.1%, 99.4%, and 80.6% respectively [165]. Although few people with low CD4 counts were included in the study, these preliminary data suggest that three doses of HepB-CpG might be an effective strategy for revaccination in these individuals. A two-dose strategy is likely to achieve seroprotection for many, and checking HBsAb levels 2 months after the second dose can inform if a third dose should be given at 6 months, as both strategies were superior to three-dose single-strength recombinant vaccine. However, ACTG 5379 is ongoing and durability of seroprotection is still unknown. No safety data on HepB-CpG are available in pregnancy; therefore, HepB-CpG should be avoided in this population. For those initially vaccinated when CD4 count was <200/ $\mu$ L, an improved response may be observed after achieving virologic suppression on ART and a CD4 count >200 cells/ $\mu$ L. One dose of vaccine should be administered to those persons who have a positive anti-HBc with a negative HBsAg and HBsAb. If HBsAb titer is not >100 mIU/mL, a full series should be administered [166]. Prior to administration of any HBV vaccine, confirm the patient does not have chronic HBV.

Those who have been incompletely vaccinated should receive one dose of hepatitis B vaccine following exposure to HBV. Those who have not been vaccinated should receive hepatitis B

immune globulin (HBIG) within 24 hours to 7 days for percutaneous and up to 14 days for sexual exposure to HBV. All infants born to HBsAg-positive persons should receive hepatitis B immune globulin and hepatitis B immunization, preferably in the first 12 hours of life. Routine vaccination for HAV and HBV is recommended for all infants [120, 167]. Serologic testing for viral hepatitis should be repeated if suspected exposure occurs or there are newly elevated transaminase levels.

## **Mmr, hpv, vzv**

### ***Recommendations***

- MMR vaccine should be administered to people with CD4 count  $\geq 200$  cells/ $\mu\text{L}$  to protect against measles, mumps, and rubella if persons were born in the U.S. in 1957 or after and have not received this vaccine or do not have immunity to these infections.
- Persons aged between 9 and 26 years should be vaccinated against human papillomavirus (HPV), and those aged 27–45 years who are unvaccinated or inadequately vaccinated should be offered the vaccination series, if appropriate, through shared decision making.
- Persons who are susceptible to VZV (those who have not been vaccinated, have no history of varicella or herpes zoster, or are seronegative for VZV) should receive postexposure prophylaxis with varicella zoster immune globulin (IG) as soon as possible (but within 10 days) after exposure to a person with varicella or shingles.
- Varicella primary vaccination should be considered in VZV seronegative persons aged  $>8$  years with CD4 cell counts  $>200$  cells/ $\mu\text{L}$  and in children with HIV aged 1–8 years with CD4 cell percentages  $>15\%$ . Primary varicella vaccination is contraindicated for persons with CD4  $< 200$  cells/ $\mu\text{L}$ .
- Recombinant zoster vaccine (RZV), two-dose series, should be given to those aged  $\geq 18$  years to prevent reactivation. Response may be better if suppressed on ART and CD4  $>200$  cells/ $\mu\text{L}$ .

### **Evidence summary**

In 2019, there were 1,274 individual cases of measles in 31 states, the highest number reported in the United States since 1992 [168]. The majority of cases occurred in individuals who had not received measles vaccination. The MMR vaccine is administered in a two-dose series with at least 1 month between doses. MMR should not be given if CD4 is below 200 cells/ $\mu\text{L}$ . Acceptable evidence of immunity against measles includes written documentation of adequate vaccination, laboratory evidence of immunity, laboratory confirmation of measles, or birth in the United States before 1957 [113].

A preventive 9-valent HPV vaccine (9vHPV; Gardasil<sup>®</sup>) is routinely recommended in a three-dose schedule for all persons with HIV aged 9–26 years. Catch-up vaccination can be offered to those aged 27–45 years based on shared decision making [156, 169]. The vaccine is safe and highly effective in preventing infection with the HPV subtypes associated with genital warts and those responsible for approximately 70% of cervical cancers and most anal cancers. Evidence shows a vaccine-associated decrease in the prevalence of HPV infections, anogenital lesions, and precancerous cervical neoplasia [169]. Studies show the safety of HPV vaccine in women, men, and children [170]; however, the efficacy data for people with HIV are limited with mixed results [171–174]. Furthermore, little is known about the efficacy of HPV vaccination in older age groups. One study reported HPV vaccination even given to those with HIV at older age but less than 45

years of age reduced anal dysplasia [175]. The vaccine is not expected to impact the development of cancer in those already harboring oncogenic subtypes. All persons with HIV should receive three, rather than two, doses of vaccine, regardless of age [176].

Varicella vaccination (Varivax<sup>®</sup>) should be considered (two doses of single antigen varicella vaccine, not measles/mumps/rubella/varicella, administered 3 months apart) for adults and adolescents with HIV with a CD4 cell count >200 cells/ $\mu$ L on suppressive ART who do not have prior evidence of immunity to varicella (including documented prior infection) [177, 178]. Children should also receive the vaccine if aged >8 years and with a CD4 percentage  $\geq$ 15%. Persons without evidence of immunity who have no history of varicella or shingles and no history of vaccination against VZV and who are at risk of developing severe disease or complications should receive varicella zoster IG within 10 days after exposure to persons with varicella or shingles [110, 177, 178]. Varicella zoster IG is not indicated for persons who received two doses of varicella vaccine and became immunocompromised later in life [110, 177]. RZV (Shingrix<sup>®</sup>) should be administered to adults aged  $\geq$ 18 years using two doses 2 to 6 months apart for the prevention of herpes zoster [98]. Those whose virus is suppressed on ART with CD4 >200 cells/ $\mu$ L may respond better, but the vaccine can be safely given regardless of CD4 count. Those who have not had varicella exposure (either infection or vaccination) should not be offered this vaccine. Data indicate 99% of those born prior to 1980 have had varicella even if they do not recall it [179]. Studies in HIV have found the vaccine to be safe and immunogenic after two doses.

## **Covid-19, mpox, rsv**

### ***Recommendations***

- All people with HIV should receive updated COVID-19 vaccines as recommended by CDC. Due to rapid changes in recommendations, check the CDC guidance for the most current information.
- The following should be counseled about transmission of mpox and offered vaccination with live-nonreplicating MVA-BN vaccine. The full two-dose series is required for optimum protection.
  - Persons without mpox lesions who have known or suspected exposure to someone with mpox, or a sex partner in the past 2 weeks who was diagnosed with mpox;
  - Cisgender men who have sex with cisgender men or transgender, nonbinary, or gender-diverse persons who, in the last 6 months, have had a new diagnosis of an STI or more than one sexual partner;
  - Persons who, in the last 6 months, have had sex at a commercial sex venue, or sex related to a large commercial event or in a geographic area where mpox transmission is occurring;
  - Persons who have a sex partner with any of the above risks or persons who anticipate experiencing any of the above scenarios.
- Persons ages 75 years and older should receive one dose of a respiratory syncytial virus (RSV) vaccine. Those ages 60–74 years who are at increased likelihood of severe RSV should receive one dose of an RSV vaccine.

### **Evidence summary**

Vaccination against SARS-CoV-2 has had a dramatic impact in reducing severe illness, hospitalization, and mortality. People with HIV are at increased likelihood of reinfection with

SARS-CoV-2 [180] and for post-COVID conditions (PCC, formerly postacute symptoms of COVID or PASC), and vaccination also protects against development of PCC [181]. Those who are previously unvaccinated or who received monovalent COVID-19 in the past, should now receive an updated COVID-19 vaccine at least 2 months after getting the last dose [182]. Note that these recommendations continue to change, and all clinicians should check the CDC website for the most current information [183].

CDC recommends vaccination against mpox for cisgender gay, bisexual, and other men who have sex with cisgender men, or those who are transgender, gender-diverse, or nonbinary, and who, in the past 6 months, have had a new diagnosis of at least one sexually transmitted infection, or more than one sex partner. Additionally, persons who, in the last 6 months, have had sex at a commercial sex venue, or sex in association with a large public event or in a geographic area where mpox transmission is occurring, should be offered vaccination. Vaccination also is recommended for sexual partners of persons described above and persons who anticipate experiencing any of the above [156]. A live nonreplicating vaccinia virus vaccine for smallpox and mpox (MVA-BN; Jynneos<sup>®</sup>) is safe to administer to those with immunocompromising conditions including HIV, although the immune response may be diminished in this population, particularly with low CD4 counts or unsuppressed virus. There are insufficient data on pregnancy and breastfeeding. The peak antibody response is achieved two weeks after the second dose [184]. Data from an electronic record review suggest that Jynneos<sup>®</sup> vaccine was effective in preventing mpox disease [185]. It is crucial that both doses are received for optimal immunity. Those who are unvaccinated and have had exposure should receive the complete series with the first dose within 4 to 14 days of exposure [98]. The duration of protection remains uncertain, but there is evidence suggesting that severity of disease is reduced in individuals, including those with HIV, who develop mpox after vaccination [186-188]. The live attenuated ACAM 2000 smallpox vaccine should not be given to people with HIV. (See also Section 6.)

RSV is a highly contagious virus that can cause severe lower respiratory infections in young children and older adults. Recently, the FDA approved two vaccines for those 60 years or older, based on risk for severe RSV disease. The RSVPreF3 is a single-dose adjuvanted recombinant prefusion F protein (preF) vaccine, and the RSVPreF is a single-dose recombinant stabilized preF vaccine (Arexvy<sup>®</sup>, Abrysvo<sup>®</sup>). In clinical trials, the efficacy of preventing RSV-associated lower-respiratory infection varied from 77% to 81% [189]. There were 6 cases of inflammatory neurologic events after RSV vaccination out of 38,177 participants who received the vaccines [189]. Persons ages 60 to 74 who have heart or lung disease or weakened immune systems, who are frail, or who live in a group setting are at increased likelihood of severe RSV and should receive one dose of an RSV vaccine. Persons ages 75 years and older should receive one dose of an RSV vaccine. Data regarding RSV vaccine in people with HIV are limited. Risks and benefits should be assessed based on shared decision making [190].

## **Travel vaccination**

## **Recommendation**

- Individuals who are traveling should be advised to follow CDC guidelines, with particular attention to CD4 count, based on their travel activities and destinations.

## **Evidence summary**

Cholera is a toxin-mediated bacterial infection due to ingestion of contaminated food or water, leading to severe watery diarrhea. Cholera is likely to occur in areas with inadequate sanitation. CVD103-HgR (Vaxchora<sup>®</sup>) is a single-dose live attenuated oral cholera vaccine recommended for travel to high-risk areas in which *Vibrio cholera* transmission can occur. The duration of protection is approximately 3 months, and efficacy of the vaccine may be lower in people with HIV. CVD103-HgR should be given at least 10 days prior to potential exposure among those 18–64 years [191]. Before 2022, poliovirus cases had not been seen in the U.S. for over 30 years and only a limited number of cases had been reported in Afghanistan and Pakistan. In 2022, there was a 23% increase globally in polio cases caused by circulating vaccine-derived poliovirus and decreased polio vaccination rates, including a paralytic case in New York City, accompanied by detection in local wastewater surveillance for polio virus [192]. Risk of acquiring vaccine-derived polio is low and can be mitigated by vaccination. Those who may have high-risk exposure can receive three-dose vaccine (Ipol<sup>®</sup>) if CD4 is >200 cells/ $\mu$ L and if benefit outweighs risk [193]. Typhoid fever can cause life-threatening illness due to *Salmonella Typhi*. Those traveling to high-incidence areas should consider vaccination to reduce risk for typhoid fever. Typhoid vaccine (Thyphim Vi<sup>®</sup>) is available that covers *Salmonella enterica* serotype paratype A, B, and C. Administer the IM vaccine 1 week prior to travel. Live-attenuated oral vaccine (Vivotif<sup>®</sup>) should be avoided in people with HIV [194].

## **SECTION 5: SCREENING FOR AND PREVENTION OF CANCER**

Because of an increased likelihood of both first and second primary cancers among people with HIV, enhanced cancer prevention, screening, and treatment efforts are needed for people with HIV both before and after initial cancer diagnosis. It is recommended that clinicians treating cancer inquire and screen for HIV if serostatus is not established [195, 196]. Clinicians treating HIV should regularly inquire about cancer risks and ensure recommended screenings [195]. Although persons with HIV have increased rates of certain cancers, recommendations for screening (prostate, breast, colon, lung) are not different than for the general population, and providers should follow U.S. Preventive Services Task Force (USPSTF) and American Cancer Society guidelines. However, AIDS-defining cancers and non-AIDS defining cancers, especially virally based cancers, occur more frequently among people with HIV and merit increased attention [197–199]. Higher CD4 count ( $\geq 350$  cells/ $\mu$ L) and maximal viral suppression are associated with lower 5-year mortality among patients with HIV and any cancer diagnosis [200]. While most cancers are not diagnosed necessarily at younger ages among people with HIV, lung cancer, anal cancer, and myelomas may occur at younger ages among people with HIV compared with those without HIV.



People with HIV are at greater risk for oral/pharyngeal and kidney cancers [198, 201]. Viral suppression is especially associated with lower risk of virally associated and non-AIDS defining cancers among those on ART [201]. As such, as with most comorbidities, viral suppression is urged for people with HIV who have cancer. People with HIV have higher mortality rates after developing cancer, so increased observation, vigilance, and screening are required [202].

## Recommendations

### *Prevention*

- All patients should be asked about tobacco use at every health care encounter, and those who smoke should be strongly encouraged to stop smoking and offered smoking cessation assistance, including pharmacotherapy and behavioral interventions.
- As alcohol increases risk of certain cancers, moderation in alcohol consumption should also be recommended.
- Vaccinations against HPV and HBV are essential to reduce the risk of cervical, anal, head, and neck cancers, and hepatocellular carcinoma.

### *Screening and Detection*

- Providers should be vigilant for cancer, especially human oncogenic viral-based cancers, associated with Epstein-Barr virus (EBV), HPV, HCV, and HBV, even if no specific screening is recommended.
- Screening for prostate, breast, lung, and colon cancer should be conducted according to USPSTF and American Cancer Society guidelines for the general population.
- Biennial mammogram screening is recommended for persons aged 40–74 years, as per USPSTF guidelines.
- Perform a digital anal rectal exam annually, whether or not high-resolution anoscopy (HRA) is available.
- Screen transgender women and cisgender men over 35 years of age who have sex with cisgender men, and all other people with HIV over 45 years of age, with anal Pap smears if there is access to or ability to refer for HRA (preferred) and treatment. IDSA recommends HPV testing with cytology only and not just HPV testing alone.
  - For low-grade squamous intraepithelial lesions (LSIL) or worse, refer for HRA and HPV testing if under 45 years old. For those at least 45 years of age, refer for HRA and HPV testing.
  - Treat all high-grade squamous intraepithelial lesions (HSIL), ideally with hyfrecation, and monitor routinely among people with HIV and over 35 years of age.
  - Refer all anal cancers to surgical oncology for treatment.
- Persons with HIV aged between 21 and 29 years should have a cervical Pap test annually. If the results of 3 consecutive cervical Pap tests are normal, follow-up Pap screening should be in 3 years.
  - Abnormal Pap test results require either follow-up colposcopy by a qualified practitioner or repeat Pap test in 6–12 months.
  - For persons aged 30 years or greater, cervical Pap tests should be done annually. If the results of 3 consecutive Pap tests without an HPV test are normal, a follow-up Pap should be performed in 3 years. If the Pap test is done with HPV testing and both the cytology and HPV testing are negative, follow-up cervical cancer screening can be done in 3 years after a single Pap smear.
  - Unlike for people without HIV, there is no age limit for Pap screening.
  - If the HPV testing reveals HPV16 or HPV16/18, referral for colposcopy is recommended.
  - Providers should follow USPSTF screening recommendations for prostate cancer.

- Shared decision making for PSA testing is recommended for ages 50–69 with at least a 10-year life expectancy.
- Consider offering PSA-based prostate cancer screening to persons who are Black or of African descent, or people with prostates ages 45–49 with at least a 10-year life expectancy, and for persons who have at least one first-degree relative with prostate cancer.
- Screening for hepatocellular carcinoma every 6 months by ultrasound with or without alpha-fetoprotein is recommended for those with cirrhosis from any cause, those with chronic hepatitis B, and those with a history of chronic hepatitis C (treated or untreated) and stage F3 or F4 fibrosis.

### ***Special populations***

- After vaginoplasty, remind patients that lifelong follow-up for cancer is necessary and could include organs removed.
- Cancer screening for transgender and gender-diverse persons should be conducted based on guidelines for the organs and tissues present in the individual.
- Among transgender people with prostates, PSA is unreliable for those on androgen blockers or who have undergone orchiectomy. For those with a neovagina, employ a neovaginal and rectal exam to examine the prostate.

### **Evidence summary**

Acquired immunodeficiency, as encountered among people with HIV, is associated with an increased risk for cancer [203]. As such, interventions that may prevent cancer are essential to HIV care. Health care systems should maintain a record of current smoking status of patients. All clinicians should advise patients to stop smoking and document this message at least yearly in the health record. Pharmacotherapy such as varenicline should be offered, as well as referrals for behavioral interventions to assist with smoking cessation [146, 150, 204]. The Centers for Medicare & Medicaid Services, American Cancer Society and USPSTF recommend that adults aged between 50 and 80 years with a  $\geq 20$  pack-year smoking history and who currently smoke or have quit within the past 15 years should receive screening noncontrast low-dose CT scan (LDCT) of the chest to detect lung cancer [205]. Persons with HIV may receive the same mortality benefit from LDCT screening as those not living with HIV if the CD4 cell count is  $>500$  cells/ $\mu\text{L}$  and the patient is ART-adherent [206].

Heavy alcohol use can negatively impact most cancer treatments and may put people at greater risk for esophageal, stomach, and liver cancers [207]. As such, lower alcohol use is also advised. Further, vaccination against HBV and HPV are also strongly recommended to prevent liver cancer and HPV-associated cancers, including anal, cervical, and head and neck cancers. Although persons with HIV have increased rates of certain cancers, recommendations for screening (prostate, breast, colon, lung) are not different than for the general population. Because people with HIV are at increased risk of both primary and additional cancers, screening for cancer is needed, and enhanced secondary cancer prevention also is essential [196].

While screening for most cancers for adults with HIV is no different from the general population, including breast cancer screening, providers who treat adults with HIV should have high suspicion

for cancers, even if no regular screening is recommended. Providers should be especially vigilant for human oncogenic virally based cancers, including cancers occurring due to EBV, HPV, HBV, and HCV [203]. Higher CD4 count ( $\geq 350$  cells/ $\mu$ L) and maximal viral suppression are associated with lower 5-year mortality among patients with HIV and any cancer diagnosis; maximal viral suppression should be encouraged, especially if people with HIV and cancer are undergoing chemotherapy or radiation therapy [200]. Genital, oral, cervical, and anal warts should be treated to prevent development of cancer [208].

Screening for hepatocellular carcinoma every 6 months by ultrasound with or without alpha-fetoprotein is recommended for those with cirrhosis from any cause [209]. This recommendation applies to people with HIV and chronic HBV, or with treated/untreated HCV and fibrosis stage F3 or F4. Breast cancer is the second leading cause of cancer-related death in women in the United States after lung cancer [210]. It does not appear to be increased in prevalence among people with HIV, although unusual clinical presentations and rapid progression have been reported, suggesting that breast cancer may behave more aggressively in this setting (bilateral disease, poorly differentiated carcinoma, and early metastasis) [210]. At present, screening mammography in persons with HIV should follow USPSTF and American Cancer Society guidelines for the general population, which are not always concordant [211, 212].

Anal cancer incidence (as well as oral cancers that are of HPV origin) is greatly elevated among people with HIV, especially among cisgender men who have sex with cisgender men, older people with HIV, people with CD4 counts  $< 200$  cells/ $\mu$ L, as well as African Americans [208, 213]. There are national screening guidelines for the use of anal Pap tests in health care maintenance, especially among people with HIV [214]. A digital rectal exam for all people with HIV is recommended to detect masses, blood, or prostate size and smoothness for people with HIV who have a prostate. Data published in 2022 demonstrate the benefit of anal cancer screening and treatment among cisgender men with HIV over 35 years of age who have sex with cisgender men, and all other people with HIV over 45 years if there is access to or ability to refer to HRA (preferred) and treatment. If anal Pap or HRA is done, treat all HSIL lesions, preferably using hyfrecation, and monitor regularly for clearance or recurrence. The exact timing of follow-up monitoring is still undetermined [215, 216]. Additional data are needed to determine whether persons with a history of receptive anal intercourse and all persons with genital warts should have periodic anal Pap tests if access to appropriate referral for follow-up, including HRA, is available [217]. If anal cancer is diagnosed, referral should be made to oncology or surgical oncology for appropriate treatment [208]. Data are needed to generate recommendations for anal cancer screening and prevention in cisgender women.

Prostate cancer screening is generally recommended to follow USPSTF guidelines. There is increasing evidence, however, that prostate cancers among people with prostates ages 50–69 years who have a 10-year life expectancy should have shared decision making about PSA testing. Among Black adults with a prostate, the lower age limit is 45 years. PSA screening is not recommended at this time for adults 70 years of age or older with a prostate [218–220].

For persons aged between 21 and 29 years, cervical cancer screening should be performed within 1 year of sexual debut but not later than age 21 years or at the diagnosis of HIV. If the initial Pap smear is negative, some experts recommend a repeat Pap smear be performed within 6 to 12 months. If the results of three consecutive Pap tests are normal, a follow-up Pap test should be performed at 3 years. The use of HPV co-testing in this age group is not recommended. For persons aged >30 years, cervical cancer screening should commence at diagnosis and be continued throughout a woman's lifetime and not stopped at age 65 as recommended for the general population. In this age group, Pap testing can be done with cytology alone or with the addition of HPV co-testing. Some experts recommend a repeat Pap test be done 6 months after the initial Pap test. If the results of three consecutive Pap tests are normal, a follow-up Pap test should be done in 3 years. If testing is done with Pap and HPV co-testing and if the results of both tests are normal, the next screening can occur in 3 years [221, 222].

Special considerations are needed for transgender adults with HIV in regard to cancer. While likely multifactorial, transgender persons have a greater risk of being diagnosed later than the general population, lower odds of receiving appropriate oncologic treatment, and worse odds of survival than other people with cancer. Thus, higher vigilance is needed for transgender individuals at risk of cancer [223]. Further, even after vaginoplasty, there needs to be lifelong follow-up for prostate cancer and other cancers found among people born with male sex organs that are not removed. It also should be noted that among transgender individuals with prostates, PSA testing may be unreliable if they are taking androgen blockers or are status-post-orchietomy. For those with a neovagina, employ a neovaginal exam to examine the prostate [224].

## **SECTION 6: SEXUALLY TRANSMITTED INFECTION SCREENING, TREATMENT, AND PREVENTION**

In 2022, the U.S. experienced extremely high rates of chlamydia, gonorrhea, and syphilis, with continuing and striking disparities by race/ethnicity, gender, sexual orientation, age, and geography. People with HIV accounted for 36.4% of cases of primary and secondary syphilis among gay and bisexual men [225]. *Trichomonas* is common among persons having vaginal sex, although most cases are asymptomatic. Beginning in 2022, global outbreaks of mpox have disproportionately affected people with HIV and been particularly frequent and more severe among those with advanced immune suppression [226]. Evidence is evolving to support prevention of some STIs using doxyPEP, although the risk of antimicrobial resistance is an ongoing concern. It is essential that STI screening, treatment, and prevention efforts are centered in equity-based strategies.

### **Screening and Treatment for stis**

#### ***Chlamydia, Gonorrhea, Syphilis, and Trichomonas***

#### **Recommendations**

- Services for STI (including mpox) screening, treatment, and prevention should be convenient and affordable, delivered in a stigma-free environment, and made accessible to populations with highest prevalence of infection using equity-based strategies.
- All patients should be screened for gonorrhea, chlamydia, and syphilis upon entry into care. Persons having receptive vaginal sex should be screened for trichomonas using vaginal or cervical nucleic acid amplification test (NAAT). Screening for gonorrhea and chlamydia should be by NAAT at all sites of sexual contact (oral, anal, urethral/urine, vaginal/neovaginal). Done correctly, self-collected NAAT swabs may be used to enhance acceptability.
- In asymptomatic sexually active persons, screening for gonorrhea, chlamydia, and syphilis should be repeated at least annually. Persons having receptive vaginal sex should be screened for trichomonas at least annually.
- In persons with multiple or anonymous sex partners, screening should be conducted every 3–6 months depending on sexual activities, presence of recent STIs in the patient or their partner(s), and local community STI prevalence. Those found to have gonorrhea, chlamydia, syphilis, or trichomonas on initial screening should be treated and rescreened in 3 months because of high reinfection rates.
- For those diagnosed with pharyngeal gonorrhea, a test of cure should be performed at 7–14 days with NAAT or culture, although testing at 7 days is associated with a higher rate of false positive results. If NAAT obtained for test of cure is positive, a culture should be obtained, and positive cultures should undergo antimicrobial susceptibility testing.
- For gonorrhea that is unresponsive to treatment, regardless of site, culture should be obtained, and positive cultures should undergo antimicrobial susceptibility testing.
- All persons with syphilis should be screened for ocular and otic involvement as well as neurologic symptoms and signs, but a lumbar puncture is not indicated in individuals with isolated ocular or otic symptoms. A lumbar puncture should be performed in those with neurologic findings.
- Retreatment for treatment failure should be implemented according to CDC STI guidelines. Following a diagnosis of syphilis, nontreponemal titers should be followed and a lumbar puncture performed if titers increase by 4-fold (sustained by at least 2 weeks) without evidence of reinfection after treatment. CSF examination and retreatment may be considered if titers do not decrease 4-fold by 24 months.
- Pregnant individuals should be screened for chlamydia, gonorrhea, and syphilis at the first prenatal visit, at 28 weeks, and, for syphilis, also at delivery. Screening for trichomonas should be offered at the first prenatal visit. Screening should be more frequent depending on past STI incidence in patient or partner(s) and community STI prevalence. Partners of pregnant persons with STIs should be offered screening and treatment.
- Because of increasing antibiotic resistance, especially for gonorrhea, CDC STI treatment guidelines should be consulted frequently, and treatment should follow these recommendations.
- In cisgender women, trichomonas should be treated using metronidazole 500mg twice daily for 7 days, while a single 2g dose may be used in cisgender men.

### **Evidence summary**

Between 2018 and 2022, gonorrhea diagnoses increased by 11% overall but were lower than in 2021, with 40% occurring among gay, bisexual, and other cisgender men who have sex with men. Syphilis diagnoses increased a striking 78.9%, including 3,755 cases of congenital syphilis, a 183% increase since 2018. Cases of chlamydia were level compared with 2018, but at a high incidence of 1,649,716 cases. Chlamydia, gonorrhea, and syphilis continued to disproportionately affect racial and ethnic minorities, with 31% of these cases occurring in non-Hispanic African Americans, and half of diagnosed STIs occurring among persons aged 15–24 years [225].

## Screening

Nucleic acid amplification testing (NAAT) is the most sensitive screening method for chlamydia and gonorrhea and should be obtained from all sites with sexual exposure. For persons with a vagina/neovagina, swabs from that area are more sensitive than urine, while urine is acceptable for persons with a penis. Self-collected vaginal/neovaginal and anal swabs are as sensitive as those collected by care providers and may be more acceptable and adaptable to at-home testing. The pandemic accelerated interest in STI home-testing, sometimes paired with telemedicine or online ordering of test kits, particularly for gonorrhea and chlamydia [227]. In a pilot study in Washington, DC, in which self-tests for HIV, chlamydia, and gonorrhea were sent to users by mail, positivity rates for chlamydia and gonorrhea (especially in extragenital areas) were high in returned samples [228]. Clinicians should be familiar with CDC's updated laboratory testing guidelines for syphilis [229]. Diagnosis of syphilis generally relies on serologic testing consisting of a nontreponemal test (with positives expressed in titers) and a treponemal test, but self-testing has relied on treponemal antibody testing, which may be falsely negative in early infection, or positive long after an initial infection has been treated. Clinicians should be familiar with considerations regarding point-of-care testing for syphilis from the National Syphilis and Congenital Syphilis Syndemic Federal Task Force [230]. The development of nontreponemal tests suitable for self-testing remains a research gap of high interest.

All persons with syphilis should be screened for ocular and otic syphilis and for neurologic signs and symptoms. Persons with syphilis and ocular or otic symptoms should receive treatment immediately to preserve vision and hearing, but a lumbar puncture is not required unless neurologic signs or symptoms are present. A lumbar puncture is indicated in those with neurologic findings, or whose nontreponemal titer has increased 4-fold (sustained for more than 2 weeks) without evidence of reinfection. Persons whose nontreponemal titers have not decreased 4-fold by 24 months should be examined clinically and a cerebrospinal fluid (CSF) examination and retreatment may be considered. CDC STI guidelines should be consulted for treatment failure [213]. Pregnant persons are at high risk for STIs and should be screened for gonorrhea, chlamydia, syphilis, and trichomonas at the first prenatal visit, at 28 weeks, and, for syphilis, also at delivery [120, 225]. Congenital syphilis is preventable and can be eliminated by diligent attention to screening and treatment during pregnancy, including at delivery. Note that treponemal antibody tests (such as FTA-ABS or MHA-TP) often remain positive for life, despite effective treatment [231].

Trichomoniasis is the most common STI among those having vaginal sex, with disproportionately high rates among Black individuals and among cisgender women with HIV [231]. It is associated with increased HIV shedding in those without viral suppression, with pelvic inflammatory disease, and with adverse pregnancy outcomes. Screening should be conducted using NAAT or an FDA-approved rapid test and repeated in 3 months for those who test positive, as reinfection rates are high. During pregnancy, screening should occur at the first prenatal visit and during the third trimester, at minimum, with treatment delivered as needed.

