HIV/AIDS: Epidemiology, Transmission, and Prevention Update

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Abstract

The human immunodeficiency virus (HIV) attacks the body's immune system, leading infected patients to be susceptible to a variety of opportunistic infections. HIV is transmitted through contact with bodily fluids from an infected person including blood, semen, and vaginal secretions. HIV compromises the immune system by destroying the body's CD4 cells, macrophages, and dendritic cells. These cells are critically important to ward off infections using cell-mediated immunity. Cell-mediated immunity is the body's primary method to eliminate pathogens without the use of antibodies. Once the CD4 cells are depleted and the immune system is compromised, the risk for opportunistic infections such as toxoplasmosis and certain cancers dramatically increases.

Similar to other chronic conditions, prevention is paramount with HIV. Providers must be vigilant with screening patients, as well as using appropriate prevention methods for occupational exposure. Accordingly, the state of Florida requires ongoing training for HIV and acquired immunodeficiency syndrome (AIDS) among physician providers in the areas of epidemiology, transmission risk, and prevention.

Epidemiology

Nationwide, 1.2 million people were living with HIV infection in 2021.[1] Based on the most recent data, more than 124,000 residents of Florida are estimated to be living with HIV infection.[2] In 2021, 4,072 Floridians were diagnosed with HIV. Florida has the second highest rate of new HIV diagnoses in the United States with 21.7 new cases per 100,000.[1,3] Overall, the number of new HIV diagnoses from 2020 to 2022 increased in Florida.

In the state of Florida, males were much more likely to be diagnosed with HIV (M: 80.7% vs. F: 19.3%).[3] Also, in Florida, most cases were diagnosed in patients between the ages of 30-34

(19%), followed by those 25-29 (15.8%) and then those 35-39 (12.9%).[3] From 2018-2022, the biggest increase in HIV diagnosis rate was seen in those 30-34 and above the age of 60.[3]

Similar to national trends, the majority of patients living with HIV in Florida identified as African American or Black.[2,3] This racial category represented 39.8% of cases in Florida compared to 40% of cases nationally.[2,3] Hispanics and Caucasians/Whites are the next most represented ethnic groups.[2] From 2018 to 2022, the rates of HIV infection decreased for both African American/Black and Caucasian/White ethnic groups in Florida.[3] In contrast, during the same time period, the HIV infection rate among Hispanics increased by 23%.[3]

Among exposure types, men who have sex with men (MSM) accounted for the highest number of cases and represents 75% of diagnoses in cisgender men in 2022.[3] The next most common exposure types in cisgender men are heterosexual contact (33.1%), and intravenous drug use (IDU) (4%).[3] Among cisgender females, heterosexual contact (90.2%) was the most prevalent exposure type followed by IDU (9.8%).[3] Among transgender individuals, the most common exposure type was sexual contact.[3]

Prevention

The risk of HIV transmission can be significantly reduced using several different methods. Abstinence is the only 100 percent effective method to prevent HIV infection. Other methods that can be utilized to reduce the risk of HIV infection include using barrier aids such as condoms during every sexual encounter, reducing the number of sexual partners, and avoiding high risk sexual behaviors such as receptive anal sex. Additionally, early testing and treatment of high-risk individuals and their partners for sexually transmitted infections such as gonorrhea and syphilis would reduce the risk of contracting HIV by preventing transmission through open sores or non-healed lesions. Pre- and post-exposure prophylaxis are the two modalities currently recommended for use in reduction of HIV infection.

Pre-exposure prophylaxis (PrEP) involves the use of antiretroviral medications prior to sexual activities to reduce the risk of HIV transmission. New guidelines also recommend that all sexually active adult and adolescent patient receive information about PrEP. Use of daily PreP has been shown to reduce the risk of HIV transmission by over 90%.[4] Previously, PreP had been focused on patients at high risk for HIV infection. Patients in this high risk group include:

- serodiscordant couples engaging in sexual activities,
- persons that have injected drugs or were in drug treatment in the past six months,
- MSM who have multiple sexual partners, have been diagnosed with a STI in the last six months, or who engage in high risk sexual behaviors,
- heterosexually active men who have condomless sex with female partners from regions with generalized HIV epidemics.[4]

The preferred regimens for PreP are daily use of a pill containing emtricitabine and tenofovir disoproxil fumarate (Truvada) or tenofovir alafrenamide (Descovy).[4] Patients can also receive an injection of cabotegravir (Apretude) every two months. Patients should be counseled on the

importance of medication compliance to avoid the development of resistance. Additionally, the provider should see the patient at least every three months if on daily pills or every four months if on injectable medication to monitor for any complications from the medications and to ensure the patient is not positive for HIV infection or any other STI.