## **Treatment**

Antibiotic resistance is of high concern, especially for gonorrhea, although most strains remain sensitive to ceftriaxone for now. In 2020, CDC recommended gonorrhea treatment with a single dose of intramuscular ceftriaxone 500mg (or 1000mg for those weighing  $\geq 150$  kg), without concurrent azithromycin [232]. Test of cure with NAAT or culture is recommended for pharyngeal gonorrhea at 7–14 days after treatment, although testing at 7 days is associated with a higher rate of false positive results. Culture should be obtained for all gonorrhea treatment failures so that antimicrobial susceptibility testing can be performed [231]. The preferred treatment for early, secondary, latent, and late latent syphilis continues to be benzathine penicillin G, although doxycycline can be used for 14 to 28 days depending on stage of disease, in the event of true penicillin allergy, or shortage of penicillin. If neurosyphilis is present or the patient is pregnant, intravenous aqueous crystalline penicillin G should be used, even if desensitization is required. The high price of commercially obtained benzathine penicillin and intermittent shortages of this drug are barriers to ending the syphilis epidemic, particularly among pregnant women in whom no other viable regimens are recommended. In cisgender women with HIV, treatment of trichomonas using metronidazole 500mg twice daily for 7 days was more effective than a single 2g dose of metronidazole; however, cisgender men can be treated using the single-dose regimen [231]. Chlamydia is treated with doxycycline 100mg twice daily for 7 days, in most cases. However, rectal chlamydia associated with inguinal lymphadenopathy or symptoms of proctocolitis (such as bloody discharge, tenesmus, ulcers) raises suspicion of lymphogranuloma venereum (LGV). Although LGV and non-LGV chlamydia can be distinguished by molecular testing, LGV is usually diagnosed clinically and treated with 21 days of doxycycline 100mg twice daily. Close monitoring of CDC STI treatment guidelines is essential, as susceptibilities, and therefore recommendations, change over time [231].

## ***Mycoplasma genitalium***

### **Recommendations**

- Persons with recurrent urethritis or cervicitis should be screened with NAAT for *Mycoplasma genitalium*, and screening should be considered for those with pelvic inflammatory disease.
- Screening for *Mycoplasma genitalium* in asymptomatic persons or screening of extragenital sites is not recommended.

### **Evidence summary**

*Mycoplasma genitalium* (Mgen) is a cause of nongonococcal/nonchlamydial penile urethritis and can cause persistent or recurrent urethritis. It also is associated with cervicitis, endometritis, and pelvic inflammatory disease in cross-sectional studies. Case control and cross-sectional studies suggest that urogenital Mgen is more common among people with HIV and may be associated with HIV shedding among people not taking ART [231]. Resistance to azithromycin is widespread and fluoroquinolone resistance is increasing. Multidrug resistance to azithromycin, fluoroquinolones, and doxycycline has been identified [233]. Resistance testing for refractory or

recurrent infections should be employed where available, but molecular tests are not yet widely available outside of research settings. There are insufficient data on clinical outcomes associated with asymptomatic Mgen, and antibiotic use in this setting could worsen the prevalence of resistant organisms. Therefore, screening of asymptomatic persons for Mgen is not recommended. The efficacy of doxyPEP for prevention of symptomatic Mgen is an area of active investigation, as is the risk of Mgen resistance in this setting [234].

## **Mpox**

### ***Screening and Treatment [For Prevention, see Section 4: Immunizations]***

#### **Recommendations**

- Persons exposed to mpox through sexual activity or close contact should be advised to monitor for symptoms for 21 days, consider vaccination if asymptomatic and within 14 days of exposure, and seek medical care immediately if symptoms develop.
- Persons with cutaneous, oropharyngeal, or anorectal lesions suspected to be due to mpox should receive polymerase chain reaction (PCR) testing of lesions for orthopoxvirus (mpox) and should isolate as recommended by CDC guidelines.
- Persons with suspected mpox should be offered screening for HIV (if not known to have HIV) and STIs, especially chlamydia, gonorrhea, and syphilis.
- Antiretroviral therapy initiation should not be delayed when HIV is diagnosed concurrent with mpox, and therapy should be adjusted as soon as possible for those on ART with virologic failure in the setting of mpox.
- Treatment with tecovirimat should be offered to people with HIV whose virus is not suppressed or whose CD4 count  $<350/\mu\text{L}$ , those who are pregnant, and those who have other immunocompromising conditions; severe disease; oropharyngeal, anorectal, genital lesions; bacterial superinfection, especially requiring debridement; or other conditions that put them at high risk of poor outcomes, as designated by CDC.

#### **Evidence summary**

Compared to previous mpox outbreaks, the global outbreak that began in 2022 has occurred predominantly among cisgender men and transgender women who have sex with cisgender men and has been associated with more mucosal and anorectal disease and delayed prodromal symptoms compared to previous outbreaks in endemic countries. A global systematic review of 52 studies including 6,345 persons with mpox found that 40% of persons also had HIV [235]. A global series of mpox among 382 people with HIV and CD4  $<350$  cells/ $\mu\text{L}$  found high prevalence of serious outcomes, including necrotizing skin lesions, lung involvement, secondary infections, and sepsis, particularly in those with CD4  $<100$  cells/ $\mu\text{L}$ . In the group as a whole, 28% were hospitalized and 7% died. Among those who died, all had CD4  $<200$  cells/ $\mu\text{L}$  and mortality was especially high (57%) among 21 persons who developed mpox immune-related inflammatory syndrome (IRIS) after initiation or reinitiating ART. In this series, only 16% received tecovirimat (TPOXX) [226]. Initiation of ART, however, should not be delayed because of concern about IRIS, as viral suppression can be lifesaving in this population. As of March 2023, CDC reported that 94% of deaths associated with mpox in the U.S. were among people with HIV and, in those



with CD4 count data available, 96% were among people with CD4 counts below 50 cells/ $\mu$ L. Among those with treatment data available, only 9.1% were receiving ART prior to their mpox diagnosis. Of all mpox deaths, 90% occurred among Black men [236]. An equity-based approach to mpox screening, treatment, and prevention is essential, prioritizing people with HIV, especially those with low CD4 counts or uncontrolled virus, and racial and ethnic groups that bear a disproportionate burden of severe mpox.

PCR testing of mpox lesions is associated with the highest diagnostic yield [237], although virus can also often be recovered from the anorectal and oropharyngeal regions. Other STIs often occur concurrently with mpox, and STI (and HIV if status is unknown) screening is imperative in persons presenting with suspicion of mpox. People with suspected or confirmed mpox who are at risk of serious outcomes should receive TPOXX under an expanded access investigational new drug submission administered by CDC [238]. This includes people with unsuppressed virus or CD4 counts  $<350/\mu$ L; other immunocompromising conditions; severe disease; oropharyngeal, anorectal, genital lesions; or bacterial superinfection, especially requiring debridement. People without severe disease may consider enrolling remotely in the STOMP trial, an NIH-sponsored study to determine the effectiveness of TPOXX [239].

Although the 2022 mpox outbreak peaked in that summer and was curtailed by vaccination, education, and behavior change among persons at highest likelihood of acquisition, clusters of resurgence continued to occur in 2023 and increased during early 2024 [188, 240]. A health alert from CDC in December 2023 notified health professionals of the spread of Clade I mpox within the Democratic Republic of Congo (DRC), with concern for international spread, although none had been identified at that time. Mpox infections in the U.S. have been Clade II virus, while Clade I is associated with increased transmissibility and more severe outcomes than Clade I. Clinicians should be aware of the possibility for Clade I infection in persons returning from DRC and other affected nations who develop symptoms within 21 days of travel. Both Jynneos<sup>®</sup> vaccination and TPOXX treatment are thought to be effective against Clade I virus [241]. Vaccination efforts are of ongoing importance, including ensuring that both doses of vaccine are received. As of November 2023, only 61% of people who received an initial MVA-BN smallpox vaccine (Jynneos<sup>®</sup>) received the full series [242]. A global case series of 37 persons with mpox reinfection or mpox occurring after adequate vaccination found that cases were mild, with few lesions and little mucosal involvement, no deaths, and only one hospitalization in spite of only 2 individuals receiving TPOXX [187]. Therefore, while a two-dose vaccination series may not prevent infection, it likely will prevent severe disease. (See Section 4: Immunizations.)

## **Prevention of STIs**

### ***Recommendations***

- Individuals with recurrent STIs and ongoing sexual activities that place them at high likelihood of STI acquisition should receive tailored HIV and STI prevention messages from providers appropriate to the individual's sexual health goals. If available, persons with recurrent STIs may benefit from

counseling or more structured programs offering interventions to reduce acquisition.

- Clinicians should discuss the potential benefits and harms of doxyPEP with individuals who may benefit. DoxyPEP should be discussed with and offered to cisgender gay, bisexual, and other men who have sex with cisgender men; transgender women; and people with HIV who have had syphilis, chlamydia, or gonorrhea in the last 12 months, or who anticipate having sexual activities associated with increased likelihood of acquiring an STI. The dose of doxycycline is 200 mg as a single dose (maximum 200 mg in 24 hours), ideally taken as soon as possible after sex, but no later than 72 hours afterward.
- At present, data are inadequate to support the efficacy of doxyPEP in cisgender women, cisgender heterosexual men, transgender men, or gender-diverse persons assigned female at birth, and shared decision making should be employed in these populations.
- Persons actively using doxyPEP should be screened for syphilis, chlamydia, and gonorrhea at 3- to 6-month intervals, depending on sexual practices.

### **Evidence summary**

Persons with frequent recurrent STIs may benefit from counseling and other structured interventions to decrease STI acquisition. Condoms also can be effective to decrease STI acquisition and should be offered. Some individuals with recurrent STIs also may benefit from prevention of bacterial STIs using doxyPEP, defined as a single dose of doxycycline 200 mg taken as soon as possible after sex, but no later than 72 hours afterward. The maximum dose of doxycycline is 200 mg within 24 hours.

Preliminary data supporting the activity of doxycycline in preventing chlamydia and syphilis came from a substudy of the ANRS Ipergay trial of intermittent HIV preexposure prophylaxis, in which participants took doxycycline 200 mg within 72 hours of sexual exposure. Doxycycline use was associated with a 70% decrease in chlamydia and syphilis, but no decrease in gonorrhea [234]. Two randomized trials subsequently demonstrated the efficacy of doxyPEP in preventing chlamydia, gonorrhea, and syphilis among cisgender gay and bisexual men and transgender women. The DoxyPEP trial, a randomized, open label trial in Seattle and San Francisco, included 630 cisgender gay and bisexual men and transgender women. In May 2022, the study was stopped by its Data Safety Monitoring Board after a planned interim analysis showed statistically significant reductions in syphilis (relative risk (RR) 0.23; 95% CI, 0.04–1.29), chlamydia (0.26; 95% CI, 0.12–0.57), and gonorrhea (0.43; 95% CI, 0.26–0.71) and no safety concerns, including among people with HIV [243]. In the PrEP cohort, the relative risks were 0.45 (95% CI, 0.32 to 0.65) for gonorrhea, 0.12 (95% CI, 0.05 to 0.25) for chlamydia, and 0.13 (95% CI, 0.03 to 0.59) for syphilis, and in the cohort of people with HIV, the relative risks were 0.43 (95% CI, 0.26 to 0.71), 0.26 (95% CI, 0.12 to 0.57), and 0.23 (95% CI, 0.04 to 1.29), respectively [244]. The limited antimicrobial resistance data from this study are inconclusive, although 6 of 20 incident gonorrhea isolates in the doxycycline arm displayed tetracycline resistance [245]. ANRS 174 (DOXYVAC) was a French randomized, open label, factorial design trial evaluating doxyPEP and meningococcal B vaccine (4CMenB) in gay and bisexual men on PrEP. The study was stopped by its Data Safety Monitoring Board after an unplanned interim analysis found statistically

significant reductions in first cases of syphilis, chlamydia, gonorrhea, and *Mycoplasma genitalium* in those on doxyPEP compared with no doxyPEP [246]. Although the interim analysis suggested that 4CMenB vaccination was protective against gonorrhea, this finding was not confirmed after missing study data were included. The final analysis confirmed statistically significant preventative effects of doxyPEP against first episodes of chlamydia (adjusted hazard ratio (aHR) 0.14; 95% CI: 0.09-0.23,  $P < 0.0001$ ), syphilis (aHR 0.21; 95% CI: 0.11-0.41,  $P < 0.001$ ), and gonorrhea (aHR 0.67; 95% CI: 0.52-0.87,  $P = 0.003$ ), although the effect against gonorrhea was modest and less than in the interim analysis. The effect of 4CMenB vaccination on incident gonorrhea was not statistically significant. Consistent with local epidemiology, tetracycline resistance was seen in all available gonorrhea samples from baseline and follow-up, and high-level tetracycline resistance (MIC > 8 mg/L) was more common in incident samples from the doxyPEP arm than the control arm (36% vs 13%;  $P < 0.043$ ). No chlamydia resistance was detected and there was no statistically significant difference between the arms in detection of pharyngeal methicillin-resistant *Staphylococcus aureus* or rectal extended-spectrum  $\beta$ -lactamase producing *E. coli* [247]. A randomized open label trial of doxyPEP compared to standard of care among 449 nonpregnant cisgender Kenyan women, ages 18–30 years, who were taking HIV PrEP. The study (dPEP Kenya) showed no difference between the doxyPEP arm and the standard of care arm in the incidence of chlamydia or gonorrhea. In a subset of participants on the doxyPEP arm, doxycycline was present in only 29% of hair samples. Low uptake of the intervention limits the ability to understand the true efficacy of doxycycline for bacterial STI prevention in cisgender women under more ideal adherence conditions. In addition, high-level tetracycline resistance, previously described in Kenya, was seen in 100% of gonorrhea samples identified at baseline and at study visits in both study arms [248]. DoxyPEP, therefore, is recommended for cisgender gay, bisexual, and other men who have sex with cisgender men, and transgender women, who have a history of at least one diagnosis of syphilis, chlamydia, or gonorrhea within the last 12 months, or who anticipate sexual activities associated with increased likelihood of STI acquisition. No recommendations can be made at this time for the use of doxyPEP in cisgender women, cisgender heterosexual men, transgender men, and other gender-diverse persons, and additional research is needed. Use of doxyPEP in these populations should be based on shared decision making.

The main concern for doxyPEP implementation is the risk of antimicrobial resistance, particularly for gonorrhea, but also for the microbiome, including common organisms like *Staphylococcus*. Additional data will be necessary to fully assess the public health impact of doxyPEP, and until then, it will be important to judiciously target its use. Modeling based on a cohort at Fenway Clinic (Boston) found that targeting doxyPEP to cisgender gay and bisexual men, transgender women, and nonbinary persons assigned male at birth who had been diagnosed with a bacterial STI within the last 12 months, or with repeated STIs, was the most efficient use of doxyPEP. Providing doxyPEP to all PrEP users or people with HIV prevented more STIs but was less efficient and exposed more people to doxycycline (higher number needed to treat to prevent one STI) [249]. As data evolve, CDC recommendations for use of doxyPEP will be updated [250]. People receiving

doxyPEP should continue to receive routine screening for asymptomatic STIs and ongoing evaluation of the need for continuing doxyPEP.

## **SECTION 7: METABOLIC AND OTHER NONCOMMUNICABLE COMORBIDITIES ASSOCIATED WITH HIV, ANTIRETROVIRAL THERAPY, AND AGING**

Now that approximately 50% of the global population of people with HIV is aged >50 years, concern has heightened about increased rates of common comorbidities associated with age [251, 252], including long-term cardiovascular morbidity, especially in those with traditional risk factors such as dyslipidemia, glucose intolerance or diabetes mellitus, hypertension, and smoking. The benefits of ART used in accordance with published guidelines outweigh the risks of cardiovascular disease and other comorbidities associated with long-term exposure [253]. Multiple guidelines are available to assist providers in the identification and management of lipid abnormalities, diabetes mellitus, excess weight, liver steatosis, and other comorbidities [254-258]. People with HIV also are at higher risk for weight gain, loss of bone mineral density (BMD), hypogonadism, frailty, and neurocognitive disorders.

### **Recommendations**

- Fasting (optimal) or random lipid levels should be obtained prior to and within 1–3 months after starting ART. Abnormal random lipid levels should be repeated when fasting. Patients with abnormal lipid levels should be managed according to the National Lipid Association Part 2 and 2018 Multispecialty Blood Cholesterol Guidelines. All patients should be assessed for 10-year atherosclerotic cardiovascular disease (ASCVD) risk, and those at high risk should be further evaluated and managed according to established guidelines that recognize HIV risk-enhancing factors.
- Statin therapy is recommended for primary prevention of cardiovascular disease in people with HIV, ages 40–75, regardless of lipid levels and ASCVD risk. The recommendation is strongest for those with 10-year ASCVD risk of 5% or higher. For people with HIV under 40 years of age, evidence is insufficient to recommend for or against statin therapy for primary prevention of cardiovascular disease. Decisions in this age group should be individualized, taking into consideration risk-enhancing factors for the general population and for people with HIV.
  - High-intensity statins (atorvastatin 40–80mg daily or rosuvastatin 20–40mg daily) are recommended for persons with 10-year ASCVD risk above 20%.
  - At least moderate-intensity statins (specifically, pitavastatin 4mg daily, atorvastatin 20mg daily, and rosuvastatin 10mg daily) are recommended for persons with HIV and lower risk.
- Prior to starting ART, random or fasting blood glucose and hemoglobin A1c (HbA1c) should be obtained. If random glucose is abnormal, fasting glucose should be obtained. After initiation of ART, HbA1c is insensitive and may significantly underestimate the risk of diabetes. However, a HbA1c > 6.5% remains a reliable criterion for diagnosis of diabetes in people with HIV. If HbA1c < 6.5%, fasting plasma glucose is the best screening test for people with HIV receiving ART. Those with a diagnosis of diabetes mellitus should have an HbA1c level monitored at least every 6 months with an HbA1c goal of <7%, in accordance with the American Diabetes Association Guidelines.
- Weight should be obtained at every visit. In addition, waist circumference (an indirect marker of visceral fat) should be measured annually. Monitoring and counseling on diet, exercise, and alcohol

intake should start at the time of ART initiation and be done at every visit.

- Current data do not support switching an ART regimen solely because of weight gain.
- If liver transaminases are increased, work-up for nonalcoholic fatty liver disease (NAFLD) should include ultrasound, MRI, or CT scan. Presence of steatosis should lead to a fibrosis work-up including FIB-4, Fibroscan, or MRI elastography, although biopsy remains the standard. Weight reduction is the cornerstone of treatment of NAFLD. Persons with nonalcoholic steatohepatitis (NASH) or fibrosis should be referred to a hepatologist.
- Baseline bone densitometry (DXA) screening for osteoporosis should be performed in postmenopausal cisgender women and men aged  $\geq 50$  years. Screening for transgender people should follow national recommendations based upon their individualized risk for osteoporosis.
- Testosterone replacement therapy for cisgender men should be prescribed with caution and only in those with symptomatic hypogonadism, given the long-term side effects. See Section 11 for discussion of hormone therapy for transgender men.
- Annual screening for frailty should be considered in people with HIV  $> 50$  years of age, with the Frailty Phenotype being the most commonly used.

### **Evidence summary**

#### ***Lipid Abnormalities and Cardiovascular Risk***

HIV infection is associated with dyslipidemia. In the absence of ART, HIV infection results in lower total cholesterol (TC), high-density lipoprotein (HDL-C), and low-density lipoprotein (LDL-C) levels. Initiation of ART, specifically with boosted protease inhibitors (PIs), increases LDL-C and improves HDL-C, but the latter does not normalize to pre-HIV levels [259]. Among nucleoside/nucleotide reverse transcriptase inhibitors (NRTIs), TDF has been associated with lipid-lowering effect [260], but TDF is less commonly used currently due to its effect on kidney function and bone mineral density. Other NRTIs, such as TAF and abacavir, appear to have similar and minimal effect on lipids [261].

HIV is a recognized independent atherosclerotic cardiovascular disease (ASCVD) risk enhancer in the 2018 American College of Cardiology/American Heart Association (ACC/AHA) multispecialty cholesterol management guidelines [255]. At this time, there are no validated cardiovascular risk assessment tools for use in people with HIV, and the default is to use the pooled cohort equations from the 2013 ACC/AHA guidelines but to adjust for the presence of HIV risk enhancers, understanding the limitations of such [255]. The frequency of follow-up testing and response to therapy should be based on the current National Lipid Association Recommendations for Patient-Centered Management of Dyslipidemia: Part 2 and the 2018 Multispecialty Blood Cholesterol Guidelines [255, 262]. All patients should be assessed for ASCVD risk, and those with elevated risk should be further evaluated and managed according to established guidelines.

Statin drugs are known to exert a multifactorial effect to prevent cardiovascular disease in the general population. The randomized controlled SATURN-HIV trial showed that in individuals with HIV and virologic suppression, LDL-C  $< 130$  mg/dL, and evidence of heightened inflammation, rosuvastatin decreased carotid intima media thickness, improved kidney function, and attenuated systemic and vascular inflammation, including decreasing T-cell and monocyte

activation [263-267] but worsened insulin resistance [268]. Recently, the REPRIEVE study, a multinational placebo-controlled study that enrolled 7,769 participants with HIV, ages 40–75 years, who had low to intermediate ASCVD risk, found that pitavastatin 4 mg daily reduced the risk of major cardiovascular events by 36%, including for those with LDL-C levels below current guideline thresholds for statin initiation [269, 270]. Overall, the protective effect was seen across demographics, CD4 cell count range, and viral load levels. REPRIEVE is a practice-changing study and statin use is now recommended in people with HIV ages 40 years and older, assuming no known allergy to statins or other contraindication, regardless of CVD risk or lipid levels. The strength of the benefit rises as the AHA/ACC pooled cohort equation score predicting 10-year risk of ASCVD events increases, with the number needed to treat to prevent a major event within 5 years decreasing from 130 and above for those with scores below 5% to 53 or lower for scores of 5% and above. Therefore, the recommendation for statin use is stronger for those with 10-year ASCVD risk of 5% and higher. For those with lower scores, the benefit is still present, but less pronounced. To decide on statin use in this population, additional risk factors as described for the general population, as well as risk-enhancing factors for people with HIV should be considered. High-intensity statin therapy is recommended for those with risk above 20%, as for the general population, while at least moderate-intensity statin therapy is now recommended for those with lower risk. Additionally, statins may be considered in people with HIV who are younger than the REPRIEVE population (below 40 years of age) with additional risk factors, including those with neonatal or pediatric acquired infection who are now adults with long-standing HIV, a population not included in the risk calculators. It is important to note that a slightly higher risk of diabetes was seen in REPRIEVE with pitavastatin than placebo (6.0% versus 4.7%, respectively), although at this time it is unclear whether participants who developed incident diabetes on study had pre-diabetes or were at high risk of diabetes at the time of enrollment in REPRIEVE. Treatment-limiting or grade 3 or higher muscle symptoms were seen in 2.3% of the pitavastatin group and 1.5% of the placebo group. Based on data from REPRIEVE, recommendations regarding statin therapy in people with HIV have been published by the HHS Adult and Adolescent Antiretroviral Guidelines Panel and a multisociety team including the ACC, AHA, and HIVMA [271].

Despite the fact that pitavastatin was used in REPRIEVE, it is likely that this preventive effect is generalizable across statins and other statins can be used. High-intensity statins include atorvastatin 40–80 mg and rosuvastatin 20–40 mg, while moderate-intensity statins include pitavastatin 4 mg, atorvastatin 10–20 mg, and rosuvastatin 10 mg (all taken daily). Caution should be used, however, when prescribing statins with protease inhibitors (PIs) (especially ritonavir), cobicistat, and some nonnucleoside reverse transcriptase inhibitors (NNRTIs) due to potential serious drug–drug interactions (Table 7). Most PIs and cobicistat inhibit the metabolism of statins, thereby increasing the potential for statin toxicity, with strongest interactions seen with simvastatin and lovastatin, which are contraindicated with ritonavir or cobicistat. However, pitavastatin and pravastatin are metabolized by glucuronidation, thereby having little effect when co-administered with a boosted PI or cobicistat, although pravastatin may adversely interact with darunavir, and dose modification may be needed. In addition, atorvastatin and rosuvastatin may be used in

patients taking a boosted PI or boosted elvitegravir but should be initiated at low doses and titrated carefully according to tolerability and effect. Efavirenz induces statin metabolism, resulting in lowering of statin levels. Nevirapine, etravirine, and rilpivirine have not been extensively studied. Doravirine does not affect levels of atorvastatin [272]. Cobicistat is expected to have similar interactions as ritonavir with statins; however, these interactions have not been fully studied. There may be other pathways that affect drug metabolism and lead to unexpected interactions, and it is advisable to refer to the package insert of the antiretroviral (ARV) or drug–drug interaction tables from the HHS ART guidelines before prescribing lipid-lowering agents.

### ***Glucose Metabolism and Diabetes***

Among people with HIV, HbA1c is insensitive, although highly specific for diagnosing diabetes. As such, HbA1c is no longer the preferred method for diagnosing diabetes among persons with HIV [273-276]. The American Diabetes Association (ADA) established the diagnostic criteria of diabetes mellitus as a fasting plasma glucose level of  $\geq 126$  mg/dL (7.0 mmol/L), or a 2-hour plasma glucose level of  $\geq 200$  mg/dL (11.1 mmol/L) during an oral glucose tolerance test conducted with a standard loading dose of 75 g, or a HbA1c  $\geq 6.5\%$  [273]. However, recognizing the potential underestimation of the risk of diabetes by using HbA1C in HIV, the National Health and Nutrition Examination Survey and others endorse an HbA1C cutoff of  $\geq 5.8\%$  to improve the sensitivity for diagnosis in the population with HIV [274]. Although data are lacking on the effects of integrase inhibitors on HbA1c, some studies, but not all, suggest that NNRTIs, PIs, and the NRTIs zidovudine and abacavir may affect HbA1c and result in misleading results [274, 275, 277]. The ADA 2019 Standards recommend against the use of HbA1c to diagnose diabetes in persons with HIV on ART, and states that in cases of HbA1c and fasting glucose discordance, the abnormal laboratory test should be repeated, and the diagnosis of diabetes should be made only if repeat testing is again above the diagnostic cut-point [273].

Random or fasting serum glucose and HbA1c should be obtained prior to starting ART. If random blood glucose is abnormal, fasting blood glucose should be obtained. After initiation of ART, only plasma glucose criteria should be used to diagnose diabetes. A random glucose  $>200$  mg/dL should prompt further testing with a fasting blood glucose. Therefore, either a random or fasting glucose should be obtained at entry to care and annually thereafter for screening of diabetes. Patients with diabetes mellitus should have their HbA1c level monitored at least every 6 months, with a HbA1c goal of  $<7\%$  in accordance with the ADA guidelines. Though controversial, the American College of Physicians recommends less stringent control, with an aim to achieve an HbA1c between 7% and 8% [278]. Given the potential for over- or underestimation of HbA1c in patients on ART, it is prudent to assess the correlation of blood glucose levels with HbA1c values on an individual basis in order to determine the appropriate HbA1c target.

Lifestyle interventions such as weight loss, increased physical activity, and dietary modification remain the cornerstone of diabetes prevention and management. However, if treatment is needed, insulin-sensitizing agents are preferred. Patients should be managed according to the ADA

guidelines [273, 279]. No data suggest that switching ARVs is beneficial in patients with impaired glucose tolerance associated with HIV infection itself or traditional risk factors.

### ***Weight and Fat Gain***

Weight gain is a well-recognized consequence of ART initiation, more common in non-white and female individuals [280]. Some regimens, namely integrase inhibitors and TAF, have been associated with larger gains in weight; however, it is presently unclear whether the regimens used as comparators are suppressing the weight gain with ART initiation. For instance, TDF use has been associated with weight suppression in PrEP studies and in HIV treatment initiation studies. Also, when TDF is switched to TAF, an increase in weight of about 1 kg on average is seen in the initial 6-12 months after switch [281, 282]. Similarly, the ADVANCE study showed that efavirenz (EFV) led to smaller gains in weight when compared to dolutegravir, both given with TAF/FTC [283]. A substudy assessing genetic mutations controlling EFV metabolism revealed that only slow metabolizers (high EFV blood level) had blunted weight gain, whereas fast metabolizers gained similar weight to those on dolutegravir [284]. These data suggest that the weight suppressive effect of EFV may not be a desirable effect and may signal toxic effects. TDF has been associated with mitochondrial dysfunction in subcutaneous adipose tissue, signaling the potential for adipose dysfunction with TDF [285]. As such, the weight suppressive effect of TDF should not necessarily be viewed as a desirable effect.

The weight gain seen with ART is concerning for patients and providers as studies have linked it to higher incidence of diabetes [286] and hypertension [287]. There is also evidence of ectopic fat depositions in people with HIV, for example in liver and pericardium, which may be detrimental. The HIV provider facing a patient with large gains in weight after ART may contemplate switching ART. It is important to know that switches have not been successful at reversing weight gain [288, 289], including switches off of INSTIs, unless the switch is from INSTI to EFV; however, the EFV-linked weight suppressive effect is likely a toxic effect and should not be seen as desirable. A randomized placebo-controlled switch study in virologically [290] suppressed individuals on bictegravir (BIC)/TAF/FTC showed similar weight gain at 48 weeks after switching to islatravir/doravirine compared to continuing on BIC/TAF/FTC [291]. Discontinuation of TAF did not improve weight in the TANGO study, questioning the independent effect of TAF on weight [289]. The TAF-to-TDF switch effect, for the purpose of suppressing weight gain, is modest at best and could lead to adipose tissue dysfunction and mitochondrial toxicity, and thus is not recommended as a strategy to decrease weight [292]. The benefit of the modest effect on weight of TAF-to-TDF switch also needs to be weighed against the bone and renal toxicities of TDF. Switch studies from daily oral BIC/FTC/TAF to injectable cabotegravir/rilpivirine given every 2 months did not lead to significant change in weight compared to continuation of the oral regimen, further evidence that TAF is not likely a culprit in weight gain [293]. GLP-1 receptor agonists for obesity should be reserved for select situations while awaiting results of ongoing trials among people with HIV.



All patients on ART should be routinely counseled on lifestyle factor modifications, including alcohol reduction/cessation, increased physical activity, healthier diet with reduction in saturated fat and added sugars, and increase in dietary fibers. Patients with large gains in weight may benefit from some of the new agents recommended for obesity in the general population such as GLP-1 receptor agonists. Although there are few data on their use yet in people with HIV, one randomized controlled trial in people with lipohypertrophy (abdominal obesity) showed excellent safety and efficacy with decrease in weight, and visceral and trunk fat [294].

### ***Liver steatosis***

Increasing data show that NAFLD is common in HIV, with prevalence ranging between 20% and 63%, even in people with HIV without HCV. Liver steatosis is linked to obesity and happens at lower BMI in the HIV population. NAFLD represents the most common cause of increased transaminases in people with HIV without excess alcohol or infectious hepatitis. NAFLD had been associated with older toxic ART like didanosine or stavudine, but not clearly with newer regimens. NAFLD can progress to NASH, liver cirrhosis, fibrosis, and ultimately cancer. NAFLD is also an independent risk factor for cardiovascular disease, diabetes mellitus, and all-cause mortality [295, 296]. Although NAFLD is known to be associated with obesity, HIV-associated NAFLD occurs at lower BMI than in the general population. Diagnosis of NAFLD may involve histology (liver biopsy) or imaging (ultrasound, CT scan, or MRI). Once NAFLD is identified, further work-up should assess for fibrosis. Although biopsy remains the standard, newer modalities, including Fibroscan and MRI elastography, are increasingly used. In addition, clinicians have used soluble markers to estimate fibrosis, like FIB-4, with low FIB-4 (<1.3) conferring a low likelihood of advanced fibrosis. Lifestyle modification and weight reduction is the cornerstone of treatment. Pharmacotherapy should be reserved for individuals with NASH, particularly for those with significant fibrosis  $\geq$ F2 or individuals with less severe disease but at high risk of faster disease progression such as with diabetes. Promising investigational therapies for HIV-associated NAFLD include tesamorelin [297] and GLP-1 receptor agonists [298].

### ***Bone metabolism***

Baseline bone densitometry by DXA should be performed in all postmenopausal cisgender women and men aged  $\geq$ 50 years, based on expert opinion with limited supporting evidence [299-304]. If DEXA scan reveals osteopenia or osteoporosis, a work-up for secondary causes of osteopenia should be performed. The most common secondary causes of osteopenia are vitamin D deficiency, hypogonadism, excess alcohol (>3 drinks/day), smoking, hyperthyroidism or hyperparathyroidism. The initiation of any ART regimen leads to a decrease in BMD of 2–6%, and the decrease is more prominent in the first 24–48 weeks of ART. Among all ART, TDF has been shown to lead to a 1–2% larger decrease in BMD when compared to any other non-TDF regimen, including TAF [305, 306]. When TDF is combined with ritonavir-boosted PI, bone loss is even more accentuated than when combined with unboosted integrase inhibitors [307, 308]. If the DXA demonstrates osteoporosis or there is a history of fragility fracture, intervention with

vitamin D, calcium, and a bisphosphonate or other medical therapy may be warranted. Bisphosphonates appear to be safe and effective in improving BMD [309] and in blunting the initial drop in BMD after ART initiation [310]. It is important to exclude osteomalacia prior to initiating a bisphosphonate, as this could lead to increased fragility and fracture. Common reasons for osteomalacia in this population are tenofovir-induced renal phosphate wasting and vitamin D deficiency, which have been reported in 40–80% of people with HIV. The spectrum and severity of metabolic complications associated with vitamin D deficiency among adult persons with HIV remain to be better characterized. Patients with vitamin D deficiency and osteopenia by DXA should be treated with vitamin D and calcium without bisphosphonates until the vitamin D deficiency has resolved. A follow-up DXA should be repeated 1 year later to monitor the response to therapy. It is now clear that switching off of TDF to other NRTIs or to an NRTI-sparing regimen is effective at increasing BMD and should be considered [311, 312].

Routine screening for vitamin D deficiency in subjects with normal or unavailable DEXA is not recommended, given the lack of data among people with HIV. The USPSTF concludes that the evidence on screening for vitamin D deficiency in asymptomatic adults to improve health outcomes is insufficient [313]. Patients, however, should be counseled about the health benefits of regular exercise with resistance exercise being especially important to bone building, normal dietary calcium, and vitamin D intake and the harmful risks of cigarette smoking and excessive alcohol consumption.

In people with HIV, vascular necrosis (AVN) was reported to be associated with exposure to tenofovir for longer than 1 year in one study [314]. Other more common causes of AVN include moderate to high alcohol consumption, hyperlipidemia, and corticosteroid use [314, 315]. Routine radiographic monitoring for AVN in asymptomatic persons is not recommended. However, for patients who present with persistent hip pain who have normal standard radiologic studies, magnetic resonance imaging is the preferred method of diagnosis, and both sides should be imaged regardless of whether pain is bilateral or not. Most patients with symptomatic AVN will ultimately require surgical intervention, including hip replacement [315, 316].

### ***Hypogonadism***

The prevalence of hypogonadism among cisgender men with HIV has been reported to be high prior to the introduction of ART; however, screening for hypogonadism is recommended only for men who have symptoms [317, 318]. In 2014, the FDA released safety alerts that warned of potential increased cardiac risk associated with testosterone replacement products [319-321]. Subsequently, a large systematic review and meta-analysis failed to demonstrate an increased risk of cardiac events in the general population; however, caution remains [322]. Although the Endocrine Society Guidelines [323] recommend short-term testosterone replacement therapy (TRT) for cisgender men with HIV with low testosterone, many patients have remained on TRT long term. It is unclear whether those who were diagnosed with hypogonadism at the time of their HIV diagnosis need to remain on TRT after immune recovery on ART. Since the FDA advisory,

the percentage of cisgender men overall using TRT has declined, but less so among those with HIV [324, 325]. As the population of men with HIV ages, clinicians should balance the benefits against the harms of continuing TRT that may no longer be indicated. TRT may result in testicular atrophy and permanent inability to produce the natural hormone. Men may experience “withdrawal” when TRT is stopped, given the steroidal effects of testosterone as well. Therefore, initiating TRT should be prescribed with caution and only in cisgender men with symptomatic hypogonadism, given the long-term side effects.

### ***Neurocognitive impairment***

Neurocognitive impairment is more common in older people with HIV than those not living with HIV [326]. HIV-associated neurocognitive disorder (HAND) encompasses multiple neurocognitive effects of HIV and associated inflammation on the central nervous system, resulting in deficits that range from asymptomatic neurocognitive impairment to dementia [327]. While there are no specific treatments for HAND at this time, clinicians should be aware that some persons with HIV may experience neurocognitive decline that is out of proportion to their age and should provide an appropriate work-up when such symptoms present.

### ***Frailty***

People with HIV are disproportionately affected with frailty and at a younger age than those without HIV [328]. Prevalence of frailty and prefrailty in people with HIV older than 50 is about 11% and 47%, respectively [329]. Frailty is a strong predictor of both mortality and incident comorbidity in people with HIV independent of other risk factors [330]. Annual screening for frailty should be considered in people with HIV over 50 years of age. The most commonly used screening includes the Frailty Phenotype [331] or the Frailty Index [332], with the former being simpler and more commonly recommended, although it requires a dynamometer. HIV virologic suppression decreases the risk of frailty [333]. The most effective interventions to prevent and treat frailty are increasing physical activity and structured exercise [334]. Nutritional optimization is efficacious and increases the efficacy of an exercise intervention [334]. Diagnosing and treating a concomitant depression is also paramount. There are no data yet to recommend pharmacologic interventions in HIV frailty.

## **SECTION 8: SPECIAL CONSIDERATIONS FOR INDIVIDUALS OF CHILDBEARING POTENTIAL AND FOR PREVENTION OF PERINATAL HIV TRANSMISSION**

People with HIV who are of childbearing potential are living long, healthy lives, and the need for routine gynecological care has increased. They have the same reproductive health needs and concerns as those not living with HIV. As part of the initial assessment, a comprehensive gynecologic and obstetrical history should be obtained that consists of menstrual history, sexual practices, hormonal therapy history and current use, male or female condom use and consistency of use, previous STIs and other genital tract infections, prior abnormal Pap test results including

subsequent evaluation and treatment, pregnancy history, history of gynecologic conditions (including uterine fibroids, endometriosis, and infertility) or surgery (including gender reassignment surgery), and current gynecologic symptoms (including, abnormal vaginal discharge, abnormal vaginal bleeding, amenorrhea, and pelvic pain). Recommendations for care during menopause do not differ from those for persons not diagnosed with HIV.

## **Contraception and Prepregnancy Care**

### ***Recommendation***

- All persons with HIV who are of childbearing potential should be asked about their plans and desires regarding pregnancy upon initiation of care and routinely thereafter. Clinicians should ensure that informed decisions are made about contraception to prevent unintended pregnancy and offer counseling if pregnancy is desired. Counseling should include considerations for the choices of antiretroviral therapy and infant feeding methods.

### **Evidence summary**

Any patient encounter with a nonpregnant person with reproductive potential is an opportunity to counsel about wellness and healthy habits that may improve reproductive and obstetrical outcomes if they decide to reproduce [335]. An in-depth discussion about childbearing is indicated if the patient expresses the desire for future pregnancy, is not trying to conceive but is not using appropriate contraception, or expresses uncertainty about reproductive plans. Regardless of the patient's sex, the goal is to ensure that informed decisions are made about contraception with prevention of an unintended pregnancy and to offer counseling if pregnancy is desired. Patients should explicitly be asked to communicate with their provider if their plans change, when they are ready to consider pregnancy, or when they have questions related to reproduction and parenthood. In persons who are at risk for pregnancy (trying to conceive or not using effective and consistent contraception), providers should carefully review all medications, including over-the-counter medications, and avoid drugs with potential reproductive toxicity. The time of greatest risk to the fetus is early in pregnancy, often before the pregnancy has been recognized. The time of greatest risk to the fetus is early in pregnancy, often before the pregnancy has been recognized. Ideally, a prenatal vitamin with folic acid should be prescribed prior to conception. Choice of ART for use during pregnancy and breast/chest feeding is discussed in detail in HHS perinatal guidelines [120].

Individuals who do not wish to become pregnant should be counseled on effective contraception. Combined estrogen–progestin hormonal contraceptives (birth control pill, transdermal patch, and vaginal ring) are one option but may have interactions with several antiretrovirals, resulting in decreased effectiveness or increased risk of adverse effects. Contraceptive implants, injectable contraception (depot medroxyprogesterone acetate), and intrauterine devices are other available options. Spermicides have been associated with an increased risk of HIV acquisition and are not recommended for use with partners who are not diagnosed with HIV [336].

Providers should be prepared to discuss conception among sero-different couples. The partner with HIV should always be started/continued on ART and achieve/maintain sustained HIV RNA suppression to below the limits of detection prior to beginning efforts to conceive. With durable viral suppression, there is effectively no risk of sexual transmission. For couples that are using condoms and wish to limit their episodes of condomless sex, a discussion about sex during the time of peak fertility is appropriate. Prepregnancy administration of antiretroviral preexposure prophylaxis for the partner not diagnosed with HIV offers an additional means to reduce the risk of sexual transmission [336].

## **Prevention of Perinatal Transmission**

### ***Recommendations***

- To prevent perinatal transmission, all pregnant and breast/chest feeding persons with HIV should be treated with ART, regardless of their immunologic or virologic status. Therapy should be initiated as early as possible, preferably prior to conception.
- Infants exposed to HIV in utero should be managed according to HHS perinatal guidelines.

### **Evidence summary**

Perinatal transmission of HIV is preventable if pregnant persons are screened for HIV and, if diagnosed with HIV, receive immediate ART according to HHS perinatal guidelines [120, 337]. If HIV status is unknown, pregnant people should be tested for HIV at first antenatal visit and again in the third trimester if there is ongoing risk of exposure to HIV. In those who start ART before conception and maintain viral load suppression <50 copies/mL, there is essentially zero risk of perinatal transmission [120, 337].

If an individual in labor presents for delivery without having antenatal HIV testing, an expedited HIV test (preferably fourth-generation HIV antigen/antibody testing) should be performed and, if positive, intravenous zidovudine should be initiated immediately without waiting for confirmatory tests [120]. Person who are pregnant and who have an HIV viral load that is unknown or >1,000 copies/mL at or near (within 4 weeks) of delivery, independent of antepartum ART, should be counseled regarding the potential benefit of cesarean delivery and, if consenting, should be offered a scheduled cesarean delivery at 38 weeks' gestation to reduce the risk of perinatal transmission [120]. All newborns who were exposed perinatally to HIV should receive postpartum ARV drugs to reduce the risk of perinatal transmission of HIV. Post-exposure prophylaxis in the neonate should be initiated ideally within 6 hours [120]. A newborn's ARV regimen should be determined by maternal HIV transmission risk factors according to the perinatal guidelines. Providers with questions about ARV management of perinatal HIV exposure should consult an expert in pediatric HIV infection or the Perinatal HIV/AIDS National Clinician Consultation Center hotline [338].

## **Infant feeding**

### ***Recommendations***

- In the United States, persons with HIV should receive evidence-based, patient-centered counseling to support shared decision making about infant feeding.
- Individuals with HIV who are on ART with a sustained undetectable viral load and who choose to breast/chest feed should be supported in this decision.
- Engaging Child Protective Services is not an appropriate response to the choice of infant feeding for individuals with HIV.

### **Evidence summary**

Counseling about infant feeding should begin prior to conception or as early as possible in pregnancy and should be repeated throughout pregnancy and again after delivery [120]. Choosing a method of feeding for a baby is one of the most important decisions a new parent has to make, and the decision can be compounded by mixed messages from providers who are uncomfortable talking about infant feeding for people with HIV. With current ART, rates of HIV transmission through breast/chest feeding are low but not zero. Currently, there is no consensus on a universal approach, and diverse strategies are used for HIV RNA monitoring for the breast/chest feeding parents, infant HIV testing, and ARV prophylaxis [120, 339]. Individuals with HIV who choose to formula feed should be supported in this decision. Providers should ask about potential barriers to formula feeding and explore ways to address them. Replacement feeding with formula or banked pasteurized donor human milk is recommended to eliminate the risk of HIV transmission through breast/chest feeding when people with HIV are not on ART and/or do not have a suppressed viral load during pregnancy (at a minimum throughout the third trimester), as well as at delivery. Engaging Child Protective Services or similar agencies is not an appropriate response to the infant feeding choices of an individual with HIV.

## **SECTION 9: SPECIAL CONSIDERATIONS FOR CHILDREN**

### **Recommendations**

- Plasma HIV NAAT (HIV RNA or HIV DNA) are equally recommended to diagnose HIV in infants and children aged <18 months with perinatal and postnatal HIV exposure.
- In infants with perinatal and postnatal HIV exposure, the results of plasma HIV NAAT tests can be affected by maternal ART or by antiretroviral drugs administered to the infant as prophylaxis or presumptive HIV therapy.
- For children aged 18 to ≤24 months with nonperinatal HIV exposure and for all children aged >24 months, HIV antibody or HIV antigen/antibody tests are recommended for diagnostic testing.
- Infants and children diagnosed with HIV should be started on ART immediately or within days of diagnosis. The urgency of rapid ART initiation is especially critical for children aged <1 year who carry the highest risk of rapid disease progression and mortality.
- In children with disseminated *Mycobacterium avium* complex disease, *Mycobacterium tuberculosis* disease, and cryptococcal meningitis, ART initiation may be delayed by 2 to 8 weeks with treatment for the opportunistic infection prioritized. Appropriate timing of ART initiation in these cases should be discussed with a pediatric HIV specialist.
- If a child with HIV has not initiated ART, health care providers should closely monitor the virologic, immunologic, and clinical status at least every 3 to 4 months, while continuing to educate and work

- with the family to overcome barriers to treatment.
- Absolute CD4 cell count (or CD4 percentage in children <5 years) and HIV RNA levels should be evaluated at the time of diagnosis and should be monitored at least every 3–4 months in infants and children. Close follow-up also allows for timely weight-based ART dose adjustment in infants and young children.
  - Childhood vaccinations should be administered according to ACIP schedules for infants and children with HIV.
  - Infants and children with HIV should be managed by a specialist with knowledge of the unique therapeutic, pharmacologic, behavioral, psychosocial, and developmental issues associated with pediatric HIV infection.

### **Evidence summary**

Most pediatric HIV infections are caused by perinatal transmission of the virus from mother during pregnancy, delivery, or breastfeeding. The racial and ethnic disparities in HIV epidemic among adults in the United States are, therefore, mirrored among pediatric populations. The rate of acquisition of HIV infection among infants has decreased significantly in the United States, primarily because of effective measures to prevent mother-to-child transmission of HIV. During the decade between 2010 and 2019, the annual perinatal HIV diagnosis rates declined from 1.9 to 0.9 per 100,000 live births, and perinatal HIV transmission rates declined from 1.6% to 0.9%. Both diagnosis and transmission rate perinatal HIV national elimination goals were first achieved in 2019; however, perinatal transmission of HIV still occurs and racial and ethnic disparities persist, requiring ongoing public health investment and efforts [340]. Other routes of HIV transmission in children include feeding blood-tinged pre-masticated food, contact of nonintact skin with blood-containing body fluid, transfusion of contaminated blood products, and sexual abuse. These scenarios should prompt testing of the child for HIV infection. HIV testing should also be conducted among all children in foster care or adopted domestically (if unknown exposure or at risk for acquiring HIV) and internationally (since perinatal HIV screening is variable in global settings) [341]. Children with HIV are frequently born outside the United States, including adopted children and members of immigrant families. These children may have non-B subtypes of HIV, incomplete medical and treatment histories, and an increased risk of tuberculosis and other infections.

Neonates and infants (including breastfed infants) who are exposed to HIV perinatally or postpartum should be managed according to HHS perinatal and pediatric guidelines [91]. Plasma HIV RNA and HIV DNA NAAT are equally recommended for diagnosis of HIV in infants <18 months of age. However, both tests can be affected by maternal ART through transplacental transfer of ARV drugs from the mother to the fetus or by ARV drugs administered to the infant as prophylaxis or presumptive HIV therapy. Qualitative whole blood HIV proviral DNA PCR assays detecting cell-associated virus are less affected by ARV drugs [120]. For children aged 18 to ≤24 months with nonperinatal HIV exposure and for all children aged >24 months, HIV antibody or HIV antigen/antibody tests are used for diagnostic testing. For suspected acute HIV infection, additional HIV NAT may be necessary to diagnose HIV infection.

All infants and children diagnosed with HIV should be started on ART as soon after diagnosis as possible (immediately or within days) using regimens recommended by pediatric HHS guidelines [91]. Multiple studies have reported that early ART initiation in infants and children preserves immune function and is associated with improved growth and neurodevelopmental outcomes [342-344]. In infants with perinatally acquired infection, early ART initiation may limit the formation of the viral reservoir and control of viral replication before HIV can evolve into diverse and potentially more pathogenic and/or resistant quasi-species; preserve immune function; prevent clinical disease progression; and improve neurodevelopmental outcomes. Early initiation of suppressive ART in infants aged <6 months results in a considerable proportion of infants with HIV who fail to produce their own HIV-specific antibodies. These infants are HIV-seronegative when tested; however, viral reservoirs remain, and viral rebound occurs if ART is stopped [342-344]. It is, therefore, important to educate the caregiver and the patient on the importance to continue consistent ART without treatment interruptions.

Genotypic resistance testing should be performed at the time of diagnosis, but ART can be initiated before results are available. All infants should receive *Pneumocystis jirovecii* prophylaxis in the first year of life, irrespective of CD4 cell count or percentage [110]. In general, infants with untreated perinatally acquired HIV have higher viral loads than adults, and there are age-specific differences in CD4 cell counts, with infants having higher normal absolute lymphocyte counts than adults. In young children (aged <5 years), CD4 percentages are less variable than absolute counts [345]. Infants and children with undiagnosed HIV are likely to present with unexplained fevers, hepatosplenomegaly, generalized lymphadenopathy, parotitis, persistent oral and diaper candidiasis, recurrent invasive bacterial infections, recurrent diarrhea, failure to thrive, central nervous system diseases, and delays in growth and development [346].

While initiating and managing pediatric ART, it is essential to understand that achieving consistent adherence in children is often challenging. Intensive adherence counseling and follow-up during the first few weeks to months after ART initiation is recommended to support the child and caregiver, including detailed instructions on the administration of ARV drugs and caregiver treatment literacy [91]. After initiation of ART or after a change in ARV regimen, children should be followed up in 1–2 weeks to assess the effectiveness, tolerability, and adverse events, and to evaluate and support medication adherence. Head circumference should be measured in children aged <3 years and plotted against standard growth curves. Furthermore, developmental assessment is important in infants and children. Laboratory testing for toxicity and viral load response is recommended at 2 to 4 weeks after treatment initiation or change in ARV regimen. Clinicians and multidisciplinary teams should schedule frequent clinical in-person and/or telemedicine visits to monitor patients closely during the first few months after initiating a new ART regimen. For young infants, more frequent clinical visits are required to ensure that growth and development are on schedule, that appropriate adjustment of dosages are made, and that the infant is tolerating ART. CD4 cell count can be monitored less frequently (every 6–12 months) in children who are adherent to therapy, who have sustained virologic suppression and CD4 count values that are well above



the threshold for opportunistic infection risk, and who have stable clinical status [91]. Viral load measurement every 3 to 4 months is recommended to monitor ART adherence.

Caregivers, families, and children with HIV face a wide array of socioeconomic, educational, legal, immigration, and structural challenges affecting the adherence and retention in care and require ongoing case management support to achieve and sustain positive HIV disease, health, and developmental outcomes. Disclosure of HIV status to children with perinatally acquired HIV is an emotionally and socially complex process that requires caregiver and child support. Studies suggest that disclosure of perinatal HIV status can increase self-esteem and adherence to ART and improve access to psychosocial support [347-350].

All recommended childhood immunizations should be administered to infants exposed to HIV. If HIV infection is confirmed, immunologic status (CD4 cell count or percentage) should be assessed and guidelines for the immunizations of the child with HIV should be followed [156, 346]. Children with HIV should be immunized with all age-appropriate inactivated vaccines. Inactivated influenza vaccine should be administered annually according to the most current recommendations. Generally, the administration of live vaccines, such as MMR and varicella, is guided by the CD4 cell count or percentage. Rotavirus vaccine, however, should be administered to infants with HIV or exposed to HIV irrespective of CD4 cell percentage or count [346].

In the era of ART, there has been a substantial decrease in frequency of opportunistic infections (OIs) and malignancies in children [346]. Prevention and treatment of OIs in children should be managed according to the HHS pediatric OI guidelines [110]. Leiomyosarcomas and non-Hodgkin B-cell lymphomas of the Burkitt type (including those in the CNS) occur more frequently in children with HIV than in immunocompetent children. Kaposi sarcoma, caused by human herpesvirus 8, is rare in children in the United States but has been documented in children with HIV who have emigrated from sub-Saharan African countries.

## **SECTION 10: SPECIAL CONSIDERATIONS FOR ADOLESCENTS**

### ***Recommendations***

- Adolescents with HIV require an individual and developmentally guided approach to therapy and care, ideally through an HIV specialist and team with expertise in this population.
- Adolescents with HIV should be counseled about preventative measures, including smoking cessation, alcohol and other substance use prevention, gender, and sexual health, including safer sex practices, to prevent development of comorbidities.
- Screening for early detection and management of comorbidities should be considered for adolescents with HIV.
- Vaccinations should be administered according to ACIP schedules for children with HIV, including ensuring catch-up vaccinations if applicable and administration of vaccines that prevent comorbidities, if applicable.
- Adolescents with HIV should have a coordinated, deliberate transition to adult care, with an

emphasis on supporting their capacity for self-care, including but not limited to retention, adherence to care, medical literacy, and engagement in mental health and substance use treatment.

### **Evidence summary**

The care of adolescents with HIV, whether perinatally or nonperinatally acquired, presents many challenges [347, 348, 351]. The median age of the U.S. cohort of children who acquired HIV early in life, mostly via perinatal transmission, is now in their mid to late teens, and many have reached adulthood [352, 353] with varying degrees of health. Youth with HIV, in addition to the biologic and psychosocial changes that normally occur in adolescence, often cope with stigma, disclosure, loss of family members, and negotiation of sexual activity. In many studies, rates of cognitive, psychiatric, and behavioral problems are higher in those with perinatally acquired infection [354, 355]. As a result of these challenges, many youths with perinatally acquired infection have poorer adherence to ART and may experience decreased engagement in care compared to other populations [347]. Disclosure for this population is complicated as it includes becoming aware of one's own diagnosis and the subsequent self-disclosure of one's diagnosis to others (e.g., sexual partners). While disclosure of diagnosis by the caregiver to the child or adolescent can be overwhelming to caregivers, it should occur early, by late childhood and prior to adolescence, as it has been correlated with better adjustment to illness, lower rates of depression, and improved adherence with care and ART [91, 348, 351]. Support should be provided for both types of disclosure. Screening for and addressing mental health challenges and concerns is an important part of caring for this population.

Puberty may affect drug metabolism, underscoring the importance of adolescent-specific studies. Decisions regarding dosing should consider sexual maturity, with those with sexual maturity rating  $\geq 4$  dosed according to adult treatment guidelines. This is becoming less relevant with weight-based dosing becoming the standard of care. Special attention should be paid to attaining and maintaining viral suppression, along with risk reduction counseling, STI and pregnancy prevention, and secondary HIV prevention in early or later adolescence [356, 357].

Long-term treatment may result in treatment fatigue, viral resistance due to suboptimal adherence or good adherence to suboptimal regimens, or potential end-organ toxicity, and therefore requires monitoring [358]. Early acquired HIV, particularly in the setting of suboptimal viral suppression, can result in chronic immune activation and inflammation, which leads to noncommunicable disease comorbidities (e.g., metabolic syndrome, dyslipidemia, chronic kidney disease, obesity, bone disease, atherosclerotic vascular disease, and cardiopulmonary abnormalities) [352, 358-361]. This risk is compounded by modifiable risk factors, particularly smoking/vaping and poor diet, which often begin during adolescence. Caring for youth with early-acquired HIV necessitates a life course approach with counseling regarding modifiable risk factors; prevention including smoking cessation, dietary modification, and vaccination against preventable conditions; and screening for, and early management of, comorbidities [362, 363].

Youth who acquired HIV through sexual activity or injection drug use, atop the biologic and psychosocial changes that normally occur in adolescence, have issues that are similar to those for adults, including high rates of substance use; STIs; mental health comorbidities such as depression, anxiety, and PTSD [352]; and social determinants that may present barriers to care [7]. Sexual and gender identity and sexual behaviors should be discussed in a nonjudgmental manner in order to understand sexual risk and diminish stigma [364]. Multidisciplinary teams that simultaneously address biological and psychosocial issues are critical in optimizing outcomes, including early initiation of therapy and adherence support to maximize immune recovery and health and minimize transmission risk [365, 366]. ART should be prescribed according to established adult and adolescent treatment guidelines [7]. (See also Section 1: Optimizing Care.)

The transition of adolescents from pediatric to adult care usually occurs between the ages of 18 and 25 years and is impacted by variable factors, from patient preference to availability of providers and system/clinic rules. Youth are at high risk of falling out of care and poor clinical outcomes during this transition period [367, 368]. The transition of care from pediatric or adolescent to adult providers should be a deliberate, comprehensive, and coordinated multidisciplinary youth-friendly process that involves the health care team and the patient [369-371]. Care must be given to synergistically attend to the diverse needs of the adolescent that extend beyond medical care, including employment, independent living, and intimate relationships. Over time, youth must learn to negotiate the health care system and assume increasing responsibility for their health care. There are several resources on best practices for transitioning youth with HIV to adult care [7, 372-375].

## **SECTION 11: CONSIDERATIONS FOR TRANSGENDER AND GENDER-DIVERSE ADULTS**

### ***Recommendations***

- Transgender and gender-diverse persons with HIV should have access to care that is gender-affirming, nondiscriminatory, nonstigmatizing, and culturally sensitive.
- Intake forms, medical records, and other documentation should include gender identity options in addition to sex assigned at birth, and chosen name and pronouns, in addition to the legal name.
- Transgender persons should be offered medically necessary gender-affirming interventions in accordance with national guidelines.
- HIV care providers should be familiar with gender-affirming hormone treatment and necessary clinical and laboratory monitoring or provide referral to a clinician or endocrinologist experienced in transgender care.

### **Evidence summary**

Transgender people identify with a gender that differs from their sex assigned at birth. Recent data estimate that approximately 1.3 million adults in the U.S. identify as transgender or gender diverse [376]. It is important to use the appropriate terminology when talking with and about transgender persons. Many terms are used and often are confused with each other or used incorrectly (Table

8). Gender dysphoria refers to the discomfort that some transgender people may experience due to the discrepancy between their gender identity and sex assigned at birth. Some individuals opt for medical interventions, such as the use of gender-affirming hormones and surgeries, to align their physical characteristics with their gender identity.

Stigma and discrimination are serious issues that threaten quality of care for transgender and gender-diverse persons, regardless of HIV status. Nearly half of transgender persons face family rejection, 40% report a history of suicide attempt, 29% live in poverty, 30% have experienced homelessness, 33% have experienced discrimination within the health care system, and 23% avoid the health care system due to fear of discrimination [377]. Global estimates show a pooled HIV prevalence of 19.9% (95% CI 14.7% – 25.1%) among transgender women, with 66-fold higher odds of HIV prevalence than the general population [378]. Data among transgender men are limited, but estimated HIV prevalence is 2.56% (95% CI 0.0% – 5.9%) [378]. Given the disproportionate impact of HIV on transgender individuals and the psychosocial barriers they face, health systems and health care providers should strive to create more welcoming, affirming, and trauma-informed clinical environments. Clinic intake and registration forms should allow selection of gender identity in addition to assigned sex at birth [379]. Patients should be addressed using their chosen name (when different from legal name) and pronouns. Additionally, educational and health promotional materials designed for transgender individuals create a better sense of inclusion. Staff should undergo training on gender diversity and delivery of culturally competent and sensitive care. This comprehensive approach with all staff may facilitate patient empowerment, care engagement, and viral suppression [380, 381].

Gender-affirming hormone therapy (GAHT) is safe when provided under medical supervision. This care is often provided by primary care providers and HIV specialists who have received training, including informally, through mentorship or continuing medical education [224]. HIV care providers should be familiar with gender-affirming hormone treatment and necessary clinical and laboratory monitoring or provide referral to a medical provider or endocrinologist experienced in transgender care. Persons should be offered GAHT in accordance with established clinical practice guidelines, such as those published by the Endocrine Society [382] and the World Professional Association for Transgender Health [224]. Before initiating gender-affirming medical therapy for adult patients, the clinician should ascertain that the patient's gender identity is persistent and that they have the capacity to consent to treatment. The clinician should review expectations in terms of the timeline for changes and types of changes associated with hormone therapy, as well as a balanced risk assessment of those therapies. Prior to initiating hormone therapy or undergoing gonadectomy, clinicians should discuss parenthood goals, the impact of these interventions on fertility, and available options for sperm or oocyte preservation [224]. Some payers may require an assessment and referral letter from a mental health professional prior to gender-affirming medical interventions.