Nonoccupational post-exposure prophylaxis (nPEP) is the use of antiretroviral drugs after a patient has been potentially exposed to HIV. nPEP should be offered within 72 hours to patients that have a potential significant exposure to HIV, such as exposure to bodily fluids of a person known to be HIV positive.[5] Patients should be prescribed a 28-day course of a 3-drug antiretroviral regimen. The preferred regimen is once daily enofovir disoproxil fumarate with emtricitabine combined with twice daily raltegravir or dolutegravir twice daily.[5] Patients should be tested for HIV prior to the start of nPEP and should also be counseled on risk reduction techniques to prevent the transmission of HIV.[5]

HIV prevention techniques should also focus on risk reduction for injection drug use. The sharing of syringes and other injection equipment can increase the risk of HIV transmission along with other blood-borne illnesses. Patients that inject drugs should be counseled to always use new, clean needles and never to share injection equipment. Patients should also be counseled that needles and other injection equipment can be cleaned with bleach. Additionally, the patient may be referred to syringe service programs. Syringe services programs can provide new, clean injection equipment, dispose of used injection equipment, and provide linkages to care for substance use disorders.

Diagnosis/Screening

The Centers for Disease Control and Prevention (CDC) and the U.S. Preventive Services Task Force recommend screening for HIV at least once for most adults and adolescents.[6,7] The CDC recommends repeated screening for some individuals based on risk factors.[6] Testing for HIV usually involves one of three different types of testing: antibody tests, antigen/antibody tests, and nucleic acid tests.

Antibody tests, also known as enzyme-linked immunosorbent assay (ELISA) tests, look for antibodies against HIV in a patient's blood, saliva, or urine.[7] Most rapid tests currently in use are antibody tests. An antibody test can generally detect HIV two to eight weeks after initial infection.[7,8]

Antigen/antibody tests detect the presence of both HIV antibodies and an HIV antigen, p24, in a patient's blood. The CDC recommends this test for initial HIV screening.[6] Typically, antigen/antibody tests are able to detect HIV several weeks earlier than antibody testing. There is a rapid version of this test that can yield results in 20 minutes.

Nucleic acid testing detects HIV in the blood. Nucleic acid testing can identify HIV infection the earliest among the three tests.[8] However, this test is the most expensive and is not routinely used for screening.

Clinical Management

Once HIV diagnosis is confirmed, a patient should be referred to an HIV specialist. Initial workup should include a thorough history, comprehensive physical, and laboratory evaluations.[8] These initial evaluations will act as a baseline for symptoms and other clinical markers. Baseline laboratory evaluations should include the following:[10]

- HIV antibody testing (if prior documentation is not available or if HIV RNA is below the assay's limit for detection),
- CD4 T lymphocyte cell count (CD4 count),
- Plasma HIV RNA (viral load),
- Complete blood count, chemistry profile, transaminase levels, blood urea nitrogen (BUN), and creatinine, urinalysis, and serologies for hepatitis A, B, and C viruses,
- Fasting blood glucose and serum lipids, and
- Genotypic resistance testing. For patients who have HIV RNA levels <500 to 1,000 copies/mL, viral amplification for resistance testing may not always be successful.

The results from these laboratory evaluations can aid in staging HIV infection and in the selection of the appropriate antiretroviral therapy (ART).

These visits can also provide time for a patient to be counseled on the natural history of the illness, methods to prevent transmission of the virus, and the benefits of antiretroviral therapy to slow the progression of the HIV and to decrease risk of transmission.[10] The patient should also undergo a psychosocial evaluation including domestic violence screenings to ensure that proper supports are in place for successful treatment of HIV infection.[8,10] Additionally, the patient should be referred to the appropriate agency if any psychosocial barriers are identified during screening.

Most national and international organizations support starting ART regardless of the CD4 count of the patients. Numerous studies have shown that ART has improved the morbidity and mortality associated with HIV infection.[8,10] ART has also been shown to reduce the risk of transmission among patients with chronic HIV infection. However, some concerns remain about the possible long-term complications from ART such as metabolic complications from protease inhibitors. On balance, the benefits of ART, including decreased disease progression and complication rates, outweigh these potential side effects.

ART should be started as soon as it is feasible. Selection of the regimen for ART consists of many factors including cost, safety, clinical markers, childbearing potential, and resistance testing. In general, the ART regimen for treatment naïve patients would consist of two nucleoside reverse transcriptase inhibitors alongside another antiretroviral agent, such as either an integrase transfer inhibitor, a non-nucleoside reverse transcriptase inhibitor, or a protease inhibitor with a pharmacokinetic booster such as ritonavir or cobicistat.[8,10] For more detailed information on ART, the U.S. Department of Health and Human Services publishes clinical guidelines for specific patient populations.