Feminizing hormone regimens typically use estrogen and antiandrogen medications, such as spironolactone. In 3 to 6 months, patients may start to experience breast growth, decreased muscle

mass, softer skin, redistribution of body fat, and fewer spontaneous erections [224]. Transgender individuals who receive estrogen therapy may be at increased risk of hypertriglyceridemia, venous thromboembolism (VTE), and cardiovascular disease. Transdermal estrogen formulations may pose lower risk of thrombosis and are preferred for those over age 45 years, with a history of VTE, or with known risk factors for cardiovascular disease [224]. Oral conjugated estrogen formulations and ethinyl estradiol are not recommended due to an increased risk of thromboembolic events [224]. Smoking cessation should be encouraged. Clinical evaluations with laboratory monitoring of serum estradiol and testosterone should occur every 3 months for the first year and once to twice per year thereafter, with potassium monitoring at the same intervals for those on spironolactone. Target levels for individuals receiving feminizing GAHT are serum total testosterone <50 ng/dL and serum estradiol approximately 100 to 200 pg/mL [224].

For masculinizing hormone therapy, testosterone remains the mainstay treatment. Results, including cessation of menses, deepening of voice, increased muscle mass, and facial hair, typically start within 3 to 6 months [224]. Androgen therapy may result in erythrocytosis, in increases in LDL cholesterol, and in serum creatinine [224, 383]. After initiating testosterone therapy, hemoglobin/hematocrit and serum testosterone should be measured every 3 months for the first year and 1–2 times per year thereafter. The serum total testosterone level should be maintained in the normal physiologic cisgender male range, 400–700 ng/dL [224].

Several antiretroviral regimens, including the NRTIs, unboosted INSTIs, and rilpivirine and doravirine, are not anticipated to impact GAHT and require no additional monitoring [384, 385]. Estradiol levels may be decreased by the NNRTIs efavirenz, etravirine, and nevirapine. Ritonavir-boosted protease inhibitors may increase or decrease estradiol levels, while cobicistat-boosted PIs may increase estradiol [386]. Testosterone levels are increased by boosted PIs and elvitegravir/cobicistat, and decreased by efavirenz, etravirine, and nevirapine [386]. When pharmacokinetic interactions are anticipated, clinicians should monitor clinical effects as well as serum hormone concentrations and adjust hormone doses as needed. It is important to provide patients accurate information on drug–drug interactions between their ART and hormone therapy, including the lack of deleterious effects on hormone therapy, and to make dose adjustments as appropriate. Lack of communication around this concern may contribute to fear of drug–drug interactions and poor adherence to one therapy or the other [387].

## **SECTION 12: COVID-19 AND HIV**

People with HIV have been impacted by SARS-CoV-2 infection (COVID-19) since the early days of the pandemic. Early on, the presumption was that people with HIV would fare poorly due to damaged immune systems, but that has not necessarily proven to be the case. This section discusses the interaction of COVID and HIV only. IDSA has excellent living guidelines for COVID management and treatment in the general population [388]. The best protections against COVID for people with HIV are up-to-date vaccinations and good health hygiene and safety. It is important

for providers to remember that HIV care should not be disrupted simply due to COVID. In fact, aiming for viral suppression and maximization of CD4 count is recommended to prevent a more severe COVID infection [389, 390]. Early on, and even one year after general quarantines, access to HIV care was more limited, and many people with HIV had disruptions in HIV care, including refills of ART and disease monitoring in addition to provider visits and laboratory testing [390, 391]. Providers who care for people who are more severely immunocompromised (CD4 <200 cells/ $\mu$ L) should ensure that the office is safe for people with HIV. Please consult CDC guidelines for the latest health care facility recommendations [392].

## Recommendations

- Maximize CD4 count and viral suppression to lower risk for COVID.
- Encourage weight loss as obesity is a significant risk factor for severe COVID infection.
- Treat pulmonary comorbidities to maximize protection against severe COVID infection.
- Ensure patients with more advanced HIV are fully vaccinated, including vaccines targeted to newer SARS-CoV-2 variants, and generally employ mRNA vaccines (See Section 4).
- There is no evidence that people with HIV and COVID require a change to their antiretroviral therapy simply due to presence of COVID coinfection.
- HIV is not a contraindication to COVID vaccination, nor does COVID vaccination impact HIV viremia.
- Follow treatment recommendations for COVID the same as people without HIV, and treatment recommendations do not change by HIV viral load or CD4 count.
- Treatment of COVID is not changed by HIV infection, nor is antiretroviral therapy changed due to treatment for COVID.
- Do not use dexamethasone or other corticosteroids in the outpatient setting in the care for COVID among people with HIV, in the absence of other indications.
- Be cognizant of significant drug–drug interactions with ritonavir-boosted nirmatrelvir and all medications and supplements. Antiretroviral therapy does not require dose adjustments in this setting.
- Previously disproven COVID treatment should not be used for people with HIV, including ivermectin or sotrovimab in the outpatient setting.
- As people with HIV may be at increased risk of post-COVID conditions, ask about PCC-related symptoms among people with HIV who are post-30 days from COVID diagnosis.

## Evidence summary

People with HIV are at increased risk of acquiring SARS-CoV-2 infection, and possibly of becoming reinfected with SARS-CoV-2, with risk inversely proportional to CD4 count, especially if CD4 <200 cells/ $\mu$ L [180, 393–395]. Having a CD4 count <200/uL was associated with increased mortality, while CD4 <350 cells/ $\mu$ L was associated with increased risk of hospitalization in multiple studies [393, 396]. As such, all people with HIV should be on ART and aim for CD4 counts >200 cells/ $\mu$ L, but ideally >350 cells/ $\mu$ L. This is especially important to decrease risk of hospitalization or more severe COVID infection [393]. Additional evidence suggests that all persons (regardless of HIV status) would benefit from weight loss, as obesity is associated with more severe COVID infection [397]. Data also suggest higher risk for more severe COVID is associated with cirrhosis, alcoholic hepatitis, chronic kidney disease, diabetes mellitus, and smoking [395]. Further, chronic pulmonary disease, specifically bronchiectasis, chronic

obstructive pulmonary disease, interstitial lung disease, pulmonary embolism, and pulmonary hypertension, have been associated with more severe COVID infection, including greatly increased risk of hospitalization and death. All of these conditions should be maximally optimized prior to infection (including stopping smoking) to lower the risk of severe infection.

Early data (2020 data) showed an association between decreased access to testing among non-Latino Blacks and Latinos and late diagnoses with more severe COVID infections [398]. While testing access improved during the pandemic, as the public health emergency has ended, access to testing may remain key for certain subpopulations. Vaccination against COVID, including all recommended boosters, is key for COVID prevention and lowering risk for severe COVID infections for people with HIV (see Section 4). Consistent evidence indicates that people with HIV with CD4 counts >200 cells/ $\mu$ L have robust immune response (approximating those without HIV infection), but mRNA vaccines perform superiorly to other vaccine platforms [396, 399, 400]. Further, HIV is not a contraindication to COVID vaccination, regardless of CD4 count or degree of HIV viral suppression, nor does COVID vaccination impact HIV viremia [181, 401]. Even with effective vaccination, however, there is still some evidence that people with HIV are at increased risk for breakthrough infection, but need for hospitalization or risk of death is not increased relative to people without HIV [399, 402].

Controversy persists on the role of antiretroviral agents to prevent COVID infection or mitigate the severity of infection among people with HIV. Observational evidence from several studies has suggested that tenofovir may be associated with lower risk of severe COVID; however, no confirmatory data from randomized trials exists [403]. Similarly, evidence for protease inhibitors and prevention of COVID remains inconclusive [404]. There is no evidence to suggest that people with HIV and COVID require a change to their antiretroviral therapy simply due to the presence of COVID infection. No change is required to antiretroviral therapy while on anti-COVID treatment, including remdesivir or ritonavir-boosted nirmatrelvir. Close monitoring for potential increased risk of side effects is recommended. However, dexamethasone or other corticosteroids being used as anti-COVID treatment should be avoided in the outpatient setting, as side effects may increase due to drug–drug interactions [405].

As discussed in Section 4, PCC is an ever-increasing phenomenon following SARS-CoV-2 infection. The exact incidence is unclear, and treatment is mainly symptomatic. There is some evidence that people with HIV may be at increased risk for PCC, especially if not virally suppressed or with a lower CD4 count [406-408]. As such, providers should ask about PCC-related symptoms among people with HIV who are post-30 days from COVID diagnosis. No treatment modifications for ART or comorbidities are indicated in the presence of PCC.

## NOTES

**Acknowledgments.** The authors thank the following individuals for their contributions to this guidance: Andrea Weddle, MSW (HIVMA executive director), Helaine Resnick, PhD, MPH

(consultant, literature reviews), Kendra Porter, BS, and Lily Fathi, BA. The authors also thank our reviewers (Joseph Cherabie, MD, MSc, Carolyn Chu, MD, MSc, Michael Mugavero, MD, Tim Horn, MS, and members of the IDSA Standards and Practice Guidelines Subcommittee) for their thoughtful comments that improved the manuscript.

**Disclaimer.** This guidance cannot account for individual variation among patients and is not intended to supplant clinician judgment with respect to particular patients or special clinical situations. The HIV Medicine Association and the Infectious Diseases Society of America (IDSA) consider adherence to this guidance to be voluntary, with the ultimate determination regarding its application to be made based on individual patient circumstances.

**Financial support.** IDSA provided financial support for this guidance.

**Conflicts of Interest Summary:** The following list include what has been reported to IDSA. To provide thorough transparency, IDSA requires full disclosure of all relationships, regardless of relevancy to the guideline or guidance topic. Evaluation of such relationships as potential conflicts of interest is determined by a review process which includes assessment by the Board of Directors liaison to the Standards and Practice Guidelines Committee and, if necessary, the Conflicts of Interest and Ethics Committee. The assessment of disclosed relationships for possible conflicts of interests is based on the relative weight of the financial relationship (i.e., monetary amount) and the relevance of the relationship (i.e., the degree to which an association might reasonably be interpreted by an independent observer as related to the topic or recommendation of consideration). IDSA requests panel members to disclose activities and financial relationships/investments related to consultant/advisory roles, promotional speakers bureau, stocks/bonds, honoraria, expert testimony, ownership interest, research grants, organizational benefits, intellectual property, other numeration, activities with other organizations, and relevant financial interest of family members. Readers of this guidance should be mindful of this when the list of disclosures is reviewed.

No disclosures reported: **M.A.H. M.T.** serves as the Chair of the Independent Data Monitoring Committee for Excision Biotherapeutics. **A.A.** receives grant funding from NIH and Gilead Sciences; received consulting fees from the ViiV Healthcare and Gilead Sciences; serves as Chair of the HIVMA Board of Directors, Chair of the Advocates for Youth Board and as a Board member of The Well Project and was paid for expert testimony by Medicolegal consulting unrelated to the manuscript. **J.A.C.** receives grant funding from the NIH; serves on the ACTHIV Advisory Board and received consulting fees from Prime Education and Integritas Communications. **M.H.** receives Ryan White Program Part C grant funding and served on the HIVMA Board of Directors and as Chair of HIVMA. **M.K.J.** receives grants from NIH, Gilead Sciences, Laurent and the Cancer Prevention & Research Institute of Texas; receives payment or honoraria from HCPLIVE and ACTHIV; serves on the IDSA Coordinating Council; received support for travel from the HIV Congress (India) and served on the HIVMA Board of Directors. **G.M.** receives grants from Astellas, Redhill, Genentech, Cognivue, Pfizer; receives consulting fees from Gilead, Merck,



ViiV/GSK; and received consulting fees from Janssen. **A.R.** serves as a Board member for the American Sexual Health Association and the World Professional Association of Transgender Health. **N.R.** serves as Chair of the Committee on Pediatric and Adolescent HIV at the American Academy of Pediatrics. **W.R.S.** received consulting fees from ViiV Healthcare and received payment or honoraria for lectures by ViiV Healthcare. **T.S.** received research funding from Gilead Sciences and ViiV Healthcare and funding for speaking and serving on an advisory board from ViiV/GSK. **H.T.** receives grants from NIDA, Gilead Sciences and ViiV healthcare; consulting fees from RTI International Simon Fraser University, Westat; participates on the Multi-Center Safety-Study Examining the Use of the O'Neil Long-Acting Naltrexone Impact (OLAN) in Participants with Opioid Use Disorder Receiving Repeat Dosing; and serves on the HIVMA Board of Directors, Black Harm Reduction Network, Florida Reduction Collective and Safety Project.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

**Table 1:** Initial Assessment: History of the Present Illness and HIV-Specific History

<p><b>History of the present illness</b></p> <ul style="list-style-type: none"> <li>• Initial questions should focus on establishing rapport, putting the patient at ease, and ascertaining the patient's primary reason for the visit, if not simply to establish the patient in HIV care.</li> <li>• Assess the patient's level of knowledge about HIV treatment and prevention, evaluate educational needs, and determine what ancillary and social support might be necessary (ideally in collaboration with effective case management).</li> <li>• If not previously treated with ART, assess the patient's readiness to begin ART immediately, including on the day of the first visit if feasible.</li> <li>• If previously but not currently on ART, assess the patient's readiness to reinstate ART immediately, including on the day of the first visit if feasible and if adequate information is available to choose an appropriate regimen.</li> <li>• Assess the need for assistance with social services such as housing, transportation, and food access, and involve support staff early if appropriate.</li> </ul>
<p><b>HIV-specific history</b></p> <ul style="list-style-type: none"> <li>• Approximate date of HIV diagnosis</li> <li>• Approximate date of HIV acquisition and likely cause for HIV acquisition (including sexual trauma if appropriate), which can sometimes be determined on the basis of prior negative test results, occurrence of symptoms suggestive of acute retroviral infection, or timing of activities that may have resulted in exposure</li> <li>• Prior HIV care</li> <li>• Nadir CD4 cell count and highest viral load</li> <li>• Current and past exposure to antiretroviral drugs <ul style="list-style-type: none"> <li>• Use of pre- or postexposure prophylaxis (including medications and date of last use)</li> <li>• Use of ARVs for prevention of perinatal transmission</li> <li>• Prior antiretroviral treatment <ul style="list-style-type: none"> <li>• Drug regimens taken and HIV RNA level while on those regimens</li> <li>• Duration of therapy</li> <li>• Reasons for changing regimens (e.g., virologic failure, tolerability, simplification) and adherence challenges</li> </ul> </li> </ul> </li> </ul>

<ul style="list-style-type: none"> <li>● Past medical record review (request records if not available) <ul style="list-style-type: none"> <li>● Results of all prior resistance testing</li> </ul> </li> <li>● Prior HIV-associated conditions <ul style="list-style-type: none"> <li>● Opportunistic infections and/or malignancies according to CDC Stage 3 definition</li> <li>● Other HIV-related conditions (i.e., thrush)</li> </ul> </li> </ul>
<p><b>People who currently inject drugs</b></p> <ul style="list-style-type: none"> <li>● Current drug-use practices</li> <li>● Source of needles and needle-sharing practices</li> <li>● Access to naloxone</li> </ul>

Abbreviations: HIV, human immunodeficiency virus; ART, antiretroviral therapy; CDC, Centers for Disease Control and Prevention; RNA, ribonucleic acid

**Table 2: Other Medical and Surgical History**

<p><b>Comorbidities:</b> Current or past chronic medical conditions that might affect the choice of therapy or response to therapy</p> <ul style="list-style-type: none"> <li>● Prior and present gastrointestinal disease</li> <li>● Liver disease including viral hepatitis A, B, and C; past treatment for hepatitis B and/or C</li> <li>● Cardiovascular disease and risk factors, including hyperlipidemia, hypertension, diabetes mellitus, and smoking</li> <li>● Osteopenia or osteoporosis</li> <li>● Kidney disease</li> <li>● History of receipt of blood products, organ transplant, or tattoos</li> </ul>
<p><b>Other past medical conditions that may have implications for persons with HIV</b></p> <ul style="list-style-type: none"> <li>● History of chickenpox or shingles, measles</li> <li>● <i>Mycobacterium tuberculosis</i> illness, exposure, treatment; prior testing or treatment for latent TB</li> <li>● STIs including syphilis, chlamydia, gonorrhea, herpes simplex, trichomoniasis, chancroid, HPV</li> <li>● Abnormal anal cytology; past anorectal disease including warts, fissures</li> </ul>
<p><b>Gynecologic and obstetric history</b></p> <ul style="list-style-type: none"> <li>● Past pregnancies and plans for future pregnancy, history of artificial insemination by an unidentified donor</li> <li>● Birth control practices</li> <li>● Last cervical Pap test, abnormal Pap test ever, colposcopy, LEEP, biopsy (cone/knife)</li> <li>● Menstrual history</li> <li>● Other gynecologic conditions including pelvic inflammatory disease</li> </ul>
<p><b>Mental health history, current and past</b></p> <ul style="list-style-type: none"> <li>● Previous or current psychotherapy and medication treatment</li> <li>● Anxiety disorders, bipolar disorder, depression, violent behavior</li> <li>● Suicidal, homicidal ideation; history of hospitalization due to mental health issues</li> <li>● History of trauma, including sexual and physical abuse, intimate partner and other violence; post-traumatic stress disorder (with appreciation for the sensitive nature of these inquiries and the emotional responses they may elicit)</li> <li>● History of substance use and treatments for substance use (if any; note which substances used)</li> </ul>
<p><b>Current or past use of psychoactive substances</b></p> <ul style="list-style-type: none"> <li>● Tobacco including e-cigarettes; years of use and estimate of cumulative exposure</li> <li>● Cannabis and cannabinoids (including vaping)</li> <li>● Vaping (regardless of substance)</li> <li>● Alcohol use – quantify daily/weekly/monthly use</li> <li>● Stimulants, including methamphetamine, cocaine, crack cocaine</li> </ul>

<ul style="list-style-type: none"> <li>● Opioids</li> <li>● Other nonprescription drugs</li> <li>● Misuse or overuse of prescription drugs</li> <li>● Other substances primarily used with sex (amyl nitrate [poppers], erectile dysfunction drugs)</li> <li>● Past injection drug use (regardless of substance used); history of needle sharing; hospitalizations related to injection drug use</li> </ul>
<p><b>Past hospitalizations, surgical procedures, transfusions, or blood product receipt</b>, especially during 1975–1985 or outside U.S./Canada</p>
<p><b>Immunization status</b> (obtain from past medical records if possible)</p> <ul style="list-style-type: none"> <li>● Childhood vaccination including for measles, mumps, rubella, rotavirus</li> <li>● COVID-19</li> <li>● Hepatitis A and B</li> <li>● HPV</li> <li>● Influenza</li> <li>● Meningococcus</li> <li>● Mpox</li> <li>● Pneumococcus – with type of vaccine</li> <li>● Varicella zoster</li> <li>● Tetanus/diphtheria or Tetanus/diphtheria/acellular pertussis</li> <li>● Respiratory syncytial virus</li> <li>● Travel vaccinations</li> </ul>
<p><b>Travel and residential history</b> pertinent to endemic infectious diseases that may be reactivated, including histoplasmosis (Ohio and Mississippi River valleys), coccidioidomycosis (southwestern deserts), or TB</p>
<p><b>Pediatric</b></p> <ul style="list-style-type: none"> <li>● Maternal HIV, obstetric, and birth history</li> <li>● Exposure to antiretroviral drugs perinatally</li> <li>● Growth and development milestones</li> <li>● Childhood vaccination history</li> <li>● Caregiver environment and support</li> <li>● Educational history</li> </ul>
<p><b>Family medical history</b></p> <ul style="list-style-type: none"> <li>● Diabetes</li> <li>● Early heart disease: myocardial infarction in a first-degree relative before the age of 55 years in male relatives and before the age of 65 years in female relatives</li> <li>● Hypertension</li> <li>● Hyperlipidemia</li> <li>● Cancer</li> <li>● Any other significant medical condition</li> </ul>
<p><b>Social history</b></p> <ul style="list-style-type: none"> <li>● Race and ethnicity</li> <li>● Gender identity and sexual orientation; pronouns</li> <li>● Patient birthplace, residence, and travel history</li> <li>● Employment history</li> <li>● Incarceration history</li> <li>● Education history</li> <li>● Financial support</li> <li>● Children: ages, plans for having children in the future; HIV status of children</li> <li>● Pets</li> <li>● Diet and exercise</li> </ul>

<ul style="list-style-type: none"> <li>Sexual history: nonjudgmental inquiry about types of activity including partners (number, gender, whether met online) and practices (genital, anal, oral; use of drugs with partners; exchange of sex to meet needs such as money, housing, drugs; assessment of satisfaction with sexual performance); STI prevention including use of barrier protection such as condoms or dental dams, frequency of barrier use, and prior HIV PrEP or doxycycline PEP use; past STIs and treatment (including mpox); sexual trauma, violence, and abuse also should be explored, recognizing the sensitivity of these issues</li> <li>Marital/relationship status <ul style="list-style-type: none"> <li>Partner(s) health and HIV status</li> <li>Partner(s) access to health care, including HIV testing (if appropriate)</li> <li>Disclosure of HIV status to partner(s)</li> </ul> </li> <li>Social support and participation in support groups</li> <li>Disclosure history: friends, family, work colleagues</li> <li>Access to stable housing, food, transportation</li> <li>For minors, review legal guardianship and consent/assent</li> </ul>
<b>Medications</b> <ul style="list-style-type: none"> <li>Current medications, including over-the-counter medications, supplements</li> <li>Use of complementary or alternative therapy or treatment</li> </ul>
<b>Allergies and intolerance:</b> Dates and types of reactions, including hypersensitivity reactions to ART
<b>Health care maintenance and preventative health screenings</b> (as appropriate) <p>Dates of last</p> <ul style="list-style-type: none"> <li>Cervical or anal Pap (and results, if known)</li> <li>Mammogram</li> <li>Bone density</li> <li>Colonoscopy and/or anoscopy (and results, if known)</li> <li>AAA screening</li> <li>Dental visit</li> <li>Dilated eye exam</li> <li>Lung cancer screening (if applicable and results, if known)</li> </ul>

Abbreviations: AAA, abnormal aortic aneurysm; ART, antiretroviral therapy; E -cigarettes, electronic cigarette; HIV, human immunodeficiency virus HPV, human papillomavirus; LEEP, loop electrosurgical excision procedure; Pap, Papanicolaou; PEP, postexposure prophylaxis; PrEP, preexposure prophylaxis; TB, tuberculosis.

**Table 3:** Initial Assessment – Review of Systems and Physical Examination

Review of Systems	Physical Examination
<p><i>A complete review of systems with special attention to the areas listed below:</i></p> <ul style="list-style-type: none"> <li>General: unexplained weight loss or gain, night sweats, fever, changes in body habitus</li> <li>Skin: skin discoloration, rash, ulcers, or lesions</li> <li>Lymph nodes: localized or generalized enlargement of lymph nodes</li> <li>Eyes: vision change or loss</li> </ul>	<p><i>A complete physical examination should be performed, with special attention to the following areas:</i></p> <ul style="list-style-type: none"> <li>Vital signs: including height and weight</li> <li>General: including body habitus, evidence of obesity, wasting, lipodystrophy, assessment of frailty, and ambulatory ability</li> <li>Skin: seborrheic dermatitis, ecchymoses, purpura, petechiae, Kaposi sarcoma, herpes simplex or zoster, psoriasis, molluscum contagiosum, onychomycosis,</li> </ul>

<ul style="list-style-type: none"> <li>• Mouth: gum disease, ulcers, oral lesions or pain, dental health and dentition for children</li> <li>• Cardiopulmonary: chest pain, palpitations, wheezing, dyspnea, orthopnea</li> <li>• Gastrointestinal: odynophagia, dysphagia, diarrhea, nausea, pain</li> <li>• Endocrinology: symptoms of hyperglycemia, thyroid disease, hypogonadism</li> <li>• Neurologic and psychiatric: persistent and severe headaches, memory loss, loss of concentration, depression, apathy, anxiety, mania, mood swings, lower-extremity paresthesias, pain, or numbness, paralysis or weakness, cognitive difficulties, dizziness, seizures, sleep disorders</li> <li>• Genitourinary: dysuria, urethral or vaginal discharge or lesions, hematuria</li> <li>• Orthopedic: hip pain, joint pain, fractures, diagnosis of or risk factors for osteopenia/osteoporosis</li> <li>• Anorectal: anal discharge, rectal bleeding, rectal itching, pain or fullness in anal area</li> <li>• Developmental milestones: for infants and young children assess for motor or speech delays</li> <li>• Growth delay and failure to thrive for infants and children</li> </ul>	<p>folliculitis, condylomata, cutaneous fungal infections, acanthosis</p> <ul style="list-style-type: none"> <li>• Lymph nodes: generalized or localized lymphadenopathy</li> <li>• Eye: retinal exudates or cotton wool spots, hemorrhages, pallor, icterus</li> <li>• Oropharynx: oral hairy leukoplakia, candidiasis (thrush, palatal erythema, angular cheilitis), aphthous ulcers, gingivitis, periodontal disease, Kaposi sarcoma, tonsillar or parotid gland enlargement</li> <li>• Cardiovascular: heart exam, peripheral pulses, presence/absence of edema or bruits <ul style="list-style-type: none"> <li>• Chest: lung examination</li> <li>• Breast: nodules, nipple discharge</li> <li>• Abdomen: hepatomegaly, splenomegaly, masses, tenderness</li> </ul> </li> <li>• Genitourinary: ulcers, warts, chancres, rashes; gynecologic exam including bimanual exam, discharge; (if male: testicular exam; evaluation for hernia)</li> <li>• Anorectal: ulcers, warts, fissures, internal or external hemorrhoids, masses, Kaposi sarcoma; prostate exam when appropriate</li> <li>• Neuropsychiatric: depression, mania, anxiety, signs of personality disorder, difficulties in concentration, attention, and memory, signs of dementia, speech problems, gait abnormalities, focal deficits (motor or sensory), lower-extremity vibratory sensation, deep tendon reflexes</li> </ul>
--	--

**Table 4:** Recommended Initial Laboratory Screening and Other Studies in Persons With HIV

Test	Comment(s)
<b>HIV-specific tests for all persons with HIV</b>	

In infants and children <18 years of age with perinatal HIV exposure, maternal antibodies can persist up to 24 months; therefore, HIV RNA nucleic acid tests are considered diagnostic; infants, children, and adolescents with HIV and history of initiating early ART may have negative antigen/antibody test	
HIV antigen/antibody testing	If written evidence of diagnosis not available or if viral load low or undetectable (an isolated positive HIV RNA with negative HIV antibody should be verified by repeat testing, especially in the setting of prior CAB-LA exposure as PrEP)
CD4 cell count and percentage	CD4 count and percentage access is necessary to assess for immunosuppression and support decisions on OI prophylaxis and vaccinations
Plasma HIV RNA PCR (HIV viral load)	Establish baseline and monitor viral suppression
HIV resistance testing	Baseline genotype for PI, NNRTI, NRTI mutations for persons who have never initiated therapy or who are reengaging in care and not on therapy or with inconsistent access to therapy; INSTI genotype is recommended if clinical concern for transmitted INSTI resistance and/or acquired INSTI resistance, as in the setting of prior CAB-LA (as PrEP) exposure
<b>HIV-related tests in selected patients</b>	
Coreceptor tropism assay	If use of CCR5 antagonist is being considered
HLA B*5701	If use of abacavir is being considered
<b>Other laboratory tests</b>	
Complete blood cell count with differential	Assess for anemia, neutropenia, thrombocytopenia
Alanine aminotransferase, aspartate aminotransferase, total bilirubin, alkaline phosphatase	Assess for evidence of liver damage, hepatitis, or systemic infection (e.g., elevated alkaline phosphatase with some OIs)
Total protein and albumin	High total protein common with untreated HIV infection due to increased immunoglobulin fraction secondary to B-cell hyperplasia; low albumin may indicate nutritional deficiency or nephrotic syndrome
Electrolytes, blood urea nitrogen, creatinine	Assess kidney function; use creatinine to calculate estimated GFR
Lipid profile and blood glucose; hemoglobin A1c	Fasting not needed for initial lipid and glucose assessment; if abnormal, repeat fasting (hemoglobin A1c should be measured prior to ART initiation but is not used for diagnosis of diabetes in those on ART)
Urinalysis	Assess for evidence of proteinuria, hematuria
<b>Screening for coinfections</b>	
Gonorrhea, chlamydia	NAAT testing with sites based on exposure history (e.g., urine, vaginal, rectal, oropharyngeal; 3-site testing preferred for all patients)
Trichomoniasis	In all persons who have vaginal sex
Syphilis	Using local protocol (either RPR or treponemal-specific antibody tests)
Latent <i>Mycobacterium tuberculosis</i>	Tuberculin skin test or IGRA; IGRA preferred if history of BCG vaccination

Varicella virus	Anti-varicella IgG if no known history of chickenpox or shingles
Viral hepatitis A, B, C	Measure HBsAg, HBsAb, HBeAb, HCV Ab, HAV IgG antibody. If HBsAg+, or HBeAb positive, order HBV DNA level; if HCVAb+, known past HCV, or considering acute HCV, order HCV RNA level. HCV genotype should be collected unless a pangenotypic treatment regimen will be used. Screen for hepatocellular carcinoma for all adult patients with cirrhosis and noncirrhotic patients with chronic HBV for an extended period.
Measles titer	Adequate evidence of immunity includes being born in the U.S. before 1957, written documentation of adequate vaccination, or serologic evidence of immunity [104]. Persons born in the 1960s may have been vaccinated with a vaccine other than MMR and may have waning immunity. Patients may opt to receive a booster MMR vaccine rather than check serology.
Cryptococcal antigen	Indicated for patients with CD4 <100 cells/ $\mu$ L or symptoms consistent with infection
Toxoplasma antibody	Indicated for patients with CD4 <200 cells/ $\mu$ L or symptoms consistent with infection
<b>Tests that may be performed under certain circumstances</b>	
Chest radiography	For patients with evidence of latent <i>Mycobacterium tuberculosis</i> infection; consider in patients with underlying lung disease for use as comparison in evaluation of future respiratory illness
Cytology: Cervical and/or anal Pap test	Cervical; anal if indicated. Abnormal results require follow-up with colposcopy or high-resolution anoscopy, respectively
Glucose-6-phosphate dehydrogenase	Screen for deficiency in persons, especially those assigned male at birth, who are of African, Mediterranean, or Asian descent before prescribing oxidant drugs such as dapsone and primaquine in those with G6PD deficiency. Sulfonamides should be used with caution without prior screening.
Pregnancy test in persons of child-bearing potential	Pregnancy status is required to inform choice of ART and discussions about conception in persons of childbearing potential.
Serum testosterone level	In cisgender males with fatigue, weight loss, loss of libido, erectile dysfunction, or depression or who have evidence of reduced bone mineral density. Morning free testosterone is preferred. See Section 7 for management of hypogonadism.
<b>Tests that are not recommended for general screening purposes</b>	
HSV IgG, CMV IgG, biomarkers of inflammation	In asymptomatic persons, routine testing for all persons is not recommended for HSV, CMV. Biomarkers of inflammation are not recommended. CMV IgG may be considered if blood transfusion is contemplated in a person at low risk for CMV exposure. A negative CMV IgG may support use of CMV-free blood products.

Abbreviations: Ab, antibody; ART, antiretroviral therapy; BCG, Bacillus Calmette-Guerin; CAB-LA, long acting cabotegravir; CCR5, C-C motif chemokine receptor 5; CD4, cluster of differentiation 4; CMV, cytomegalovirus; G6PD, glucose-6-phosphate dehydrogenase; GFR, glomerular filtration rate; HAV, hepatitis A virus; HBV, hepatitis B virus; HBeAb, hepatitis B core antibody; HBsAg, hepatitis B surface antigen; HBsAb, hepatitis B surface antibody; HCV, hepatitis C virus; HIV, human immunodeficiency virus; HLA, human leucocyte antigen; HSV, herpes simplex virus; IgG, immunoglobulin G; IGRA, interferon- $\gamma$  release assay; INSTI, integrase strand transfer inhibitor; MMR, measles, mumps, rubella; NAAT, nucleic acid amplification test; NNRTI, non-nucleoside reverse transcriptase inhibitor; NRTI, nucleoside/nucleotide reverse transcriptase inhibitor; OI, opportunistic infection; PCR, polymerase chain reaction; PI, protease inhibitor; RNA, ribonucleic acid; RPR, rapid plasma reagin.

**Table 5: Routine Health Care Maintenance for People With HIV (After Initial Assessment)**

	<b>Intervention</b>	<b>Recommendation</b>	<b>Comments</b>
HIV-specific monitoring	HIV RNA	Assess every 4-8 weeks after initiation of ART until undetectable and then every 3-4 months. In patients with consistent viral suppression and stable CD4 for more than 1 year, measure every 6 months. If viral blip occurs (HIV RNA detectable but <200 copies/mL), assess adherence and barriers and repeat after 2-4 weeks.	
	CD4 cell count	Assess every 3–6 months for the first 2 years after starting ART or if viremia is present or if CD4 <300/ $\mu$ L. If CD4 300–500/ $\mu$ L and HIV RNA suppressed for 2 years, measure every 12 months. If CD4 >500/ $\mu$ L and HIV RNA suppressed for 2 years, measurement is optional.	
	HIV genotype	Repeat if virologic failure occurs and when clinically indicated. Genotypic testing should include mutations in PR/RT genes as well as integrase genes when there is a history of INSTI use, including use of cabotegravir PrEP.	
	HLA B*5701 testing	No need to repeat this test if already done in past. A negative test result is required prior to use of abacavir.	



	Tropism testing	Should be done prior to use of CCR5 antagonist regardless if tropism was done in past. If result is ever X4 or D/M, no need to repeat again as CCR5 antagonist can never be used.	
Other Labs	Complete blood count	Perform once a year or when clinically indicated.	
	Chemistry panel including creatinine, eGFR, electrolytes, and AST/ALT/total bilirubin	Perform 1-2 months after ARV start or change. Then, every 6 months and when clinically indicated. If not on ART, every 6-12 months.	
	Urinalysis	Perform annually if at risk of kidney disease and when clinically indicated. Perform before and during use of TDF/TAF.	
	Pregnancy test	Perform in persons of childbearing potential prior to ART start or change and when clinically indicated.	
Screening for mental health and substance use issues	Depression screening	Perform using a validated tool like PHQ 2/9 at least annually if resources available and when clinically appropriate	
	Anxiety screening	Perform using a validated tool such as GAD 2/7 in patients under 65 at least annually, if resources available and when clinically indicated.	
	Tobacco use screening	Perform for every adolescent and adult at every visit and offer smoking cessation options if current smokers.	

	Substance and alcohol use screening	Perform using validated tools such as AUDIT and DAST at least annually when clinically indicated. Refer to treatment if substance or alcohol use disorder is diagnosed.	
Screening for and monitoring of metabolic disorders	Blood pressure screening	Perform at every visit.	
	Weight measurement	Perform at every visit.	
	Screening for hyperlipidemia	Lipid profile: perform every 5 years if normal; more frequently if abnormal or other cardiovascular risk factors present (every 6–12 months); if abnormal, repeat fasting.	Follow ASCVD Risk Calculator; Consider testing 1–3 months after starting or changing ART. See Section 7 for further discussion.
	Screening for diabetes mellitus and glucose intolerance	<p>Serum glucose: perform annually; if abnormal, obtain fasting glucose.</p> <p>Hemoglobin A1C should be obtained prior to initiation of ART, if possible.</p> <p>In persons with diabetes, repeat at least every 6 months (more frequently if clinically indicated).</p> <p>Urine microalbumin or urine protein/creatinine ratio: In patients with diabetes, repeat at least every 6 months (more frequently if clinically indicated)</p>	<p>Consider testing 1–3 months after starting or changing antiretroviral medications. HbA1c is not used to diagnose diabetes in persons on ART. It may be used for screening and monitoring.</p> <p>Consider threshold cutoff of 5.8%. See Section 7 for further discussion.</p>
	Screening for bone mineral density	Baseline bone densitometry by dual-energy x-ray absorptiometry should be performed in all	See Section 7 for further discussion.

		postmenopausal women and men aged $\geq 50$ years.	
Screening for infectious diseases	Syphilis screening	Perform at least annually in asymptomatic persons; repeat every 3-6 months in asymptomatic persons if risk of acquisition is high, regardless of doxyPEP use.	Acquisition risk depends on sexual activities, use of barrier protection, and local prevalence.
	Gonorrhea and chlamydia screening	Perform at least annually in asymptomatic persons; can repeat every 3–6 months in asymptomatic persons if risk of acquisition is high, regardless of doxyPEP use.	Screening by NAAT at all sites of sexual contact (rectal, oropharyngeal, vaginal, urine/urethral) is recommended for all sexually active persons with HIV. Acquisition risk depends on sexual activities, use of barrier protection, and local prevalence.
	Trichomoniasis screening	Perform annually for persons having vaginal sex.	Screen using NAAT testing.
	Hepatitis A, B, and C screening	Hepatitis C: In sexually active cisgender men and transgender women who have sex with cisgender men and PWID, screen annually. Hepatitis B: Repeat HBV serology (HBsAg, HBsAb, and HBcAb total) in persons without known HBV infection or immunity prior to switching to ART without tenofovir, and when clinically indicated, including prior to HCV treatment with DAAs.	In those with new abnormal liver function tests, check for acute HAV, HBV, and HCV. Use HCV RNA and HBV DNA testing when clinically appropriate, including for HCV screening in persons with past HCV or those suspected of recent infection

			within the past 6 months.
	Tuberculosis screening	Perform annually in patients at risk for tuberculosis.	Either tuberculin skin test or IGRA.
Screening for and prevention of cancer	Smoking	Screen at every visit and for smokers, advise about benefits of cessation and offer pharmacotherapy and referral to behavioral interventions.	Provide resources per local guidelines, including classes, agents that facilitate smoking cessation.
	Low dose chest CT scan	Those between ages 50 and 80 who have $\geq 20$ pack-years of smoking and are current or former smokers should have an annual low-dose computed tomography scan of lung,	
	Prostate cancer screening	Digital rectal exam: Considered primary evaluation before PSA screening; consider for ages 55–69  PSA screening:  Age 50–69: Discuss risks and potential benefits with patient.  Age 70 and older: PSA screening is not recommended.	The impact of HIV on prostate cancer risk is not yet known. African Americans and people with a relative with prostate cancer have a higher burden of prostate cancer. Clinicians should follow USPSTF or American Cancer Society guidelines and consider patient wishes.
	Colon cancer screening	Age 45–75 years if average risk (including personal and family history). Age 76–85	Screening tests include: stool-based screening

		<p>years: individualize screening based on overall health and prior screening.</p> <p>Consider screening earlier if first-degree relatives diagnosed with colon cancer prior to age 50</p>	<p>(gFOBT, FIT, FIT-DNA) every year, or colonoscopy every 10 years if normal, or more frequently if polyps are identified.</p>
	Breast cancer screening	<p>Age 50–75: mammography performed at least every 2 years.</p>	<p>Age 40–49: Inform of the potential risks and benefits of screening and offer screening every 2 years.</p>
	Cervical cancer screening	<p>Age &lt;21: Pap within 1 year of sexual activity, no later than age 21</p> <p>Age 21–29: Pap at diagnosis of HIV, repeat yearly x 3, then if all normal, Pap every 3 years.</p> <p>Age &lt;30 years: no HPV testing unless abnormalities are found on Pap test.</p> <p>Age ≥30 years: Pap only, same as 21-29 years.</p> <p>Or</p> <p>Pap with HPV testing, if both negative then Pap with HPV every 3 years.</p>	<p>Abnormal Pap and/or HPV follow-up similar to general population.</p> <p>Note: In general, continue screening past 65 years.</p>
	Anal cancer screening	<p>Digital anorectal exam: perform at least annually if asymptomatic.</p> <p>Anal Pap: screen transgender women and men over 35 years of age who have sex with men, and all other people with HIV over 45 years of age, with anal Pap smears if</p>	<p>Abnormal anal Pap should prompt referral for high-resolution anoscopy.</p>

		there is access to, or ability to, refer for high-resolution anoscopy and treatment.	
	Hepatocellular carcinoma screening	Alpha-fetoprotein and liver ultrasound every 6 months.	For patients with cirrhosis from any cause or chronic hepatitis B, as well as fibrosis levels F3 or F4 among patients with hepatitis C.
Other health care maintenance	Reproductive desires	All persons with HIV regardless of sexual orientation and gender identity should be asked about their reproductive desires. Persons of childbearing potential should be routinely asked about their plans and desires regarding pregnancy.	ART, hormone therapy, and other treatments may affect pregnancy and pregnancy plans.
	Oral health examination	All persons with HIV should have oral health examinations biannually.	
	Patient education	Tailor education at every visit to patient's current needs. Address regularly with all patients the importance of medication adherence and viral suppression for personal health and preventing sexual transmission (undetectable equals Untransmittable; U=U), and provide information on sexual health and harm reduction practices including PrEP, PEP, safer injection practices, SSPs, and naloxone.	Brief counseling and tailored interventions should be offered to patients who may benefit from them to reduce risk. Refer patients to programs that offer interventions not accessible locally, such as medication for opioid use disorder, mental health services,

			STI testing, viral hepatitis treatment, PrEP, PEP, etc.
--	--	--	---

Abbreviations: Ab, antibody; ALT, alanine aminotransferase; ART, antiretroviral therapy; ARV, antiretroviral; ASCVD, atherosclerotic cardiovascular disease; AST, aspartate aminotransferase; AUDIT, alcohol use disorders identification test; CCR5, C-C motif chemokine receptor 5; CD4, cluster of differentiation 4; DAA, direct acting antiviral; D/M, dual-mixed; DAST, drug abuse screening test; DNA, deoxyribonucleic acid; eGFR, estimated glomerular filtration rate; FIT, fecal immunochemical test; G6PD, glucose-6-phosphate dehydrogenase; gFOBT, guaiac fecal occult blood test; GAD, general anxiety disorder; HAV, hepatitis A virus; HbA1c, hemoglobin A1c; HBV, hepatitis B virus; HBcAb, hepatitis B core antibody; HBsAg, hepatitis B surface antigen; HBsAb, hepatitis B surface antibody; HCV, hepatitis C virus; HIV, human immunodeficiency virus; HLA, human leucocyte antigen; HPV, human papilloma virus; IgG, immunoglobulin G; IGRA, interferon- $\gamma$  release assay; INSTI, integrase strand transfer inhibitor; NAAT, nucleic acid amplification test; OI, opportunistic infection; Pap, Papanicolaou; PHQ, patient health questionnaire; PR, protease; PSA, prostate-specific antigen; PWID, people who inject drugs; RNA, ribonucleic acid; RT, reverse transcriptase; SSP, syringe services programs; STI, sexually transmitted infection; TAF, tenofovir alafenamide; TDF, tenofovir disoproxil fumarate; USPSTF, United States Preventative Services Task Force; X4, C-X-C motif chemokine receptor 4.

**Table 6:** Immunizations

Vaccination	Dose	Revaccination	Comment
Influenza: standard dose: IIV4 (Afluria <sup>®</sup> , Fluarix <sup>®</sup> , FluLaval <sup>®</sup> , Fluzone <sup>®</sup> ), ccIV4 (Flucelvax <sup>®</sup> ), aIIV4 (Fluad <sup>®</sup> ), RIV4 (Flublok <sup>®</sup> ); high dose: HD-IIV4 (HD-IIV4 (Fluzone <sup>®</sup> ))	One	Yearly	Age >65 high dose (HD-IIV4, aIIV4, RIV4). LAIV4 (FluMist <sup>®</sup> ) is contraindicated for PWH; for people with egg allergy, use IIV or RIV.
Tetanus, diphtheria, and acellular pertussis: Tdap (Adacel <sup>®</sup> , Boostrix <sup>®</sup> ) Tetanus, diphtheria (Tenivac <sup>®</sup> , Tdavax)	One	10 years	Td can be given every 10 years; give Tdap with each pregnancy, give Td if contaminated wound and none received in 5 years.

Meningococcus (MenACWY-TT vaccine; MenQuadfi® or Menveo®)	2 doses; 2 months apart	5 years	MenACWY-TT: every 5 years after primary series. MenACWY-D is no longer available. Vaccination against meningococcus B not routinely recommended for all individuals. Two MenB vaccines are available (MenB-4C (Bexsero®) and MenB-FhBp (Trumenba®). A pentavalent meningococcal is available from serogroups ACWY and B (Penvrava®) if both vaccines are indicated.
Measles, Mumps, Rubella (MMR)	2 doses; 1 months apart		CD4>200/μL and no immunity, if pregnant and not immune administer after delivery if CD4> 200/μL.
Hepatitis A (Havrix®, Vaqta®)	2 doses 6 months apart		Check for evidence of immunity post-vaccination, 1–2 months post-vaccination series complete.
Hepatitis B  <ul style="list-style-type: none"> <li>Hepatitis B naive to vaccination (primary series: recombinant, adjuvanted vaccine (HepB- CpG; Heplisav-B®)</li> </ul>	2 doses: 0, 1 months	Nonresponders to primary series: repeat <u>full</u> primary series of recombinant, adjuvanted vaccine 0, 1 month. (Can give third dose @ 6 months if HBsAb not seroprotective.) Alternatives for revaccination due to nonresponse: double dose recombinant vaccines (Engerix-B®, Recombivax HB®) at 0, 1, 6 months.	Vaccinate those who do <i>not</i> have chronic HBV. Check for evidence of immunity postvaccination (HBsAb titer >10 mIU/mL).  <ul style="list-style-type: none"> <li>Primary series: HepB-CpG (Heplisav-B®): after 2 doses check antibody levels at 1–2 months (and if not immune [titer is not &gt;10mIU/mL] may consider third dose).</li> </ul>

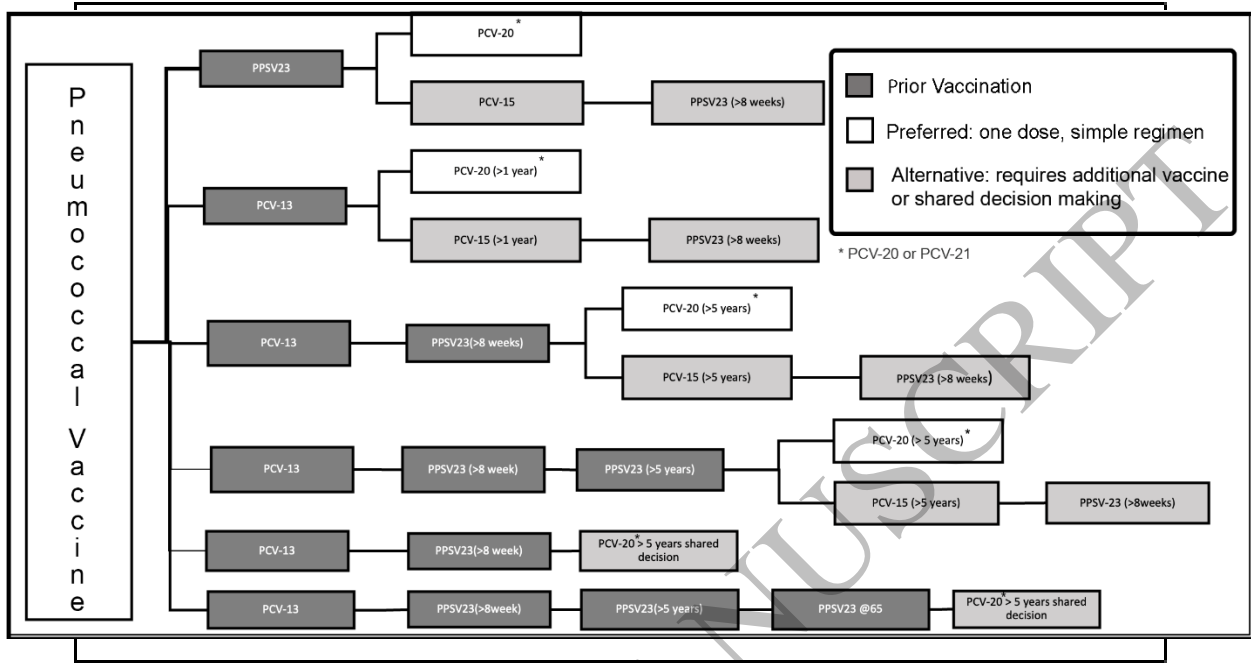


<ul style="list-style-type: none"> <li>Alternatives to HepB-CpG: recombinant vaccine <u>double dose</u> (<u>Engerix-B<sup>®</sup></u>, Recombivax-HB<sup>®</sup>)</li> <li>Alternatives to HepB-CpG and needing Hepatitis A vaccination: combined Hepatitis A and recombinant hepatitis B vaccine (Twinrix<sup>®</sup>)</li> </ul>	3 doses: 0, 1, and 6 months (double dose)		<ul style="list-style-type: none"> <li>Alternatives to HepB-CpG: Engerix-B<sup>®</sup> (20 mcg; double dose = 40 mcg); Recombivax HB<sup>®</sup> (10mcg; double dose = 20 mcg); check HBsAb titer 1-2 months after complete series.</li> </ul>
Human papillomavirus (HPV; Gardasil <sup>®</sup> )	3 doses (0, 1–2, 6 months)		Recombinant 9-valent can be offered to PWH to age 45 with shared decision making; vaccination should not be given during pregnancy.
Mpox (Jynneos <sup>®</sup> )	2 doses, 4 weeks apart (subcutaneous or intradermal)		Jynneos <sup>®</sup> live nonreplicating vaccinia vaccine requires both doses for maximal immunity (subcutaneous preferred); ACAM 2000 vaccine contraindicated with HIV.
Respiratory syncytial virus (RSV; Arexvy <sup>®</sup> , Abrysvo <sup>®</sup> )	1 dose		≥75 years should receive a dose; ages 60–74 years with likelihood of severe RSV should receive a dose (2 different vaccines available); limited data in people with HIV
Varicella zoster virus (VZV; Varivax <sup>®</sup> )	2 doses 3 months apart		Contraindicated if CD4 <200 cells/μL.
Recombinant zoster vaccine (RZV; Shingrix <sup>®</sup> for prevention of recurrence)	2 doses (0, 2–6 months apart)		Can be given ≥18 years of age for prevention of recurrence herpes zoster (if prior VZV).
SARS-CoV-2 (COVID-19) – primary series in persons with moderate to severe immunocompromised	Because of the changing nature of COVID vaccine policy, see CDC COVID-19 vaccine recommendations for details: <a href="https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html">https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html</a>		
Unvaccinated	3 doses (mRNA; Pfizer-BioNTech or Moderna); 2		Pfizer-BioNTech: second dose 3 weeks from first, third dose 4 weeks from second dose; Moderna: each dose 4 weeks apart; Novavax: 3 weeks apart.

	doses Novavax		
<ul style="list-style-type: none"> <li>Received 1 dose prior mRNA</li> </ul>	2 doses		<p>Moderna: each dose at least 4 weeks apart.</p> <p>Pfizer-BioNTech: 3 weeks from last dose; 4 weeks from first and second updated.</p>
<ul style="list-style-type: none"> <li>Received 2 doses prior mRNA</li> </ul>	1 dose		Moderna or Pfizer-BioNTech at least 4 weeks after last dose.
<ul style="list-style-type: none"> <li>Received 1 or more Novavax or Janssen</li> </ul>	1 dose		Moderna, Pfizer-BioNTech, or Novavax at least 8 weeks after last dose.
Vaccination following primary series completion: Please check ACIP recommendations for updates			
<ul style="list-style-type: none"> <li>Received complete series not including 2023-24 vaccine</li> </ul>	1 dose 2023-24 vaccine		
<ul style="list-style-type: none"> <li>Received complete series including 2023-24 vaccine</li> </ul>	≥65 years: 1 additional dose 2023-24 vaccine; 19–64 years: may give 1 additional 2023–24 vaccine based on risk		
<ul style="list-style-type: none"> <li>Subsequent revaccination</li> </ul>	Please check ACIP recommendations		
<b>Pneumococcus (please see Figure 1 for more illustration)</b>			
<ul style="list-style-type: none"> <li>PCV20 (Pevnar20®)</li> <li>PCV21 (Capvaxive®)</li> </ul>	1 dose	<p>No further doses of PCV 20 are needed after first dose</p> <p>At any time, if PCV 20 is substituted for PPSV23, the pneumococcal vaccination series is complete</p>	<ul style="list-style-type: none"> <li>If no pneumococcal vaccine given or unknown, 1 dose of PCV20 completes pneumococcal vaccination (preferred due to simplicity). PCV21 could be substituted for PCV20 in adults in whom a dose of PCV20 is currently recommended.</li> <li>If previous PPSV23 or PCV13 alone, can give 1 dose of PCV20 at least 1 year later to complete the series.</li> <li>If previous PCV13 and PPSV23 received before age 65, may give 1 dose PCV20 at least 5 years later to complete series</li> </ul>

			<ul style="list-style-type: none"> <li>If previous PCV13, and 1 dose of PPSV23 received age <math>\geq 65</math>, no further vaccine needed but may receive 1 dose PCV20 at least 5 years later with shared decision making.</li> </ul>
<ul style="list-style-type: none"> <li>PCV15 (Vaxneuvance<sup>®</sup>)</li> </ul>	1 dose	Give PPSV23 8 weeks after PCV 15 to complete the series	<ul style="list-style-type: none"> <li>If no pneumonia vaccine given or unknown, may give 1 dose, followed by PPSV23 8 weeks later (alternative);</li> <li>If previous PPSV23 alone, give 1 dose PCV15 at least 1 year later to complete series.</li> <li>If previous PCV13 alone, no PCV15 needed; give PPSV23 at least 8 weeks later or PCV20 at least 1 year later.</li> </ul>
<ul style="list-style-type: none"> <li>PPSV23 (Pneumovax23<sup>®</sup>)</li> </ul>	Do not give as initial vaccine	If only received PPSV23, give PCV20 or PCV15 at least 1 year later to complete series	<p>If received PCV13 and PPSV23:</p> <ul style="list-style-type: none"> <li>If received PPSV23 at age <math>&lt; 65</math> years, may give third and final PPSV23 dose at least 5 years after second PPSV23 dose; OR may receive 1 dose PCV20 at least 5 years after last PPSV23.</li> <li>If received PPSV23 at age <math>\geq 65</math>, no further PPSV23 needed (may receive 1 dose of PCV20 with shared decision making).</li> </ul>
<b>Travel Vaccines</b>			
Vibrio cholera (CVD103-HGR; Vaxchora <sup>®</sup> )	1 dose, oral		CVD103-HgR live attenuated; give 10 days prior to exposure; lasts for 3 months; do not give if CD4 $< 200$ cells/ $\mu$ L.
Polio (Ipol <sup>®</sup> )	3 doses (0, 1–2, 6–12 months)		IM, inactivated vaccine for those at high risk for exposure to poliovirus.
Typhoid (Thyphim Vi <sup>®</sup> )	1 dose		Thyphim Vi polysaccharide vaccine (IM) administer 1 week prior to exposure; note: do not give oral vaccine; avoid in pregnancy.

**Figure 1:** Vaccinations To Prevent Pneumococcus Infection



**Table 7:** Effect of Protease Inhibitors and Nonnucleoside Reverse Transcriptase Inhibitors on Statins

Statin	Protease Inhibitors	NNRTI
Atorvastatin	Use lowest atorvastatin starting dose and titrate, monitoring for safety, as risk for myopathy/rhabdomyolysis can be increased with some protease inhibitors. Do not coadminister with atazanavir/cobicistat; Maximum dose of atorvastatin is 20mg with darunavir/cobicistat or darunavir + ritonavir	Acceptable with appropriate dosing and monitoring Efavirenz and etravirine decrease atorvastatin's AUC No data for nevirapine; may need higher atorvastatin starting dose Doravirine does not affect levels of atorvastatin
Fluvastatin	Use lowest fluvastatin starting dose and titrate, monitoring for safety, as risk for myopathy/rhabdomyolysis can be increased with some protease inhibitors	Acceptable with appropriate dosing and monitoring Etravirine may increase fluvastatin's AUC. May need lower fluvastatin starting dose with etravirine. No data on doravirine
Lovastatin	Contraindicated (greatly increase lovastatin's AUC)	Acceptable with appropriate dosing and monitoring Decrease in simvastatin AUC, so may need higher lovastatin starting dose No data on doravirine

Pitavastatin	Acceptable with appropriate dosing and monitoring No significant change in pitavastatin's AUC with lopinavir/ritonavir Pitavastatin's mean AUC decreased 26% with darunavir	No data for NNRTIs
Pravastatin	Acceptable with appropriate dosing and monitoring, except with darunavir Decrease in pravastatin's AUC, except with darunavir, which increases pravastatin's AUC by 81%	Acceptable with appropriate dosing and monitoring Efavirenz decreases pravastatin's AUC, but no change with etravirine No data for nevirapine, rilpivirine, doravirine May need higher pravastatin starting dose with efavirenz
Rosuvastatin	Use lowest rosuvastatin starting dose and titrate, monitoring for safety, as risk for myopathy/rhabdomyolysis can be increased with some protease inhibitors; Maximum dose of rosuvastatin is 10mg with atazanavir, atazanavir/cobicistat, or atazanavir + ritonavir and 20mg with darunavir/cobicistat Lopinavir/ritonavir and tipranavir + ritonavir increases rosuvastatin's AUC No dose adjustments with cobicistat; cobicistat increases Cmax 89% and AUC by 38%	Acceptable with appropriate dosing and monitoring No data on doravirine
Simvastatin	Contraindicated (greatly increase simvastatin's AUC)	Acceptable with appropriate dosing and monitoring Efavirenz and etravirine decrease simvastatin's AUC No data for nevirapine, doravirine May need higher simvastatin starting dose

Abbreviations: AUC, area under the curve; NNRTI, nonnucleoside reverse transcriptase inhibitor

**Table 8.** Terminology Associated With Gender Identity and Hormonal Therapy

Gender identity: An individual's sense of being male, female, nonbinary, agender, etc.
Transgender, trans, nonbinary, gender diverse: Adjectives used to refer to persons whose gender identity does not align with their sex recorded at birth (the latter primarily based on visible physical anatomy)
Nonbinary: An adjective used to refer to persons whose gender identity is outside the gender binary, i.e., do not identify exclusively as a man or a woman; some nonbinary persons may not identify with any gender (agender)

Cisgender: An adjective used to refer to people whose gender identity corresponds to the sex they were assigned at birth
Gender expression: How a person communicates their gender through appearance, dress, name, pronouns, mannerisms, and speech
Gender-affirming hormone treatment and surgeries: Broad categories of medical interventions that transgender persons might consider to align their appearance and their gender identity
Gender affirmation: An overall process of alignment of physical characteristics and/or gender expression with gender identity
Gender dysphoria: Discomfort felt by some persons due to lack of alignment between gender identity and the sex recorded at birth; not all transgender persons have dysphoria, but many U.S. insurance companies require this diagnosis for payment for gender-affirming medical and surgical interventions
Feminizing hormone therapy: The use of estrogens and often androgen blockers with the objective of inducing changes in physical characteristics to better match patient gender identity
Masculinizing hormone therapy: The use of testosterone with the objective of inducing changes in physical characteristics to better match patient gender identity
Sex assigned at birth: Refers to a person's status as male, female, or intersex based on physical characteristics at birth

## Reference List

- Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 territories and freely associated states, 2022. HIV Surveillance Supplemental Report 2024. Available at: <https://www.cdc.gov/hiv-data/nhss/national-hiv-prevention-and-care-outcomes.html>. Accessed May 29, 2024.
- Centers for Disease Control and Prevention. Diagnoses of HIV Infection in the United States and Dependent Areas, 2021. HIV Surveillance Report **2021**; 34.
- Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 dependent areas, 2021. HIV Surveillance Supplemental Report **2023**; 28(4).
- Centers for Disease Control and Prevention. Social Determinants of Health among Adults with Diagnosed HIV Infection in the United States and Puerto Rico, 2021. HIV Surveillance Supplemental Report **2023**; 28(5).
- World Health Organization. Guidelines for managing advanced HIV disease and rapid initiation of antiretroviral therapy: World Health Organization, **2017** July 2017.
- Gandhi RT, Bedimo R, Hoy JF, et al. Antiretroviral Drugs for Treatment and Prevention of HIV Infection in Adults: 2022 Recommendations of the International Antiviral Society-USA Panel. JAMA **2023**; 329(1): 63-84.

7. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents with HIV. Washington, DC: Department of Health and Human Services, **2023**.
8. Office of Infectious Disease and HIV/AIDS Policy, Department of Health and Human Services. Key Ending the HIV Epidemic Strategies. Washington, District of Columbia: Department of Health and Human Services, **2022** Updated: July 2022.
9. The White House. National HIV/AIDS Strategy for the United States 2022–2025. Washington, DC, **2021**.
10. Colasanti J, Sumitani J, Mehta CC, Zhang Y, Nguyen ML, Del Rio C, Armstrong WS. Implementation of a Rapid Entry Program Decreases Time to Viral Suppression Among Vulnerable Persons Living With HIV in the Southern United States. *Open Forum Infect Dis* **2018**; 5(6): ofy104.
11. Gosset A, Protopopescu C, Larmarange J, et al. Retention in Care Trajectories of HIV-Positive Individuals Participating in a Universal Test-and-Treat Program in Rural South Africa (ANRS 12249 TasP Trial). *J Acquir Immune Defic Syndr* **2019**; 80(4): 375-85.
12. Labhardt ND, Brown JA, Sass N, Ford N, Rosen S. Treatment Outcomes After Offering Same-Day Initiation of Human Immunodeficiency Virus Treatment—How to Interpret Discrepancies Between Different Studies. *Clin Infect Dis* **2023**; 77(8): 1176-84.
13. Broyles LN, Luo R, Boeras D, Vojnov L. The risk of sexual transmission of HIV in individuals with low-level HIV viraemia: a systematic review. *Lancet* **2023**; 402(10400): 464-71.
14. Rice WS, Crockett KB, Mugavero MJ, Raper JL, Atkins GC, Turan B. Association Between Internalized HIV-Related Stigma and HIV Care Visit Adherence. *J Acquir Immune Defic Syndr* **2017**; 76(5): 482-7.
15. The Lancet HIV. Putting people first in communication about HIV. *Lancet HIV* **2023**; 10(10): e623.
16. Nyblade L, Stangl A, Weiss E, Ashburn K. Combating HIV stigma in health care settings: what works? *J Int AIDS Soc* **2009**; 12: 15.
17. Joint United Nations Programme on HIV/AIDS (UNAIDS). Evidence for eliminating HIV-related stigma and discrimination, **2020**.
18. Yan L, Ellman T, McNairy M, et al. New York State Department of Health AIDS Institute Clinical Guidelines. Perioperative Care in Adults With HIV. Baltimore (MD): Johns Hopkins University, **2021**.
19. Joyce MP, Kuhar D, Brooks JT. Notes from the field: occupationally acquired HIV infection among health care workers - United States, 1985-2013. *MMWR Morb Mortal Wkly Rep* **2015**; 63(53): 1245-6.
20. Doberne JW, Jawitz OK, Raman V, Bryner BS, Schroder JN, Milano CA. Heart Transplantation Survival Outcomes of HIV Positive and Negative Recipients. *Ann Thorac Surg* **2021**; 111(5): 1465-71.
21. Roland ME, Barin B, Carlson L, et al. HIV-infected liver and kidney transplant recipients: 1- and 3-year outcomes. *Am J Transplant* **2008**; 8(2): 355-65.
22. Durand CM, Martinez N, Neumann K, et al. Living kidney donors with HIV: experience and outcomes from a case series by the HOPE in Action Consortium. *The Lancet Regional Health - Americas* **2023**; 24: 100553.

23. Stock PG, Barin B, Murphy B, et al. Outcomes of kidney transplantation in HIV-infected recipients. *N Engl J Med* **2010**; 363(21): 2004-14.
24. Organ Procurement & Transplantation Network (OPTN). HOPE Act, **2015**.
25. Paterson DL, Swindells S, Mohr J, et al. Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Ann Intern Med* **2000**; 133(1): 21-30.
26. Havlir DV, Hellmann NS, Petropoulos CJ, et al. Drug susceptibility in HIV infection after viral rebound in patients receiving indinavir-containing regimens. *JAMA* **2000**; 283(2): 229-34.
27. Byrd KK, Hou JG, Hazen R, et al. Antiretroviral Adherence Level Necessary for HIV Viral Suppression Using Real-World Data. *J Acquir Immune Defic Syndr* **2019**; 82(3): 245-51.
28. Castillo-Mancilla JR, Cavassini M, Schneider MP, et al. Association of Incomplete Adherence to Antiretroviral Therapy With Cardiovascular Events and Mortality in Virologically Suppressed Persons With HIV: The Swiss HIV Cohort Study. *Open Forum Infect Dis* **2021**; 8(2): ofab032.
29. Beer L, Tie Y, Weiser J, Shouse RL. Nonadherence to Any Prescribed Medication Due to Costs Among Adults with HIV Infection - United States, 2016-2017. *MMWR Morb Mortal Wkly Rep* **2019**; 68(49): 1129-33.
30. Kim MH, Wanless RS, Caviness AC, et al. Multimonth Prescription of Antiretroviral Therapy Among Children and Adolescents: Experiences From the Baylor International Pediatric AIDS Initiative in 6 African Countries. *J Acquir Immune Defic Syndr* **2018**; 78 Suppl 2(Suppl 2): S71-s80.
31. Dang BN, Westbrook RA, Hartman CM, Giordano TP. Retaining HIV Patients in Care: The Role of Initial Patient Care Experiences. *AIDS Behav* **2016**; 20(10): 2477-87.
32. Dang BN, Westbrook RA, Njue SM, Giordano TP. Building trust and rapport early in the new doctor-patient relationship: a longitudinal qualitative study. *BMC Med Educ* **2017**; 17(1): 32.
33. Ingram L, Stafford C, Deming ME, Anderson JD, Robillard A, Li X. A Systematic Mixed Studies Review of the Intersections of Social-Ecological Factors and HIV Stigma in People Living With HIV in the U.S. South. *J Assoc Nurses AIDS Care* **2019**; 30(3): 330-43.
34. McAllister J, Beardsworth G, Lavie E, MacRae K, Carr A. Financial stress is associated with reduced treatment adherence in HIV-infected adults in a resource-rich setting. *HIV Med* **2013**; 14(2): 120-4.
35. Hackett S, Badell ML, Meade CM, et al. Improved Perinatal and Postpartum Human Immunodeficiency Virus Outcomes After Use of a Perinatal Care Coordination Team. *Open Forum Infect Dis* **2019**; 6(6): ofz183.
36. Lucas GM, Chaisson RE, Moore RD. Highly active antiretroviral therapy in a large urban clinic: risk factors for virologic failure and adverse drug reactions. *Ann Intern Med* **1999**; 131(2): 81-7.
37. Giordano TP, Gifford AL, White AC, Jr., et al. Retention in care: a challenge to survival with HIV infection. *Clin Infect Dis* **2007**; 44(11): 1493-9.
38. Centers for Disease Control and Prevention. Linkage to, Retention in, and Re-engagement in HIV Care (LRC). Atlanta, GA, **2019**.
39. Gardner LI, Metsch LR, Anderson-Mahoney P, et al. Efficacy of a brief case management intervention to link recently diagnosed HIV-infected persons to care. *AIDS* **2005**; 19(4): 423-31.
40. Ehrenkranz P, Grimsrud A, Holmes CB, Preko P, Rabkin M. Expanding the Vision for Differentiated Service Delivery: A Call for More Inclusive and Truly Patient-Centered Care for People Living With HIV. *J Acquir Immune Defic Syndr* **2021**; 86(2): 147-52.



41. Gardner LI, Giordano TP, Marks G, et al. Enhanced personal contact with HIV patients improves retention in primary care: a randomized trial in 6 US HIV clinics. *Clin Infect Dis* **2014**; 59(5): 725-34.
42. El-Sadr WM, Donnell D, Beauchamp G, et al. Financial Incentives for Linkage to Care and Viral Suppression Among HIV-Positive Patients: A Randomized Clinical Trial (HPTN 065). *JAMA Intern Med* **2017**; 177(8): 1083-92.
43. McCoy SI, Njau PF, Fahey C, et al. Cash vs. food assistance to improve adherence to antiretroviral therapy among HIV-infected adults in Tanzania. *AIDS* **2017**; 31(6): 815-25.
44. Dillingham R, Ingersoll K, Flickinger TE, et al. PositiveLinks: A Mobile Health Intervention for Retention in HIV Care and Clinical Outcomes with 12-Month Follow-Up. *AIDS Patient Care STDS* **2018**; 32(6): 241-50.
45. Bouris A, Jaffe K, Eavou R, Liao C, Kuhns L, Voisin D, Schneider JA. Project nGage: Results of a Randomized Controlled Trial of a Dyadic Network Support Intervention to Retain Young Black Men Who Have Sex With Men in HIV Care. *AIDS Behav* **2017**; 21(12): 3618-29.
46. Geng Elvin H, Odeny Thomas A, Montoya Lina M, et al. Adaptive Strategies for Retention in Care among Persons Living with HIV. *NEJM Evidence* **2023**; 2(4): EVIDoA2200076.
47. Spinelli MA, Hessol NA, Schwarcz S, et al. Homelessness at diagnosis is associated with death among people with HIV in a population-based study of a US city. *AIDS* **2019**; 33(11): 1789-94.
48. Gallant JE, Adimora AA, Carmichael JK, et al. Essential components of effective HIV care: a policy paper of the HIV Medicine Association of the Infectious Diseases Society of America and the Ryan White Medical Providers Coalition. *Clin Infect Dis* **2011**; 53(11): 1043-50.
49. Armstrong WS, Agwu AL, Barrette EP, et al. Innovations in Human Immunodeficiency Virus (HIV) Care Delivery During the Coronavirus Disease 2019 (COVID-19) Pandemic: Policies to Strengthen the Ending the Epidemic Initiative-A Policy Paper of the Infectious Diseases Society of America and the HIV Medicine Association. *Clin Infect Dis* **2021**; 72(1): 9-14.
50. Arora S, Kalishman S, Dion D, et al. Partnering urban academic medical centers and rural primary care clinicians to provide complex chronic disease care. *Health Aff (Millwood)* **2011**; 30(6): 1176-84.
51. Arora S, Kalishman S, Thornton K, et al. Expanding access to hepatitis C virus treatment--Extension for Community Healthcare Outcomes (ECHO) project: disruptive innovation in specialty care. *Hepatology* **2010**; 52(3): 1124-33.
52. Arora S, Thornton K, Murata G, et al. Outcomes of treatment for hepatitis C virus infection by primary care providers. *N Engl J Med* **2011**; 364(23): 2199-207.
53. Ohl M, Dillon D, Moeckli J, et al. Mixed-methods evaluation of a telehealth collaborative care program for persons with HIV infection in a rural setting. *J Gen Intern Med* **2013**; 28(9): 1165-73.
54. Wood BR, Unruh KT, Martinez-Paz N, et al. Impact of a Telehealth Program That Delivers Remote Consultation and Longitudinal Mentorship to Community HIV Providers. *Open Forum Infect Dis* **2016**; 3(3): ofw123.
55. Medicare Learning Network. Medicare Learning Network Fact Sheet: Telehealth Services, **2023** June 2023.
56. Rush KL, Howlett L, Munro A, Burton L. Videoconference compared to telephone in healthcare delivery: A systematic review. *Int J Med Inform* **2018**; 118: 44-53.

57. Heckman TG, Heckman BD, Anderson T, Lovejoy TI, Markowitz JC, Shen Y, Sutton M. Tele-Interpersonal Psychotherapy Acutely Reduces Depressive Symptoms in Depressed HIV-Infected Rural Persons: A Randomized Clinical Trial. *Behav Med* **2017**; 43(4): 285-95.
58. Collins KM, Armenta RF, Cuevas-Mota J, Liu L, Strathdee SA, Garfein RS. Factors associated with patterns of mobile technology use among persons who inject drugs. *Subst Abuse* **2016**; 37(4): 606-12.
59. Delisle-Reda S, Bruneau J, Martel-Laferrrière V. Telehealth for people who inject drugs: An acceptable method of treatment but challenging to access. *J Addict Dis* **2022**; 40(4): 514-7.
60. Genz A, Kirk G, Piggott D, Mehta SH, Linas BS, Westergaard RP. Uptake and Acceptability of Information and Communication Technology in a Community-Based Cohort of People Who Inject Drugs: Implications for Mobile Health Interventions. *JMIR Mhealth Uhealth* **2015**; 3(2): e70.
61. Davis CS, Samuels EA. Continuing increased access to buprenorphine in the United States via telemedicine after COVID-19. *Int J Drug Policy* **2021**; 93: 102905.
62. Young JD, Patel M, Badowski M, et al. Improved virologic suppression with HIV subspecialty care in a large prison system using telemedicine: an observational study with historical controls. *Clin Infect Dis* **2014**; 59(1): 123-6.
63. Young JD, Abdel-Massih R, Herchline T, et al. Infectious Diseases Society of America Position Statement on Telehealth and Telemedicine as Applied to the Practice of Infectious Diseases. *Clin Infect Dis* **2019**; 68(9): 1437-43.
64. Hawk M, Coulter RWS, Egan JE, Fisk S, Reuel Friedman M, Tula M, Kinsky S. Harm reduction principles for healthcare settings. *Harm Reduct J* **2017**; 14(1): 70.
65. Altice FL, Springer S, Buitrago M, Hunt DP, Friedland GH. Pilot study to enhance HIV care using needle exchange-based health services for out-of-treatment injecting drug users. *J Urban Health* **2003**; 80(3): 416-27.
66. Imbert E, Hickey MD, Clemenzi-Allen A, et al. Evaluation of the POP-UP programme: a multicomponent model of care for people living with HIV with homelessness or unstable housing. *AIDS* **2021**; 35(8): 1241-6.
67. Dombrowski JC, Galagan SR, Ramchandani M, et al. HIV Care for Patients With Complex Needs: A Controlled Evaluation of a Walk-In, Incentivized Care Model. *Open Forum Infect Dis* **2019**; 6(7): ofz294.
68. Hickey MD, Imbert E, Appa A, et al. HIV Treatment Outcomes in POP-UP: Drop-in HIV Primary Care Model for People Experiencing Homelessness. *J Infect Dis* **2022**; 226(Suppl 3): S353-s62.
69. Stefanowicz M, Feldman B, Robinson J. House Calls Without Walls: Street Medicine Delivers Primary Care to Unsheltered Persons Experiencing Homelessness. *Ann Fam Med* **2021**; 19(1): 84.
70. Dombrowski JC, Ramchandani M, Dhanireddy S, Harrington RD, Moore A, Golden MR. The Max Clinic: Medical Care Designed to Engage the Hardest-to-Reach Persons Living with HIV in Seattle and King County, Washington. *AIDS Patient Care STDS* **2018**; 32(4): 149-56.
71. Borne D, Tryon J, Rajabiun S, Fox J, de Groot A, Gunhouse-Vigil K. Mobile Multidisciplinary HIV Medical Care for Hard-to-Reach Individuals Experiencing Homelessness in San Francisco. *Am J Public Health* **2018**; 108(S7): S528-s30.
72. Schneider J, Kaplan SH, Greenfield S, Li W, Wilson IB. Better physician-patient relationships are associated with higher reported adherence to antiretroviral therapy in patients with HIV infection. *J Gen Intern Med* **2004**; 19(11): 1096-103.

73. Christopoulos KA, Olender S, Lopez AM, et al. Retained in HIV Care But Not on Antiretroviral Treatment: A Qualitative Patient-Provider Dyadic Study. *PLoS Med* **2015**; 12(8): e1001863.
74. Irvine MK, Chamberlin SA, Robbins RS, et al. Improvements in HIV care engagement and viral load suppression following enrollment in a comprehensive HIV care coordination program. *Clin Infect Dis* **2015**; 60(2): 298-310.
75. Horberg MA, Hurley LB, Towner WJ, et al. Determination of optimized multidisciplinary care team for maximal antiretroviral therapy adherence. *J Acquir Immune Defic Syndr* **2012**; 60(2): 183-90.
76. Nash D, Robertson MM, Penrose K, et al. Short-term effectiveness of HIV care coordination among persons with recent HIV diagnosis or history of poor HIV outcomes. *PLoS One* **2018**; 13(9): e0204017.
77. Stone VE. Optimizing the care of minority patients with HIV/AIDS. *Clin Infect Dis* **2004**; 38(3): 400-4.
78. Horberg MA, Aberg JA, Cheever LW, Renner P, O'Brien Kaleba E, Asch SM. Development of national and multiagency HIV care quality measures. *Clin Infect Dis* **2010**; 51(6): 732-8.
79. Korthuis PT, McGinnis KA, Kraemer KL, et al. Quality of HIV Care and Mortality Rates in HIV-Infected Patients. *Clin Infect Dis* **2016**; 62(2): 233-9.
80. Centers for Disease Control and Prevention. A Guide to Taking a Sexual History. Atlanta, GA, **2022** June 2022.
81. Centers for Disease Control and Prevention. Duty to Warn. Atlanta, GA, **2021** April 2021.
82. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med* **2001**; 16(9): 606-13.
83. Kroenke K, Spitzer RL, Williams JB, Monahan PO, Löwe B. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann Intern Med* **2007**; 146(5): 317-25.
84. Assessment, diagnosis, and treatment of HIV-associated neurocognitive disorder: a consensus report of the mind exchange program. *Clin Infect Dis* **2013**; 56(7): 1004-17.
85. UCSF Weill Institute for Neurosciences. A Healthcare Provider's Guide to HIV-Associated Neurocognitive Disorder (HAND): Diagnosis, pharmacologic management, non-pharmacologic management, and other considerations, **2017**.
86. Centers for Disease Control and Prevention. Technical Update for HIV Nucleic Acid Tests Approved for Diagnostic Purposes, **2023** Updated: May 2023.
87. CDC Nexus. CDC Nexus: CDC Resources for Clinicians. Clinical Guidance for PrEP. Updated May 6, 2024. Available at: [https://www.cdc.gov/hivnexus/hcp/prep/index.html#cdc\\_clinical\\_guidance\\_resources-resources](https://www.cdc.gov/hivnexus/hcp/prep/index.html#cdc_clinical_guidance_resources-resources) Accessed May 29, 2024.
88. Landovitz RJ, Gao F, Fogel Jea. Performance characteristics of HIV RNA screening with long-acting injectable cabotegravir (CAB-LA) pre-exposure prophylaxis (PrEP) in the multicenter global HIV Prevention Trials Network 083 (HPTN 083) Study. International AIDS Conference. Munich, Germany: International AIDS Society, **2024**.
89. Centers for Disease Control and Prevention. Preventing New HIV Infections. Available at: <https://www.cdc.gov/hiv/guidelines/preventing.html>. Accessed August 2, 2024.
90. Centers for Disease Control and Prevention. 2018 Quick reference guide: Recommended laboratory HIV testing algorithm for serum or plasma specimens. Atlanta, GA, **2018** January 2018.

91. Panel on Antiretroviral Therapy and Medical Management of Children Living with HIV. Guidelines for the Use of Antiretroviral Agents in Pediatric HIV Infection. Washington, DC: Department of Health and Human Services, **2023** April 2023.
92. Wensing AM, Calvez V, Ceccherini-Silberstein F, et al. 2022 update of the drug resistance mutations in HIV-1. *Top Antivir Med* **2022**; 30(4): 559-74.
93. Stanford University. HIV Drug Resistance Database. Available at: <https://hivdb.stanford.edu/>. Accessed December 19, 2023.
94. McClung RP, Oster AM, Ocfemia MCB, Saduvala N, Heneine W, Johnson JA, Hernandez AL. Transmitted Drug Resistance Among Human Immunodeficiency Virus (HIV)-1 Diagnoses in the United States, 2014-2018. *Clin Infect Dis* **2022**; 74(6): 1055-62.
95. Gupta SK, Eustace JA, Winston JA, et al. Guidelines for the management of chronic kidney disease in HIV-infected patients: recommendations of the HIV Medicine Association of the Infectious Diseases Society of America. *Clin Infect Dis* **2005**; 40(11): 1559-85.
96. Razzak Chaudhary S, Workeneh BT, Montez-Rath ME, Zolopa AR, Klotman PE, Winkelmayr WC. Trends in the outcomes of end-stage renal disease secondary to human immunodeficiency virus-associated nephropathy. *Nephrol Dial Transplant* **2015**; 30(10): 1734-40.
97. McLaughlin MM, Guerrero AJ, Merker A. Renal effects of non-tenofovir antiretroviral therapy in patients living with HIV. *Drugs Context* **2018**; 7: 212519.
98. Panel on Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV: National Institutes of Health, Centers for Disease Control and Prevention, HIV Medicine Association, and Infectious Diseases Society of America, **2023** September 2023.
99. Mazurek GH, Jereb J, Vernon A, LoBue P, Goldberg S, Castro K. Updated guidelines for using Interferon Gamma Release Assays to detect Mycobacterium tuberculosis infection - United States, 2010. *MMWR Recomm Rep* **2010**; 59(Rr-5): 1-25.
100. Centers for Disease Control and Prevention. TB Guidelines. **2023**.
101. Doshi S, Chen TF, Zapata J, Holzman RS, Zapata LC, Aberg JA, Sivapalasingam S. Risk factors for tuberculin skin test conversion among HIV-infected patients in New York City. *Int J Infect Dis* **2012**; 16(7): e518-21.
102. Anergy skin testing and tuberculosis [corrected] preventive therapy for HIV-infected persons: revised recommendations. Centers for Disease Control and Prevention. *MMWR Recomm Rep* **1997**; 46(Rr-15): 1-10.
103. Cattamanchi A, Smith R, Steingart KR, et al. Interferon-gamma release assays for the diagnosis of latent tuberculosis infection in HIV-infected individuals: a systematic review and meta-analysis. *J Acquir Immune Defic Syndr* **2011**; 56(3): 230-8.
104. Terrault NA, Lok ASF, McMahon BJ, et al. Update on prevention, diagnosis, and treatment of chronic hepatitis B: AASLD 2018 hepatitis B guidance. *Hepatology* **2018**; 67(4): 1560-99.
105. Centers for Disease Control and Prevention. Screening and Testing Recommendations for Chronic Hepatitis B Virus Infection (HBV), **2023**.
106. American Association for the Study of Liver Diseases, Infectious Diseases Society of America,,. HCV Guidance: Recommendations for Testing, Managing, and Treating Hepatitis C, **2023**.

107. Foster M, Ramachandran S, Myatt K, et al. Hepatitis A Virus Outbreaks Associated with Drug Use and Homelessness - California, Kentucky, Michigan, and Utah, 2017. *MMWR Morb Mortal Wkly Rep* **2018**; 67(43): 1208-10.
108. O'Riordan M, Goh L, Lamba H. Increasing hepatitis A IgG prevalence rate in men who have sex with men attending a sexual health clinic in London: implications for immunization policy. *Int J STD AIDS* **2007**; 18(10): 707-10.
109. Arshad M, El-Kamary SS, Jhaveri R. Hepatitis C virus infection during pregnancy and the newborn period--are they opportunities for treatment? *J Viral Hepat* **2011**; 18(4): 229-36.
110. Panel on Opportunistic Infections in Children with and Exposed to HIV. Guidelines for the Prevention and Treatment of Opportunistic Infections in Children with and Exposed to HIV: Department of Health and Human Services, **2023**.
111. Kanwal F, Kramer JR, Asch SM, Cao Y, Li L, El-Serag HB. Long-Term Risk of Hepatocellular Carcinoma in HCV Patients Treated With Direct Acting Antiviral Agents. *Hepatology* **2020**; 71(1): 44-55.
112. Centers for Disease Control and Prevention. Measles (Rubeola): For Healthcare Providers, **2020** November 2020.
113. McLean HQ, Fiebelkorn AP, Temte JL, Wallace GS. Prevention of measles, rubella, congenital rubella syndrome, and mumps, 2013: summary recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* **2013**; 62(Rr-04): 1-34.
114. Berkowitz EM, Moyle G, Stellbrink HJ, et al. Safety and immunogenicity of an adjuvanted herpes zoster subunit candidate vaccine in HIV-infected adults: a phase 1/2a randomized, placebo-controlled study. *J Infect Dis* **2015**; 211(8): 1279-87.
115. Brosio F, Masetti G, Matteo G, Stefanati A, Gabutti G. A novel nonlive, adjuvanted herpes zoster subunit vaccine: a report on the emerging clinical data and safety profile. *Infect Drug Resist* **2018**; 11: 1401-11.
116. Tungsiripat M, Drechsler H, Sarlone C, Amyot K, Laffey E, Aberg J. Prevalence and significance of G6PD deficiency in patients of an urban HIV clinic. *J Int Assoc Physicians AIDS Care (Chic)* **2008**; 7(2): 88-90.
117. Richardson SR, O'Malley GF. Glucose-6-Phosphate Dehydrogenase Deficiency. StatPearls. Treasure Island (FL), **2024**.
118. Zash R HL, Diseko M, et al. . Update on neural tube defects with antiretroviral exposure in the Tsepamo Study, Botswana. 24th International AIDS Conference **2022**: Abstract 12759.
119. Kourtis AP, Zhu W, Lampe MA, Huang YA, Hoover KW. Dolutegravir and pregnancy outcomes including neural tube defects in the USA during 2008-20: a national cohort study. *Lancet HIV* **2023**; 10(9): e588-e96.
120. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States: Department of Health and Human Services, **2023**.
121. International Society for the Study of the Aging Male. Free & Bioavailable Testosterone Calculator. Available at: <https://www.issam.ch/freetesto.htm>. Accessed December 18, 2023.
122. Feltner C, Grodensky C, Ebel C, Middleton JC, Harris RP, Ashok M, Jonas DE. Serologic Screening for Genital Herpes: An Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA* **2016**; 316(23): 2531-43.

123. Nixon DE, Landay AL. Biomarkers of immune dysfunction in HIV. *Curr Opin HIV AIDS* **2010**; 5(6): 498-503.
124. Lucas GM, Ross MJ, Stock PG, et al. Clinical practice guideline for the management of chronic kidney disease in patients infected with HIV: 2014 update by the HIV Medicine Association of the Infectious Diseases Society of America. *Clin Infect Dis* **2014**; 59(9): e96-138.
125. Gabai CM, Moore MS, Penrose K, Braunstein S, Bocour A, Neaigus A, Winters A. Hepatitis C infection among men who have sex with men living with HIV in New York City, 2000-2015. *Sex Transm Infect* **2020**; 96(6): 445-50.
126. Wolfe HL, Hughto JMW, Quint M, Hashemi L, Hughes LD. Hepatitis C Virus Testing and Care Cascade Among Transgender and Gender Diverse Individuals. *Am J Prev Med* **2023**; 64(5): 695-703.
127. Lockart I, Matthews GV, Danta M. Sexually transmitted hepatitis C infection: the evolving epidemic in HIV-positive and HIV-negative MSM. *Curr Opin Infect Dis* **2019**; 32(1): 31-7.
128. Bradshaw D, Vasylyeva TI, Davis C, et al. Transmission of hepatitis C virus in HIV-positive and PrEP-using MSM in England. *J Viral Hepat* **2020**; 27(7): 721-30.
129. Chamie G, Bonacini M, Bangsberg DR, et al. Factors associated with seronegative chronic hepatitis C virus infection in HIV infection. *Clin Infect Dis* **2007**; 44(4): 577-83.
130. Toka B, Köksal A, Dertli R, et al. Hepatitis B Reactivation in Patients Treated with Direct-Acting Antivirals for Hepatitis C. *Dig Dis* **2022**; 40(5): 635-43.
131. Mücke MM, Backus LI, Mücke VT, et al. Hepatitis B virus reactivation during direct-acting antiviral therapy for hepatitis C: a systematic review and meta-analysis. *Lancet Gastroenterol Hepatol* **2018**; 3(3): 172-80.
132. Mücke VT, Mücke MM, Peiffer KH, et al. No evidence of hepatitis B virus reactivation in patients with resolved infection treated with direct-acting antivirals for hepatitis C in a large real-world cohort. *Aliment Pharmacol Ther* **2017**; 46(4): 432-9.
133. Barry MJ, Nicholson WK, Silverstein M, et al. Screening for Depression and Suicide Risk in Adults: US Preventive Services Task Force Recommendation Statement. *JAMA* **2023**; 329(23): 2057-67.
134. O'Connor EA, Perdue LA, Senger CA, Rushkin M, Patnode CD, Bean SI, Jonas DE. Screening and Behavioral Counseling Interventions to Reduce Unhealthy Alcohol Use in Adolescents and Adults: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA* **2018**; 320(18): 1910-28.
135. Barry MJ, Nicholson WK, Silverstein M, et al. Screening for Anxiety Disorders in Adults: US Preventive Services Task Force Recommendation Statement. *JAMA* **2023**; 329(24): 2163-70.
136. Krist AH, Davidson KW, Mangione CM, et al. Screening for Unhealthy Drug Use: US Preventive Services Task Force Recommendation Statement. *JAMA* **2020**; 323(22): 2301-9.
137. Negeri ZF, Levis B, Sun Y, et al. Accuracy of the Patient Health Questionnaire-9 for screening to detect major depression: updated systematic review and individual participant data meta-analysis. *BMJ* **2021**; 375: n2183.
138. Levis B, Sun Y, He C, et al. Accuracy of the PHQ-2 Alone and in Combination With the PHQ-9 for Screening to Detect Major Depression: Systematic Review and Meta-analysis. *JAMA* **2020**; 323(22): 2290-300.

139. Wejnert C, Hess KL, Hall HI, et al. Vital Signs: Trends in HIV Diagnoses, Risk Behaviors, and Prevention Among Persons Who Inject Drugs - United States. *MMWR Morb Mortal Wkly Rep* **2016**; 65(47): 1336-42.
140. Hitch AE, Gause NK, Brown JL. Substance Use Screening in HIV Care Settings: a Review and Critique of the Literature. *Curr HIV/AIDS Rep* **2019**; 16(1): 7-16.
141. Haldane V, Cervero-Liceras F, Chuah FL, et al. Integrating HIV and substance use services: a systematic review. *J Int AIDS Soc* **2017**; 20(1): 21585.
142. Sanchez M, Finnell D. Alcohol Screening and Brief Intervention for Persons Living with HIV. *J Assoc Nurses AIDS Care* **2017**; 28(2): 266-78.
143. National Center for Chronic Disease Prevention and Health Promotion (US), Office on Smoking and Health. The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention, **2014** January 2014.
144. Reddy KP, Parker RA, Losina E, et al. Impact of Cigarette Smoking and Smoking Cessation on Life Expectancy Among People With HIV: A US-Based Modeling Study. *J Infect Dis* **2016**; 214(11): 1672-81.
145. Bold KW, Deng Y, Dziura J, et al. Practices, attitudes, and confidence related to tobacco treatment interventions in HIV clinics: a multisite cross-sectional survey. *Transl Behav Med* **2022**; 12(6): 726-33.
146. Ledgerwood DM, Yskes R. Smoking Cessation for People Living With HIV/AIDS: A Literature Review and Synthesis. *Nicotine Tob Res* **2016**; 18(12): 2177-84.
147. Centers for Disease Control and Prevention. Smoking & Tobacco Use: Clinical Cessation Tools. **2021**.
148. Vidrine JJ, Shete S, Cao Y, et al. Ask-Advise-Connect: a new approach to smoking treatment delivery in health care settings. *JAMA Intern Med* **2013**; 173(6): 458-64.
149. Bui TC, Piñeiro B, Vidrine DJ, Wetter DW, Frank-Pearce SG, Vidrine JJ. Quitline Treatment Enrollment and Cessation Outcomes Among Smokers Linked With Treatment via Ask-Advise-Connect: Comparisons Among Smokers With and Without HIV. *Nicotine Tob Res* **2020**; 22(9): 1640-3.
150. Reddy KP, Kruse GR, Lee S, Shuter J, Rigotti NA. Tobacco Use and Treatment of Tobacco Dependence Among People With Human Immunodeficiency Virus: A Practical Guide for Clinicians. *Clin Infect Dis* **2022**; 75(3): 525-33.
151. Patnode CD, Coker T, Cippola EL, Melnikow J, Durbin S, Thomas RG. Tobacco Smoking Cessation in Adults, Including Pregnant Persons: Interventions: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force. *JAMA* **2021**; 325(3): 280-98.
152. Lomelí-Martínez SM, González-Hernández LA, Ruiz-Anaya AJ, et al. Oral Manifestations Associated with HIV/AIDS Patients. *Medicina (Kaunas)* **2022**; 58(9).
153. Davidson KW, Mangione CM, Barry MJ, et al. Collaboration and Shared Decision-Making Between Patients and Clinicians in Preventive Health Care Decisions and US Preventive Services Task Force Recommendations. *JAMA* **2022**; 327(12): 1171-6.
154. McKibben LJ, Stange PV, Sneller VP, Strikas RA, Rodewald LE. Use of standing orders programs to increase adult vaccination rates. *MMWR Recomm Rep* **2000**; 49(Rr-1): 15-6.
155. Dexter PR, Perkins SM, Maharry KS, Jones K, McDonald CJ. Inpatient computer-based standing orders vs physician reminders to increase influenza and pneumococcal vaccination rates: a randomized trial. *JAMA* **2004**; 292(19): 2366-71.

156. Centers for Disease Control and Prevention. Advisory Committee on Immunization Practices (ACIP). Recent Meeting Recommendations, **2023**.
157. Kobayashi M, Farrar JL, Gierke R, et al. Use of 15-Valent Pneumococcal Conjugate Vaccine and 20-Valent Pneumococcal Conjugate Vaccine Among U.S. Adults: Updated Recommendations of the Advisory Committee on Immunization Practices - United States, 2022. *MMWR Morb Mortal Wkly Rep* **2022**; 71(4): 109-17.
158. Kobayashi M, Pilishvili T, Farrar JL, et al. Pneumococcal Vaccine for Adults Aged  $\geq 19$  Years: Recommendations of the Advisory Committee on Immunization Practices, United States, 2023. *MMWR Recomm Rep* **2023**; 72(3): 1-39.
159. Centers for Disease Control and Prevention. Advisory Committee on Immunization Practices (ACIP) Recommendations. June 27, 2024. Available at: <https://www.cdc.gov/vaccines/acip/recommendations.html>. . Accessed July 7, 2024.
160. Bell J, Meng L, Barbre K, et al. Influenza and Up-to-Date COVID-19 Vaccination Coverage Among Health Care Personnel - National Healthcare Safety Network, United States, 2022-23 Influenza Season. *MMWR Morb Mortal Wkly Rep* **2023**; 72(45): 1237-43.
161. Grohskopf LA, Blanton LH, Ferdinands JM, et al. Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices - United States, 2022-23 Influenza Season. *MMWR Recomm Rep* **2022**; 71(1): 1-28.
162. Havers FP, Moro PL, Hunter P, Hariri S, Bernstein H. Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis Vaccines: Updated Recommendations of the Advisory Committee on Immunization Practices - United States, 2019. *MMWR Morb Mortal Wkly Rep* **2020**; 69(3): 77-83.
163. Mbaeyi SA, Bozio CH, Duffy J, Rubin LG, Hariri S, Stephens DS, MacNeil JR. Meningococcal Vaccination: Recommendations of the Advisory Committee on Immunization Practices, United States, 2020. *MMWR Recomm Rep* **2020**; 69(9): 1-41.
164. Marks KM, Kang M, Umbleja T, et al. Immunogenicity and Safety of Hepatitis B Virus (HBV) Vaccine With a Toll-Like Receptor 9 Agonist Adjuvant in HBV Vaccine-Naïve People With Human Immunodeficiency Virus. *Clin Infect Dis* **2023**; 77(3): 414-8.
165. Marks K, Kang M, Umbleja T, et al. HepB-CpG Vaccine Is Superior to HepB-alum in People With HIV and Prior Vaccine Nonresponse: A5379. CROI 2024. Denver Colorado, **2024**.
166. Laksananun N, Praparattanapan J, Kotarathitum W, Supparatpinyo K, Chaiwarith R. Immunogenicity and safety of 4 vs. 3 standard doses of HBV vaccination in HIV-infected adults with isolated anti-HBc antibody. *AIDS Res Ther* **2019**; 16(1): 10.
167. Schillie S, Vellozzi C, Reingold A, Harris A, Haber P, Ward JW, Nelson NP. Prevention of Hepatitis B Virus Infection in the United States: Recommendations of the Advisory Committee on Immunization Practices. *MMWR Recomm Rep* **2018**; 67(1): 1-31.
168. Centers for Disease Control and Prevention. Measles (Rubeola): Measles Cases and Outbreaks, **2023**.
169. Meites E, Szilagyi PG, Chesson HW, Unger ER, Romero JR, Markowitz LE. Human Papillomavirus Vaccination for Adults: Updated Recommendations of the Advisory Committee on Immunization Practices. *MMWR Morb Mortal Wkly Rep* **2019**; 68(32): 698-702.
170. Kojic EM, Kang M, Cespedes MS, et al. Immunogenicity and safety of the quadrivalent human papillomavirus vaccine in HIV-1-infected women. *Clin Infect Dis* **2014**; 59(1): 127-35.



171. Wilkin TJ, Chen H, Cespedes MS, et al. A Randomized, Placebo-Controlled Trial of the Quadrivalent Human Papillomavirus Vaccine in Human Immunodeficiency Virus-Infected Adults Aged 27 Years or Older: AIDS Clinical Trials Group Protocol A5298. *Clin Infect Dis* **2018**; 67(9): 1339-46.
172. McClymont E, Lee M, Raboud J, et al. The Efficacy of the Quadrivalent Human Papillomavirus Vaccine in Girls and Women Living With Human Immunodeficiency Virus. *Clin Infect Dis* **2019**; 68(5): 788-94.
173. Moscicki AB, Karalius B, Tassiopoulos K, et al. Human Papillomavirus Antibody Levels and Quadrivalent Vaccine Clinical Effectiveness in Perinatally Human Immunodeficiency Virus-infected and Exposed, Uninfected Youth. *Clin Infect Dis* **2019**; 69(7): 1183-91.
174. Lacey CJ. HPV vaccination in HIV infection. *Papillomavirus Res* **2019**; 8: 100174.
175. Cavallari EN SL, Maddaloni L, Motta E, Scordio M, Frasca F, Ceccarelli G, Scagnolari C, Arcieri S, Pierangeli A. Efficacy of Late HPV Vaccination in Young HIV+ MSM. Conference on Retrovirus and Opportunistic Infections **2023**: Poster 1030.
176. Menon S, Rossi R, Kariisa M, Callens S. Determining the HPV vaccine schedule for a HIV-infected population in sub Saharan Africa, a commentary. *Virology* **2018**; 15(1): 129.
177. Kim DK, Hunter P. Recommended Adult Immunization Schedule, United States, 2019. *Ann Intern Med* **2019**; 170(3): 182-92.
178. Marin M, Güris D, Chaves SS, Schmid S, Seward JF. Prevention of varicella: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* **2007**; 56(Rr-4): 1-40.
179. Harpaz R, Ortega-Sanchez IR, Seward JF. Prevention of herpes zoster: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep* **2008**; 57(Rr-5): 1-30; quiz CE2-4.
180. Teran RA, Gagner A, Gretsche S, et al. SARS-CoV-2 Reinfection Risk in Persons with HIV, Chicago, Illinois, USA, 2020-2022. *Emerg Infect Dis* **2023**; 29(11): 2257-65.
181. Yendewa GA, Perez JA, Patil N, McComsey GA. Associations Between Post-Acute Sequelae of SARS-CoV-2, COVID-19 Vaccination and HIV Infection: A United States Cohort Study. *Frontiers in Immunology* **2024**; 15: e-pub ahead of print.
182. Centers for Disease Control and Prevention. Interim Clinical Considerations for Use of COVID-19 Vaccines in the United States, **2023**.
183. Centers for Disease Control and Prevention. Stay Up to Date with COVID-19 Vaccines, **2023**.
184. Rao AK, Petersen BW, Whitehill F, et al. Use of JYNNEOS (Smallpox and Monkeypox Vaccine, Live, Nonreplicating) for Preexposure Vaccination of Persons at Risk for Occupational Exposure to Orthopoxviruses: Recommendations of the Advisory Committee on Immunization Practices - United States, 2022. *MMWR Morb Mortal Wkly Rep* **2022**; 71(22): 734-42.
185. Deputy NP, Deckert J, Chard AN, et al. Vaccine Effectiveness of JYNNEOS against Mpox Disease in the United States. *N Engl J Med* **2023**; 388(26): 2434-43.
186. Ramchandani MS, Berzkalns A, Cannon CA, et al. Effectiveness of the Modified Vaccinia Ankara Vaccine Against Mpox in Men Who Have Sex With Men: A Retrospective Cohort Analysis, Seattle, Washington. *Open Forum Infect Dis* **2023**; 10(11): ofad528.
187. Hazra A, Zucker J, Bell E, et al. Mpox in people with past infection or a complete vaccination course: a global case series. *Lancet Infect Dis* **2023**; 24(1): 57-64.

188. Faherty EAG, Holly T, Ogale YP, et al. Notes from the Field: Emergence of an Mpox Cluster Primarily Affecting Persons Previously Vaccinated Against Mpox - Chicago, Illinois, March 18-June 12, 2023. *MMWR Morb Mortal Wkly Rep* **2023**; 72(25): 696-8.
189. Melgar M, Britton A, Roper LE, Talbot HK, Long SS, Kotton CN, Havers FP. Use of Respiratory Syncytial Virus Vaccines in Older Adults: Recommendations of the Advisory Committee on Immunization Practices - United States, 2023. *MMWR Morb Mortal Wkly Rep* **2023**; 72(29): 793-801.
190. Centers for Disease Control and Prevention. Healthcare Providers: RSV Vaccination for Adults 60 Years of Age and Over. July 3, 2024. In: (ACIP) ACoIP. Atlanta, Georgia: Centers for Disease Control and Prevention, **2024**.
191. Collins JP, Ryan ET, Wong KK, et al. Cholera Vaccine: Recommendations of the Advisory Committee on Immunization Practices, 2022. *MMWR Recomm Rep* **2022**; 71(2): 1-8.
192. Rai A, Uwishema O, Uweis L, et al. Polio returns to the USA: An epidemiological alert. *Ann Med Surg (Lond)* **2022**; 82: 104563.
193. Lee SE, Greene SA, Burns CC, Tallis G, Wassilak SGF, Bolu O. Progress Toward Poliomyelitis Eradication - Worldwide, January 2021-March 2023. *MMWR Morb Mortal Wkly Rep* **2023**; 72(19): 517-22.
194. Jackson BR, Iqbal S, Mahon B. Updated recommendations for the use of typhoid vaccine-- Advisory Committee on Immunization Practices, United States, 2015. *MMWR Morb Mortal Wkly Rep* **2015**; 64(11): 305-8.
195. Fuzzell LN, Vadaparampil ST, Giuliano AR, Liu Y, Coghill AE. Patterns of HIV Self-Disclosure in the Oncology Setting. *JNCI Cancer Spectr* **2021**; 5(4).
196. Hessol NA, Whittmore H, Vittinghoff E, Hsu LC, Ma D, Scheer S, Schwarcz SK. Incidence of first and second primary cancers diagnosed among people with HIV, 1985-2013: a population-based, registry linkage study. *Lancet HIV* **2018**; 5(11): e647-e55.
197. Silverberg MJ, Chao C, Leyden WA, et al. HIV infection and the risk of cancers with and without a known infectious cause. *AIDS* **2009**; 23(17): 2337-45.
198. Shiels MS, Althoff KN, Pfeiffer RM, et al. HIV Infection, Immunosuppression, and Age at Diagnosis of Non-AIDS-Defining Cancers. *Clin Infect Dis* **2017**; 64(4): 468-75.
199. Park B, Ahn KH, Choi Y, et al. Cancer Incidence Among Adults With HIV in a Population-Based Cohort in Korea. *JAMA Netw Open* **2022**; 5(8): e2224897.
200. Coburn SB, Humes E, Lang R, et al. Risk factors for 5-year mortality in people with HIV after cancer diagnosis (2000-2017). *Conference on Retrovirus and Opportunistic Infections* **2023**: Abstract 628.
201. Dickey B, Yanik E, Thompson Z, et al. Association of HIV Control and Immunosuppression with NADC risk among Patient on ART. *Conference on Retrovirus and Opportunistic Infections* **2023**: Abstract 625.
202. Luo Q, Pfeiffer RM, Noone AM, Horner MJ, Engels EA, Shiels MS. Years of life lost to cancer among the United States HIV population, 2006-2015. *AIDS* **2022**; 36(9): 1279-86.
203. Dalla Pria A, Merchant S, Bower M. Oncological challenges for an ageing population living with HIV. *AIDS* **2017**; 31 Suppl 2: S185-s9.
204. West R, McNeill A, Raw M. Smoking cessation guidelines for health professionals: an update. *Health Education Authority. Thorax* **2000**; 55(12): 987-99.

205. U.S. Preventive Services Task Force. Screening for Lung Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA* **2021**; 325(10): 962-70.
206. Kong CY, Sigel K, Criss SD, et al. Benefits and harms of lung cancer screening in HIV-infected individuals with CD4+ cell count at least 500 cells/ $\mu$ l. *AIDS* **2018**; 32(10): 1333-42.
207. American Cancer Society. HIV and Cancer. Available at: <https://www.cancer.org/cancer/risk-prevention/infections/hiv-infection-aids/hiv-aids-and-cancer.html>. Accessed December 18, 2023.
208. Panel on Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV. Available at: <https://clinicalinfo.hiv.gov/en/guidelines/hiv-clinical-guidelines-adult-and-adolescent-opportunistic-infections/human>. Accessed July 9, 2024.
209. Marrero JA, Kulik LM, Sirlin CB, et al. Diagnosis, Staging, and Management of Hepatocellular Carcinoma: 2018 Practice Guidance by the American Association for the Study of Liver Diseases. *Hepatology* **2018**; 68(2): 723-50.
210. Owens DK, Davidson KW, Krist AH, et al. Risk Assessment, Genetic Counseling, and Genetic Testing for BRCA-Related Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA* **2019**; 322(7): 652-65.
211. American Cancer Society. American Cancer Society Recommendations for the Early Detection of Breast Cancer. Available at: <https://www.cancer.org/cancer/types/breast-cancer/screening-tests-and-early-detection/american-cancer-society-recommendations-for-the-early-detection-of-breast-cancer.html>. Accessed December 18, 2023.
212. U. S. Preventive Services Task Force, Nicholson WK, Silverstein M, et al. Screening for Breast Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA* **2024**.
213. Colón-López V, Shiels MS, Machin M, et al. Anal Cancer Risk Among People With HIV Infection in the United States. *J Clin Oncol* **2018**; 36(1): 68-75.
214. Stier EA, Clarke MA, Deshmukh AA, et al. International Anal Neoplasia Society's consensus guidelines for anal cancer screening. *Int J Cancer* **2024**.
215. Palefsky JM, Lee JY, Jay N, et al. Treatment of Anal High-Grade Squamous Intraepithelial Lesions to Prevent Anal Cancer. *N Engl J Med* **2022**; 386(24): 2273-82.
216. Tomassi MJ, Abbas MA, Klaristenfeld DD. Expectant management surveillance for patients at risk for invasive squamous cell carcinoma of the anus: a large US healthcare system experience. *Int J Colorectal Dis* **2019**; 34(1): 47-54.
217. Sun J, Wiley D, Barrett BW, et al. Comparison of anal pre-cancer screening strategies among men who have sex with men. *Int J STD AIDS* **2023**; 34(2): 87-97.
218. American Cancer Society. Prostate Cancer Incidence and Mortality by Race/Ethnicity, US, 2009–2013. Cancer facts and figures 2017. Atlanta, GA, **2017**.
219. U.S. Preventive Services Task Force. Screening for Prostate Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA* **2018**; 319(18): 1901-13.
220. Wei JT, Barocas D, Carlsson S, et al. Early Detection of Prostate Cancer: AUA/SUO Guideline Part I: Prostate Cancer Screening. *J Urol* **2023**; 210(1): 46-53.
221. American College of Obstetrics and Gynecology. Updated Cervical Cancer Screening Guidelines, April 2021, **2021**.
222. Perkins RB, Guido RS, Castle PE, et al. 2019 ASCCP Risk-Based Management Consensus Guidelines for Abnormal Cervical Cancer Screening Tests and Cancer Precursors. *J Low Genit Tract Dis* **2020**; 24(2): 102-31.

223. Jackson SS, Han X, Mao Z, Nogueira L, Suneja G, Jemal A, Shiels MS. Cancer Stage, Treatment, and Survival Among Transgender Patients in the United States. *J Natl Cancer Inst* **2021**; 113(9): 1221-7.
224. Coleman E, Radix AE, Bouman WP, et al. Standards of Care for the Health of Transgender and Gender Diverse People, Version 8. *Int J Transgend Health* **2022**; 23(Suppl 1): S1-s259.
225. Centers for Disease Control and Prevention. Sexually Transmitted Infections Surveillance, 2022. Atlanta: US Department of Health and Human Services, **2024**.
226. Mitjà O, Alemany A, Marks M, et al. Mpox in people with advanced HIV infection: a global case series. *Lancet* **2023**; 401(10380): 939-49.
227. Kersh EN, Shukla M, Raphael BH, Habel M, Park I. At-Home Specimen Self-Collection and Self-Testing for Sexually Transmitted Infection Screening Demand Accelerated by the COVID-19 Pandemic: a Review of Laboratory Implementation Issues. *J Clin Microbiol* **2021**; 59(11): e0264620.
228. Fistonich GM, Troutman KM, Visconti AJ. A Pilot of Mail-Out HIV and Sexually Transmitted Infection Testing in Washington, District of Columbia During the COVID-19 Pandemic. *Am J Prev Med* **2021**; 61(5 Suppl 1): S16-s25.
229. Papp JR, Park IU, Fakile Y, Pereira L, Pillay A, Bolan GA. CDC Laboratory Recommendations for Syphilis Testing, United States, 2024. *MMWR Recomm Rep* **2024**; 73(1): 1-32.
230. National Syphilis and Congenital Syphilis Syndemic Federal Task Force. Considerations for the Implementation of Point of Care (POC) Tests for Syphilis. Available at: <https://www.hhs.gov/sites/default/files/nscss-considerations-for-the-implementation-of-syphilis-poc-tests.pdf>. Accessed July 1, 2024.
231. Workowski KA, Bachmann LH, Chan PA, et al. Sexually Transmitted Infections Treatment Guidelines, 2021. *MMWR Recomm Rep* **2021**; 70(4): 1-187.
232. St Cyr S, Barbee L, Workowski KA, et al. Update to CDC's Treatment Guidelines for Gonococcal Infection, 2020. *MMWR Morb Mortal Wkly Rep* **2020**; 69(50): 1911-6.
233. Li L, Yuan Y, He W, Zheng L, Wang Q. Emerging multidrug resistance contributes to treatment failure in *Mycoplasma genitalium* infected patients in China. *Diagn Microbiol Infect Dis* **2023**; 105(2): 115854.
234. Molina JM, Charreau I, Chidiac C, et al. Post-exposure prophylaxis with doxycycline to prevent sexually transmitted infections in men who have sex with men: an open-label randomised substudy of the ANRS IPERGAY trial. *Lancet Infect Dis* **2018**; 18(3): 308-17.
235. Ortiz-Saavedra B, Montes-Madariaga ES, Cabanillas-Ramirez C, et al. Epidemiologic Situation of HIV and Monkeypox Coinfection: A Systematic Review. *Vaccines (Basel)* **2023**; 11(2).
236. Riser AP, Hanley A, Cima M, et al. Epidemiologic and Clinical Features of Mpox-Associated Deaths - United States, May 10, 2022-March 7, 2023. *MMWR Morb Mortal Wkly Rep* **2023**; 72(15): 404-10.
237. Palich R, Burrell S, Monsel G, et al. Viral loads in clinical samples of men with monkeypox virus infection: a French case series. *Lancet Infect Dis* **2023**; 23(1): 74-80.
238. Centers for Disease Control and Prevention. Guidance for Tecovirimat Use, **2023**.
239. National Institute of Allergy and Infectious Diseases, Division of AIDS. STOMP: Study of Tecovirimat for Mpox. Available at: <https://www.stomptpox.org/main>. Accessed December 18, 2023.

240. Centers for Disease Control and Prevention. Nationally Notifiable Infections Diseases and Conditions, United States, Weekly Tables. Available at: [https://wonder.cdc.gov/nndss/nndss\\_weekly\\_tables\\_menu.asp](https://wonder.cdc.gov/nndss/nndss_weekly_tables_menu.asp). Accessed April 3, 2024.
241. Centers for Disease Control and Prevention Health Alert Network. Mpox Caused by Human-to-Human Transmission of Monkeypox Virus with Geographic Spread in the Democratic Republic of the Congo. CDCHAN00501. Health Alert Network. Atlanta, Georgia: Centers for Disease Control and Prevention Health Alert Network, **2023**.
242. Centers for Disease Control and Prevention. Mpox Vaccine Administration in the U.S., **2023**.
243. Luetkemeyer AF, Donnell D, Dombrowski JC, et al. Postexposure Doxycycline to Prevent Bacterial Sexually Transmitted Infections. *N Engl J Med* **2023**; 388(14): 1296-306.
244. Hyman S, Roman J, Spinelli M, Bena J, Toores T, Buchbinder S. Doxycycline PEP: High Uptake and Significant Decline in STIs after Clinical Implementation,. CROI 2024. Denver, Colorado, **2024**.
245. Luetkemeyer ADD, Dombrowski J, Cohen S, al. e. DoxyPEP and antimicrobial resistance in *N. gonorrhoeae*, commensal *Neisseria* and *S. aureus*. Conference on Retroviruses and Opportunistic Infections 2023. Seattle, Washington, USA, **2023**.
246. Molina JM Bercot B Assoumou L. ANRS 174 DOXYVAC: an open-label randomized trial to prevent STIs in MSM on PrEP. CROI 2023. Seattle, Washington, **2023**.
247. Molina JM, Bercot B, Assoumou L, et al. Doxycycline prophylaxis and meningococcal group B vaccine to prevent bacterial sexually transmitted infections in France (ANRS 174 DOXYVAC): a multicentre, open-label, randomised trial with a 2 x 2 factorial design. *Lancet Infect Dis* **2024**.
248. Stewart J, Oware K, Donnell D, et al. Doxycycline Prophylaxis to Prevent Sexually Transmitted Infections in Women. *N Engl J Med* **2023**; 389(25): 2331-40.
249. Traeger MW, Mayer KH, Krakower DS, Gitin S, Jenness SM, Marcus JL. Potential Impact of Doxycycline Post-exposure Prophylaxis Prescribing Strategies on Incidence of Bacterial Sexually Transmitted Infections. *Clin Infect Dis* **2023**; Aug 18: ciad488.
250. Bachmann LH, Barbee LA, Chan P, et al. CDC Clinical Guidelines on the Use of Doxycycline Postexposure Prophylaxis for Bacterial Sexually Transmitted Infection Prevention, United States, 2024. *MMWR Recomm Rep* **2024**; 73(2): 1-8.
251. Wong C, Gange SJ, Moore RD, et al. Multimorbidity Among Persons Living with Human Immunodeficiency Virus in the United States. *Clin Infect Dis* **2018**; 66(8): 1230-8.
252. Guaraldi G, Malagoli A, Calcagno A, et al. The increasing burden and complexity of multimorbidity and polypharmacy in geriatric HIV patients: a cross sectional study of people aged 65 - 74 years and more than 75 years. *BMC Geriatr* **2018**; 18(1): 99.
253. Lundgren JD, Babiker AG, Gordin F, et al. Initiation of Antiretroviral Therapy in Early Asymptomatic HIV Infection. *N Engl J Med* **2015**; 373(9): 795-807.
254. ElSayed NA, Aleppo G, Aroda VR, et al. Standards of Care in Diabetes—2023. *Diabetes Care* **2022**; 46(Supplement\_1): S1-S291.
255. Grundy SM, Stone NJ, Bailey AL, et al. 2018 AHA/ACC/AACVPR/AAPA/ABC/ACPM/ADA/AGS/APhA/ASPC/NLA/PCNA Guideline on the Management of Blood Cholesterol: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation* **2019**; 139(25): e1082-e143.

256. Chalasani N, Younossi Z, Lavine JE, et al. The diagnosis and management of nonalcoholic fatty liver disease: Practice guidance from the American Association for the Study of Liver Diseases. *Hepatology* **2018**; 67(1): 328-57.
257. Garvey WT, Mechanick JI, Brett EM, et al. American Association of Clinical Endocrinologists and American College of Endocrinology Comprehensive Clinical Practice Guidelines for Medical Care of Patients with Obesity. *Endocr Pract* **2016**; 22 Suppl 3: 1-203.
258. Dent E, Morley JE, Cruz-Jentoft AJ, et al. Physical Frailty: ICFSR International Clinical Practice Guidelines for Identification and Management. *J Nutr Health Aging* **2019**; 23(9): 771-87.
259. Riddler SA, Li X, Chu H, et al. Longitudinal changes in serum lipids among HIV-infected men on highly active antiretroviral therapy. *HIV Med* **2007**; 8(5): 280-7.
260. Tungsiripat M, Kitch D, Glesby MJ, et al. A pilot study to determine the impact on dyslipidemia of adding tenofovir to stable background antiretroviral therapy: ACTG 5206. *AIDS* **2010**; 24(11): 1781-4.
261. 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-e63.
262. Jacobson TA, Maki KC, Orringer CE, et al. National Lipid Association Recommendations for Patient-Centered Management of Dyslipidemia: Part 2. *J Clin Lipidol* **2015**; 9(6 Suppl): S1-122.e1.
263. Longenecker CT, Sattar A, Gilkeson R, McComsey GA. Rosuvastatin slows progression of subclinical atherosclerosis in patients with treated HIV infection. *AIDS* **2016**; 30(14): 2195-203.
264. Funderburg NT, Jiang Y, Debanne SM, et al. Rosuvastatin reduces vascular inflammation and T-cell and monocyte activation in HIV-infected subjects on antiretroviral therapy. *J Acquir Immune Defic Syndr* **2015**; 68(4): 396-404.
265. Longenecker CT, Hileman CO, Funderburg NT, McComsey GA. Rosuvastatin preserves renal function and lowers cystatin C in HIV-infected subjects on antiretroviral therapy: the SATURN-HIV trial. *Clin Infect Dis* **2014**; 59(8): 1148-56.
266. Eckard AR, Jiang Y, Debanne SM, Funderburg NT, McComsey GA. Effect of 24 weeks of statin therapy on systemic and vascular inflammation in HIV-infected subjects receiving antiretroviral therapy. *J Infect Dis* **2014**; 209(8): 1156-64.
267. Funderburg NT, Jiang Y, Debanne SM, et al. Rosuvastatin treatment reduces markers of monocyte activation in HIV-infected subjects on antiretroviral therapy. *Clin Infect Dis* **2014**; 58(4): 588-95.
268. Erlandson KM, Jiang Y, Debanne SM, McComsey GA. Rosuvastatin Worsens Insulin Resistance in HIV-Infected Adults on Antiretroviral Therapy. *Clin Infect Dis* **2015**; 61(10): 1566-72.
269. Grinspoon SK, Fitch KV, Zanni MV, et al. Pitavastatin to Prevent Cardiovascular Disease in HIV Infection. *N Engl J Med* **2023**; 389(8): 687-99.
270. Grinspoon SK, Ribaldo HJ, Douglas PS. Trial Update of Pitavastatin to Prevent Cardiovascular Events in HIV Infection. *N Engl J Med* **2024**; 390(17): 1626-8.
271. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents with HIV: Recommendations for the Use of Statin Therapy as Primary Prevention of Atherosclerotic Cardiovascular Disease in People with HIV. Washington, DC: Department of Health and Human Services, **2024**.
272. Wilby KJ, Eissa NA. Clinical Pharmacokinetics and Drug Interactions of Doravirine. *Eur J Drug Metab Pharmacokinet* **2018**; 43(6): 637-44.

273. American Diabetes Association. 2. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes-2019. *Diabetes Care* **2019**; 42(Suppl 1): S13-S28.
274. Eckhardt BJ, Holzman RS, Kwan CK, Baghdadi J, Aberg JA. Glycated Hemoglobin A(1c) as screening for diabetes mellitus in HIV-infected individuals. *AIDS Patient Care STDS* **2012**; 26(4): 197-201.
275. Kim PS, Woods C, Georgoff P, Crum D, Rosenberg A, Smith M, Hadigan C. A1C underestimates glycemia in HIV infection. *Diabetes Care* **2009**; 32(9): 1591-3.
276. Slama L, Palella FJ, Jr., Abraham AG, et al. Inaccuracy of haemoglobin A1c among HIV-infected men: effects of CD4 cell count, antiretroviral therapies and haematological parameters. *J Antimicrob Chemother* **2014**; 69(12): 3360-7.
277. Jeremiah K, Filteau S, Faurholt-Jepsen D, et al. Diabetes prevalence by HbA1c and oral glucose tolerance test among HIV-infected and uninfected Tanzanian adults. *PLoS One* **2020**; 15(4): e0230723.
278. Qaseem A, Wilt TJ, Kansagara D, et al. Hemoglobin A1c Targets for Glycemic Control With Pharmacologic Therapy for Nonpregnant Adults With Type 2 Diabetes Mellitus: A Guidance Statement Update From the American College of Physicians. *Ann Intern Med* **2018**; 168(8): 569-76.
279. McComsey GA, Moser C, Currier J, et al. Body Composition Changes After Initiation of Raltegravir or Protease Inhibitors: ACTG A5260s. *Clin Infect Dis* **2016**; 62(7): 853-62.
280. 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): 1379-89.
281. Mallon PW, Brunet L, Hsu RK, et al. Weight gain before and after switch from TDF to TAF in a U.S. cohort study. *J Int AIDS Soc* **2021**; 24(4): e25702.
282. Erlandson KM, Carter CC, Melbourne K, et al. Weight Change Following Antiretroviral Therapy Switch in People With Viral Suppression: Pooled Data from Randomized Clinical Trials. *Clin Infect Dis* **2021**; 73(8): 1440-51.
283. 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-e76.
284. Griesel R, Maartens G, Chirehwa M, et al. CYP2B6 Genotype and Weight Gain Differences Between Dolutegravir and Efavirenz. *Clin Infect Dis* **2021**; 73(11): e3902-e9.
285. McComsey GA, Daar ES, O'Riordan M, et al. Changes in fat mitochondrial DNA and function in subjects randomized to abacavir-lamivudine or tenofovir DF-emtricitabine with atazanavir-ritonavir or efavirenz: AIDS Clinical Trials Group study A5224s, substudy of A5202. *J Infect Dis* **2013**; 207(4): 604-11.
286. McCann K, Shah S, Hindley L, et al. Implications of weight gain with newer anti-retrovirals: 10-year predictions of cardiovascular disease and diabetes. *AIDS* **2021**; 35(10): 1657-65.
287. Brennan AT, Nattey C, Kileel EM, et al. Change in body weight and risk of hypertension after switching from efavirenz to dolutegravir in adults living with HIV: evidence from routine care in Johannesburg, South Africa. *eClinicalMedicine* **2023**; 57.

288. Kumar P, Johnson M, Molina JM, et al. Brief Report: Switching to DOR/3TC/TDF Maintains HIV-1 Virologic Suppression Through Week 144 in the DRIVE-SHIFT Trial. *J Acquir Immune Defic Syndr* **2021**; 87(2): 801-5.
289. van Wyk J, Ajana F, Bisshop F, et al. Efficacy and Safety of Switching to Dolutegravir/Lamivudine Fixed-Dose 2-Drug Regimen vs Continuing a Tenofovir Alafenamide-Based 3- or 4-Drug Regimen for Maintenance of Virologic Suppression in Adults Living With Human Immunodeficiency Virus Type 1: Phase 3, Randomized, Noninferiority TANGO Study. *Clin Infect Dis* **2020**; 71(8): 1920-9.
290. Short WR, Ramgopal M, Hagins DP, et al. A prospective, randomized trial to assess a protease inhibitor–based regimen switch strategy to manage integrase inhibitor–related weight gain. 12th International AIDS Society Conference on HIV Science (IAS 2023) **2023**; Brisbane, Australia: Abstract 5962.
291. McComsey GA, Molina JM, Mills AM, et al. Weight and body composition after switch to doravirine/islatravir (DOR/ISL) 100/0.75mg once daily: week 48 results from 2 randomized active-controlled phase 3 trials, MK8591A-017 (P017) and MK8591A-018 (P018). 12th International AIDS Society Conference on HIV Science (IAS 2023) **2023**; Brisbane, Australia: Abstract 883.
292. Bosch B, Akpomemie G, Chandiwana N, et al. Weight and Metabolic Changes After Switching From Tenofovir Alafenamide/Emtricitabine (FTC)+Dolutegravir (DTG), Tenofovir Disoproxil Fumarate (TDF)/FTC + DTG, and TDF/FTC/Efavirenz to TDF/Lamivudine/DTG. *Clin Infect Dis* **2023**; 76(8): 1492-5.
293. Tan DHS, Antinori A, Eu B, et al. Weight and Metabolic Changes With Cabotegravir + Rilpivirine Long-Acting or Bicitegravir/Emtricitabine/Tenofovir Alafenamide. *Conference on Retrovirus and Opportunistic Infections* **2023**: Abstract 146.
294. Eckard AR, Wu Q, Sattar A, et al. Once-weekly semaglutide in people with HIV-associated lipohypertrophy: a randomised, double-blind, placebo-controlled phase 2b single-centre clinical trial. *Lancet Diabetes Endocrinol* **2024**; 12(8): 523-34.
295. Mantovani A, Byrne CD, Bonora E, Targher G. Nonalcoholic Fatty Liver Disease and Risk of Incident Type 2 Diabetes: A Meta-analysis. *Diabetes Care* **2018**; 41(2): 372-82.
296. Mantovani A, Csermely A, Petracca G, et al. Non-alcoholic fatty liver disease and risk of fatal and non-fatal cardiovascular events: an updated systematic review and meta-analysis. *Lancet Gastroenterol Hepatol* **2021**; 6(11): 903-13.
297. Stanley TL, Fourman LT, Zheng I, et al. Relationship of IGF-1 and IGF-Binding Proteins to Disease Severity and Glycemia in Nonalcoholic Fatty Liver Disease. *J Clin Endocrinol Metab* **2021**; 106(2): e520-e33.
298. McComsey GA, Sattar A, Albar Z, Ansari Gilani K, Labbato D, Foster T, Ross Eckard A. 1984. Effects of Semaglutide on Adipose Tissue in HIV-Associated Lipohypertrophy. *Open Forum Infect Dis* **2023**; 10(Suppl 2): ofad500.111.
299. European AIDS Clinical Society (EACS). EACS Guidelines 10.0, **2019**.
300. Starup-Linde J, Rosendahl SB, Storgaard M, Langdahl B. Management of Osteoporosis in Patients Living With HIV-A Systematic Review and Meta-analysis. *J Acquir Immune Defic Syndr* **2020**; 83(1): 1-8.
301. Alvarez E, Bellosso WH, Boyd MA, et al. Which HIV patients should be screened for osteoporosis: an international perspective. *Curr Opin HIV AIDS* **2016**; 11(3): 268-76.



302. Biver E, Calmy A, Aubry-Rozier B, et al. Diagnosis, prevention, and treatment of bone fragility in people living with HIV: a position statement from the Swiss Association against Osteoporosis. *Osteoporos Int* **2019**; 30(5): 1125-35.
303. Davidson N, Sowden D. Evaluation of screening practices for low bone mass and prevalence of osteoporosis and fractures in people living with human immunodeficiency virus attending a sexual health clinic. *Intern Med J* **2019**; 49(9): 1119-24.
304. Viswanathan M, Reddy S, Berkman N, Cullen K, Middleton JC, Nicholson WK, Kahwati LC. Screening to Prevent Osteoporotic Fractures: An Evidence Review for the U.S. Preventive Services Task Force. Rockville (MD): Agency for Healthcare Research and Quality (US), **2018** Jun 2018. Report No.: Report No.: 15-05226-EF-1.
305. McComsey GA, Kitch D, Daar ES, et al. Bone mineral density and fractures in antiretroviral-naive persons randomized to receive abacavir-lamivudine or tenofovir disoproxil fumarate-emtricitabine along with efavirenz or atazanavir-ritonavir: Aids Clinical Trials Group A5224s, a substudy of ACTG A5202. *J Infect Dis* **2011**; 203(12): 1791-801.
306. McComsey GA, Tebas P, Shane E, et al. Bone disease in HIV infection: a practical review and recommendations for HIV care providers. *Clin Infect Dis* **2010**; 51(8): 937-46.
307. Brown TT, Moser C, Currier JS, et al. Changes in Bone Mineral Density After Initiation of Antiretroviral Treatment With Tenofovir Disoproxil Fumarate/Emtricitabine Plus Atazanavir/Ritonavir, Darunavir/Ritonavir, or Raltegravir. *J Infect Dis* **2015**; 212(8): 1241-9.
308. Kelesidis T, Tran TT, Stein JH, et al. Changes in Inflammation and Immune Activation With Atazanavir-, Raltegravir-, Darunavir-Based Initial Antiviral Therapy: ACTG 5260s. *Clin Infect Dis* **2015**; 61(4): 651-60.
309. McComsey GA, Kendall MA, Tebas P, et al. Alendronate with calcium and vitamin D supplementation is safe and effective for the treatment of decreased bone mineral density in HIV. *AIDS* **2007**; 21(18): 2473-82.
310. Ofotokun I, Collins LF, Titanji K, et al. Antiretroviral Therapy-Induced Bone Loss Is Durably Suppressed by a Single Dose of Zoledronic Acid in Treatment-Naive Persons with Human Immunodeficiency Virus Infection: A Phase IIB Trial. *Clin Infect Dis* **2020**; 71(7): 1655-63.
311. Maggiolo F, Rizzardini G, Raffi F, et al. Bone mineral density in virologically suppressed people aged 60 years or older with HIV-1 switching from a regimen containing tenofovir disoproxil fumarate to an elvitegravir, cobicistat, emtricitabine, and tenofovir alafenamide single-tablet regimen: a multicentre, open-label, phase 3b, randomised trial. *Lancet HIV* **2019**; 6(10): e655-e66.
312. McComsey GA, Lupo S, Parks D, et al. Switch from tenofovir disoproxil fumarate combination to dolutegravir with rilpivirine improves parameters of bone health. *AIDS* **2018**; 32(4): 477-85.
313. LeFevre ML. Screening for vitamin D deficiency in adults: U.S. Preventive Services Task Force recommendation statement. *Ann Intern Med* **2015**; 162(2): 133-40.
314. Bayard C, Ledergerber B, Flepp M, et al. Associations Between Antiretroviral Treatment and Avascular Bone Necrosis: The Swiss HIV Cohort Study. *Open Forum Infect Dis* **2017**; 4(4): ofx177.
315. Green KR, Hernandez-Jimenez JM, Isache CL, Jacob R. Avascular necrosis: a growing concern for the HIV population. *BMJ Case Rep* **2018**; Jun 6; 2018:bcr2017221678.
316. Chokotho L, Harrison WJ, Lubega N, Mkandawire NC. Avascular necrosis of the femoral head in HIV positive patients-an assessment of risk factors and early response to surgical treatment. *Malawi Med J* **2013**; 25(2): 28-32.

317. Gomes AC, Aragüés JM, Guerra S, Fernandes J, Mascarenhas MR. Hypogonadotropic hypogonadism in human immunodeficiency virus-infected men: uncommonly low testosterone levels. *Endocrinol Diabetes Metab Case Rep* **2017**; 2017.
318. Bhasin S, Cunningham GR, Hayes FJ, Matsumoto AM, Snyder PJ, Swerdloff RS, Montori VM. Testosterone therapy in men with androgen deficiency syndromes: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab* **2010**; 95(6): 2536-59.
319. Health Canada. Information Update - Possible cardiovascular problems associated with testosterone products, **2014**. Report No.: RA-40587.
320. Seftel AD. Re: Testosterone Products: Drug Safety Communication - FDA Cautions about Using Testosterone Products for Low Testosterone due to Aging; Requires Labeling Change to Inform of Possible Increased Risk of Heart Attack and Stroke. *J Urol* **2015**; 194(3): 759-60.
321. Traish A. Testosterone therapy in men with testosterone deficiency: Are we beyond the point of no return? *Investig Clin Urol* **2016**; 57(6): 384-400.
322. Elliott J, Kelly SE, Millar AC, et al. Testosterone therapy in hypogonadal men: a systematic review and network meta-analysis. *BMJ Open* **2017**; 7(11): e015284.
323. Jayasena CN, Anderson RA, Llahana S, et al. Society for Endocrinology guidelines for testosterone replacement therapy in male hypogonadism. *Clin Endocrinol (Oxf)* **2022**; 96(2): 200-19.
324. Habermen SA, Jacobson LP, Palella FJ, Jr., et al. To T or not to T: Differences in Testosterone Use and Discontinuation by HIV Serostatus among Men who Have Sex with Men. *HIV Med* **2018**; 19(9): 634-44.
325. Park HJ, Ahn ST, Moon DG. Evolution of Guidelines for Testosterone Replacement Therapy. *J Clin Med* **2019**; 8(3).
326. Makinson A, Dubois J, Eymard-Duvernay S, et al. Increased Prevalence of Neurocognitive Impairment in Aging People Living With Human Immunodeficiency Virus: The ANRS EP58 HAND 55-70 Study. *Clin Infect Dis* **2020**; 70(12): 2641-8.
327. Clifford DB, Ances BM. HIV-associated neurocognitive disorder. *Lancet Infect Dis* **2013**; 13(11): 976-86.
328. Eke UA, Mohanty K, Gruber-Baldini AL, Ryan AS. Frailty and Aging in HIV- Status Post 13 Years of National Awareness. *J Frailty Aging* **2023**; 12(1): 49-58.
329. Yamada Y, Kobayashi T, Condo A, Sangarlangkarn A, Ko F, Taniguchi Y, Kojima G. Prevalence of Frailty and Prefrailty in People With Human Immunodeficiency Virus Aged 50 or Older: A Systematic Review and Meta-Analysis. *Open Forum Infect Dis* **2022**; 9(5): ofac129.
330. Verheij E, Kirk GD, Wit FW, et al. Frailty Is Associated With Mortality and Incident Comorbidity Among Middle-Aged Human Immunodeficiency Virus (HIV)-Positive and HIV-Negative Participants. *J Infect Dis* **2020**; 222(6): 919-28.
331. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci* **2001**; 56(3): M146-56.
332. Mitnitski AB, Mogilner AJ, Rockwood K. Accumulation of deficits as a proxy measure of aging. *ScientificWorldJournal* **2001**; 1: 323-36.
333. Erlandson KM, Zhang L, Ng DK, et al. Risk Factors for Falls, Falls With Injury, and Falls With Fracture Among Older Men With or at Risk of HIV Infection. *J Acquir Immune Defic Syndr* **2019**; 81(4): e117-e26.

334. Erlandson KM, Piggott DA. Frailty and HIV: Moving from Characterization to Intervention. *Curr HIV/AIDS Rep* **2021**; 18(3): 157-75.
335. ACOG Committee Opinion No. 762: Prepregnancy Counseling. *Obstet Gynecol* **2019**; 133(1): e78-e89.
336. Practice Bulletin No. 167: Gynecologic Care for Women and Adolescents With Human Immunodeficiency Virus. *Obstet Gynecol* **2016**; 128(4): e89-e110.
337. Mandelbrot L, Tubiana R, Le Chenadec J, et al. No perinatal HIV-1 transmission from women with effective antiretroviral therapy starting before conception. *Clin Infect Dis* **2015**; 61(11): 1715-25.
338. National Clinician Consultation Center. Perinatal HIV/AIDS. Available at: <https://nccc.ucsf.edu/clinician-consultation/perinatal-hiv-aids/>. Accessed December 18, 2023.
339. Levison J, McKinney J, Duque A, et al. Breastfeeding Among People With Human Immunodeficiency Virus in North America: A Multisite Study. *Clin Infect Dis* **2023**; 77(10): 1416-22.
340. Lampe MA, Nesheim SR, Oladapo KL, Ewing AC, Wiener J, Kourtis AP. Achieving Elimination of Perinatal HIV in the United States. *Pediatrics* **2023**; 151(5).
341. Jones VF, Schulte EE. Comprehensive Health Evaluation of the Newly Adopted Child. *Pediatrics* **2019**; 143(5).
342. Payne H, Mkhize N, Ot wombe K, et al. Reactivity of routine HIV antibody tests in children who initiated antiretroviral therapy in early infancy as part of the Children with HIV Early Antiretroviral Therapy (CHER) trial: a retrospective analysis. *Lancet Infect Dis* **2015**; 15(7): 803-9.
343. Ananworanich J, Puthanakit T, Suntarattiwong P, et al. Reduced markers of HIV persistence and restricted HIV-specific immune responses after early antiretroviral therapy in children. *AIDS* **2014**; 28(7): 1015-20.
344. Kuhn L, Schramm DB, Shiao S, et al. Young age at start of antiretroviral therapy and negative HIV antibody results in HIV-infected children when suppressed. *AIDS* **2015**; 29(9): 1053-60.
345. Shearer WT, Rosenblatt HM, Gelman RS, et al. Lymphocyte subsets in healthy children from birth through 18 years of age: the Pediatric AIDS Clinical Trials Group P1009 study. *J Allergy Clin Immunol* **2003**; 112(5): 973-80.
346. Committee on Infectious Diseases, American Academy of Pediatrics, Kimberlin DW, Barnett ED, Lynfield R, Sawyer MH. Red Book: 2021–2024 Report of the Committee on Infectious Diseases: American Academy of Pediatrics, **2021**.
347. Agwu AL, Fairlie L. Antiretroviral treatment, management challenges and outcomes in perinatally HIV-infected adolescents. *J Int AIDS Soc* **2013**; 16(1): 18579.
348. Wiener L, Mellins CA, Marhefka S, Battles HB. Disclosure of an HIV diagnosis to children: history, current research, and future directions. *J Dev Behav Pediatr* **2007**; 28(2): 155-66.
349. Vreeman RC, Gramelspacher AM, Gisore PO, Scanlon ML, Nyandiko WM. Disclosure of HIV status to children in resource-limited settings: a systematic review. *J Int AIDS Soc* **2013**; 16(1): 18466.
350. Hatfield-Timajchy K, Brown JL, Haddad LB, Chakraborty R, Kourtis AP. Parenting Among Adolescents and Young Adults with Human Immunodeficiency Virus Infection in the United States: Challenges, Unmet Needs, and Opportunities. *AIDS Patient Care STDS* **2016**; 30(7): 315-23.

351. Verweel G, Saavedra-Lozano J, van Rossum AM, Ramilo O, de Groot R. Initiating highly active antiretroviral therapy in human immunodeficiency virus type 1-infected children in Europe and the United States: comparing clinical practice to guidelines and literature evidence. *Pediatr Infect Dis J* **2006**; 25(11): 987-94.
352. Yusuf H, Agwu A. Adolescents and young adults with early acquired HIV infection in the united states: unique challenges in treatment and secondary prevention. *Expert Rev Anti Infect Ther* **2021**; 19(4): 457-71.
353. Slogrove AL, Schomaker M, Davies MA, et al. The epidemiology of adolescents living with perinatally acquired HIV: A cross-region global cohort analysis. *PLoS Med* **2018**; 15(3): e1002514.
354. Nozyce ML, Lee SS, Wiznia A, et al. A behavioral and cognitive profile of clinically stable HIV-infected children. *Pediatrics* **2006**; 117(3): 763-70.
355. Boon-Yasidhi V, Naiwatanakul T, Chokephaibulkit K, Lolekha R, Leowsrisook P, Chotpitayasunond T, Wolfe M. Effect of HIV diagnosis disclosure on psychosocial outcomes in Thai children with perinatal HIV infection. *Int J STD AIDS* **2016**; 27(4): 288-95.
356. Koenig LJ, Pals SL, Chandwani S, Hodge K, Abramowitz S, Barnes W, D'Angelo L. Sexual transmission risk behavior of adolescents With HIV acquired perinatally or through risky behaviors. *J Acquir Immune Defic Syndr* **2010**; 55(3): 380-90.
357. Brogly SB, Watts DH, Ylitalo N, et al. Reproductive health of adolescent girls perinatally infected with HIV. *Am J Public Health* **2007**; 97(6): 1047-52.
358. Innes S, Patel K. Noncommunicable diseases in adolescents with perinatally acquired HIV-1 infection in high-income and low-income settings. *Curr Opin HIV AIDS* **2018**; 13(3): 187-95.
359. Geffner ME, Patel K, Jacobson DL, et al. Changes in insulin sensitivity over time and associated factors in HIV-infected adolescents. *AIDS* **2018**; 32(5): 613-22.
360. Patel K, Wang J, Jacobson DL, et al. Aggregate risk of cardiovascular disease among adolescents perinatally infected with the human immunodeficiency virus. *Circulation* **2014**; 129(11): 1204-12.
361. Abd-Elmoniem KZ, Unsal AB, Eshera S, et al. Increased coronary vessel wall thickness in HIV-infected young adults. *Clin Infect Dis* **2014**; 59(12): 1779-86.
362. Yusuf HE, Griffith D, Agwu AL. Preventing and diagnosing HIV-related comorbidities in adolescents. *Top Antivir Med* **2022**; 30(3): 537-44.
363. Flynn JT, Kaelber DC, Baker-Smith CM, et al. Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents. *Pediatrics* **2017**; 140(3).
364. Office-based care for lesbian, gay, bisexual, transgender, and questioning youth. *Pediatrics* **2013**; 132(1): 198-203.
365. Garofalo R, Kuhns LM, Hotton A, Johnson A, Muldoon A, Rice D. A Randomized Controlled Trial of Personalized Text Message Reminders to Promote Medication Adherence Among HIV-Positive Adolescents and Young Adults. *AIDS Behav* **2016**; 20(5): 1049-59.
366. Mutumba M, Musiime V, Mugerwa H, Nakyambadde H, Gautam A, Matama C, Stephenson R. Perceptions of HIV Self-Management Roles and Challenges in Adolescents, Caregivers, and Health Care Providers. *J Assoc Nurses AIDS Care* **2019**; 30(4): 415-27.
367. Ritchwood TD, Malo V, Jones C, et al. Healthcare retention and clinical outcomes among adolescents living with HIV after transition from pediatric to adult care: a systematic review. *BMC Public Health* **2020**; 20(1): 1195.

368. Tanner AE, Philbin MM, Chambers BD, et al. Healthcare Transition for Youth Living With HIV: Outcomes from a Prospective Multi-site Study. *J Adolesc Health* **2018**; 63(2): 157-65.
369. Griffith DC, Agwu AL. Caring for youth living with HIV across the continuum: turning gaps into opportunities. *AIDS Care* **2017**; 29(10): 1205-11.
370. Philbin MM, Tanner AE, Duval A, Ellen J, Kapogiannis B, Fortenberry JD. Linking HIV-positive adolescents to care in 15 different clinics across the United States: creating solutions to address structural barriers for linkage to care. *AIDS Care* **2014**; 26(1): 12-9.
371. Lee L, Yehia BR, Gaur AH, et al. The Impact of Youth-Friendly Structures of Care on Retention Among HIV-Infected Youth. *AIDS Patient Care STDS* **2016**; 30(4): 170-7.
372. Transitioning HIV-infected youth into adult health care. *Pediatrics* **2013**; 132(1): 192-7.
373. Hussen SA, Chahroudi A, Boylan A, Camacho-Gonzalez AF, Hackett S, Chakraborty R. Transition of youth living with HIV from pediatric to adult-oriented healthcare: a review of the literature. *Future Virol* **2015**; 9(10): 921-9.
374. Tanner AE, Philbin MM, DuVal A, Ellen J, Kapogiannis B, Fortenberry JD. Transitioning HIV-Positive Adolescents to Adult Care: Lessons Learned From Twelve Adolescent Medicine Clinics. *J Pediatr Nurs* **2016**; 31(5): 537-43.
375. Foster C. CHIVA Guidance on Transition for adolescents living with HIV: Children's HIV Association, **2023**.
376. Herman JL, Flores, A.R., O'Neill, K.K. How Many Adults and Youth Identify as Transgender in the United States?: The Williams Institute, UCLA School of Law, **2022**.
377. James SE, Herman, J. L., Rankin, S., Keisling, M., Mottet, L., & Anafi, M. The Report of the 2015 U.S. Transgender Survey. Washington, DC: National Center for Transgender Equality, **2016**.
378. Stutterheim SE, van Dijk M, Wang H, Jonas KJ. The worldwide burden of HIV in transgender individuals: An updated systematic review and meta-analysis. *PLoS One* **2021**; 16(12): e0260063.
379. Badgett M, Baker K, Conron K, Gates G, Gill A, Greytak E, Herman J. Best practices for asking questions to identify transgender and other gender minority respondents on population-based surveys (GenIUSS): The GenIUSS Group, UCLA Williams Institute, **2014**.
380. Sevelius JM, Patouhas E, Keatley JG, Johnson MO. Barriers and facilitators to engagement and retention in care among transgender women living with human immunodeficiency virus. *Ann Behav Med* **2014**; 47(1): 5-16.
381. Sevelius J, Chakravarty D, Neilands TB, Keatley J, Shade SB, Johnson MO, Rebchook G. Evidence for the Model of Gender Affirmation: The Role of Gender Affirmation and Healthcare Empowerment in Viral Suppression Among Transgender Women of Color Living with HIV. *AIDS Behav* **2021**; 25(Suppl 1): 64-71.
382. Hembree WC, Cohen-Kettenis PT, Gooren L, et al. Endocrine Treatment of Gender-Dysphoric/Gender-Incongruent Persons: An Endocrine Society Clinical Practice Guideline. *Endocr Pract* **2017**; 23(12): 1437.
383. Krupka E, Curtis S, Ferguson T, et al. The Effect of Gender-Affirming Hormone Therapy on Measures of Kidney Function: A Systematic Review and Meta-Analysis. *Clin J Am Soc Nephrol* **2022**; 17(9): 1305-15.
384. Bleasby K, Fillgrove KL, Houle R, et al. In Vitro Evaluation of the Drug Interaction Potential of Doravirine. *Antimicrob Agents Chemother* **2019**; 63(4).

385. Crauwels HM, van Heeswijk RP, Buelens A, Stevens M, Hoetelmans RM. Lack of an effect of rilpivirine on the pharmacokinetics of ethinylestradiol and norethindrone in healthy volunteers. *Int J Clin Pharmacol Ther* **2014**; 52(2): 118-28.
386. Cirrincione LR, Senneker T, Scarsi K, Tseng A. Drug Interactions with Gender-Affirming Hormone Therapy: Focus on Antiretrovirals and Direct Acting Antivirals. *Expert Opin Drug Metab Toxicol* **2020**; 16(7): 565-82.
387. Braun HM, Candelario J, Hanlon CL, Segura ER, Clark JL, Currier JS, Lake JE. Transgender Women Living with HIV Frequently Take Antiretroviral Therapy and/or Feminizing Hormone Therapy Differently Than Prescribed Due to Drug-Drug Interaction Concerns. *LGBT Health* **2017**; 4(5): 371-5.
388. Bhimraj A MR, Shumaker AH, Baden L, Cheng VC, Edwards KM, Gallagher JC, Gandhi RT, Muller WJ, Nakamura MM, O'Horo JC, Shafer RW, Shoham S, Murad MH, Mustafa RA, Sultan S, Falck-Ytter Y. Infectious Diseases Society of America Guidelines on the Treatment and Management of Patients with COVID-19, **2023** June 2023.
389. Hadi YB, Naqvi SFZ, Kupec JT, Sarwari AR. Characteristics and outcomes of COVID-19 in patients with HIV: a multicentre research network study. *AIDS* **2020**; 34(13): F3-f8.
390. Zhu W, Huang YA, Wiener J, Neblett-Fanfair R, Kourtis AP, Hall HI, Hoover KW. Impact of the coronavirus disease 2019 pandemic on prescriptions for antiretroviral drugs for HIV treatment in the United States, 2019-2021. *AIDS* **2022**; 36(12): 1697-705.
391. Spears CE, Taylor BS, Liu AY, Levy SM, Eaton EF. Intersecting epidemics: the impact of coronavirus disease 2019 on the HIV prevention and care continua in the United States. *AIDS* **2022**; 36(13): 1749-59.
392. Centers for Disease Control and Prevention. Interim Infection Prevention and Control Recommendations for Healthcare Personnel During the Coronavirus Disease 2019 (COVID-19) Pandemic, **2023** May 2023.
393. Spinelli MA, Jones BLH, Gandhi M. COVID-19 Outcomes and Risk Factors Among People Living with HIV. *Curr HIV/AIDS Rep* **2022**; 19(5): 425-32.
394. Taylor CA PK, Patton ME, et al. COVID-19–Associated Hospitalizations Among U.S. Adults Aged  $\geq 65$  Years — COVID-NET, 13 States, January–August 2023. *MMWR Morb Mortal Wkly Rep* **2023**; 72: 1089-94.
395. Centers for Disease Control and Prevention. Underlying Medical Conditions Associated with Higher Risk for Severe COVID-19: Information for Healthcare Professionals. Atlanta, GA: Centers for Disease Control and Prevention, **2023**.
396. Lang R, Humes E, Coburn SB, et al. Analysis of Severe Illness After Postvaccination COVID-19 Breakthrough Among Adults With and Without HIV in the US. *JAMA Netw Open* **2022**; 5(10): e2236397.
397. Tartof SY, Qian L, Hong V, et al. Obesity and Mortality Among Patients Diagnosed With COVID-19: Results From an Integrated Health Care Organization. *Ann Intern Med* **2020**; 173(10): 773-81.
398. Jefferson C, Watson E, Certa JM, et al. Differences in COVID-19 testing and adverse outcomes by race, ethnicity, sex, and health system setting in a large diverse US cohort. *PLoS One* **2022**; 17(11): e0276742.
399. Coburn SB, Humes E, Lang R, et al. Analysis of Postvaccination Breakthrough COVID-19 Infections Among Adults With HIV in the United States. *JAMA Netw Open* **2022**; 5(6): e2215934.

400. Lapointe HR, Mwimanzi F, Cheung PK, et al. People With Human Immunodeficiency Virus Receiving Suppressive Antiretroviral Therapy Show Typical Antibody Durability After Dual Coronavirus Disease 2019 Vaccination and Strong Third Dose Responses. *J Infect Dis* **2023**; 227(7): 838-49.
401. Duncan MC, Omondi FH, Kinloch NN, et al. Effects of COVID-19 mRNA vaccination on HIV viremia and reservoir size. *AIDS* **2024**.
402. Sun J, Zheng Q, Madhira V, et al. Association Between Immune Dysfunction and COVID-19 Breakthrough Infection After SARS-CoV-2 Vaccination in the US. *JAMA Intern Med* **2022**; 182(2): 153-62.
403. Lea AN, Leyden WA, Sofrygin O, et al. Human Immunodeficiency Virus Status, Tenofovir Exposure, and the Risk of Poor Coronavirus Disease 19 Outcomes: Real-World Analysis From 6 United States Cohorts Before Vaccine Rollout. *Clin Infect Dis* **2023**; 76(10): 1727-34.
404. Ssentongo P, Heilbrunn ES, Ssentongo AE, Advani S, Chinchilli VM, Nunez JJ, Du P. Epidemiology and outcomes of COVID-19 in HIV-infected individuals: a systematic review and meta-analysis. *Sci Rep* **2021**; 11(1): 6283.
405. COVID-19 Treatment Guidelines Panel. Coronavirus Disease 2019 (COVID-19) Treatment Guidelines. Special Considerations in People with HIV: National Institutes of Health.
406. Horberg MA, Watson E, Bhatia M, et al. Post-acute sequelae of SARS-CoV-2 with clinical condition definitions and comparison in a matched cohort. *Nat Commun* **2022**; 13(1): 5822.
407. Yendewa GA, Perez JA, Patil NT, McComsey GA. HIV Infection Increases Risk of PASC while COVID-19 Vaccination is Protective. Conference on Retrovirus and Opportunistic Infections **2023**: Abstract 724.
408. Yue Y, Liang C, Weissman S, Lyu T, Olatosi B, Li X. 12-Month Consequences in People with HIV/SARS-CoV-2 Coinfection: National EHR Cohort. Conference on Retrovirus and Opportunistic Infections **2023**: Abstract 884.