Infection Control

Transmission of HIV between patients and healthcare providers is an important issue. Overall, the risk of acquiring HIV infection through occupational exposure is low. In the U.S., there have only been 58 confirmed cases of occupationally acquired HIV infection.[11] Only one of those cases has occurred since 2000.[11] The risk of HIV transmission depends on the exposure type. Most of the confirmed cases involved percutaneous inoculation from hollow bore needles.[12] Studies have shown the risk of HIV infection after a needle stick to be 0.33 percent.[11] The risk of mucosal exposure is even lower at 0.09 percent.[11] There have been no confirmed cases from exposure to intact skin.[11] It should also be noted that transmission of HIV from HIV positive healthcare providers to patients is exceedingly rare. There has only been one confirmed case in the U.S.[13]

Despite the low risk of HIV transmission in occupational settings, providers and healthcare organizations must remain vigilant in their infection control policies and use of universal precautions. The Occupational Safety and Health Administration (OSHA) requires healthcare organizations to have detailed policies about occupational exposure to HIV and other infectious diseases.[14] The policy should be easily accessible to employees and readily implemented by the department of employee health and emergency departments of those institutions. The most comprehensive of these plans includes educating employees of the risk of blood borne pathogens such as HIV and methods to reduce those risks including prevention of occupational exposures.

Preventing occupational exposures is the most important strategy to reduce the risk of HIV transmission. Providers should assume that all blood and bodily fluids are potentially infectious. One of the most readily available safeguards is following universal precautions. According to the CDC, these infection control precautions should be followed at all times:[14]

- Routinely use barriers (such as gloves and/or goggles) when anticipating contact with blood or bodily fluids.
- Immediately wash hands and other skin surfaces after contact with blood or bodily fluids.
- Carefully handle and dispose of sharp instruments during and after use.

Providers should use needles with safety devices to avoid needle stick injuries. Proper disposal of sharps, such as used syringes or other sharp instruments, can reduce the risk of injections and occupational HIV transmission.

If a healthcare provider is exposed, several steps must be taken to reduce the risk of transmission. The first step for an exposure is to clean the affected area. For skin exposure, the areas must be cleaned with soap and water. Puncture wounds should by cleaned with antiseptics such as alcohol-based cleansers or chlorohexidine.[14] The exposure should also be documented. Documentation should include clinical information about the source patient and the provider that has been exposed such as viral load, method of exposure, and time and date of the exposure. Risk factors and results of other testing, such as Hepatitis B or Hepatitis C, should be included in the

information.[13] Post exposure prophylaxis (PEP) should also be offered to any employee with exposure to a source patient with known or suspected HIV.

The CDC has produced guidelines that provide clear direction on which regimen should be used for PEP based on the type of exposure.[15] Several national and international organizations suggest PEP should be started as soon as possible after exposure, ideally within 2-72 hours.[15] According to the CDC guidelines, most HIV exposures can be treated with a four-week, two-drug regimen. However, some high-risk situations may require a three-drug regimen. Providers receiving PEP should be monitored for drug toxicity. Monitoring should include a complete blood count and complete metabolic panel at baseline, at two weeks of therapy, and at four weeks of therapy.

Current Laws

Codified in 1988, Florida's Omnibus AIDS Act contains most laws that concern diagnoses, testing, and disclosure for HIV and AIDS in the state.[16] This piece of legislation requires every licensed healthcare provider in the state to undergo mandatory education on HIV/AIDS. Additionally, this law requires healthcare facilities and other institutions, such as colleges and universities, to educate their work force on HIV/AIDS.

In respect to HIV testing, the law requires that healthcare providers have the necessary procedures in place to obtain "informed consent," to confirm positive test results prior to informing the patient, and to notify patients using "all reasonable efforts." Additionally, the Omnibus AIDS Acts states that testing should be "informed, voluntary, and confidential" (FS 381.004). Prior to obtaining informed consent, providers should ensure that patients have the capacity to make decisions about whether to undergo testing for HIV. This decision should be based on a patient's cognitive ability, age, and language skills. Under the current law, patients must explicitly agree or consent to have HIV testing done in the majority of cases. Exceptions to informed consents are delineated within the statute and include, but are not confined to, the following circumstances: emergencies, criminal acts, significant exposures, abandoned infants, and judicial authority. Appropriate informed consent for HIV testing should include:[16]

- explanation of the nature of the tests,
- the uses and limitations of the tests,
- procedures to be followed i.e. positive test results must be reported to local public health authorities,
- informing that HIV testing is voluntary and the right to withdraw consent at any time during the performance of the test,
- explanation that other sites can provide HIV testing anonymously, and
- explanation that results of HIV testing are confidential.

Documenting informed consent does not require written consent from the patient. Providers must still document in the patient's medical record that HIV testing was explained and that consent was obtained prior to testing. However, obtaining written consent from patient does provide a

practical benefit to some providers as the written document will clearly outline what was explained to the patient.

Failure to obtain informed consent carries many consequences. Licensed healthcare providers may receive disciplinary actions from their licensing bodies including revocation of their license. Also, patients may sue providers civilly citing negligence or invasion of privacy.

Requirements for notifying patients of the results of HIV testing are also spelled out under the Omnibus AIDS Act. Providers must "ensure that all reasonable efforts are made to notify test subject of his or her test results" whether positive or negative. Providers are expected to use similar methods that they would use to notify patients of any other serious condition. In addition to notification, providers administering HIV testing should have methods in place to confirm the test subject's identity and to provide adequate counseling based on the testing results. Minimally, patients with HIV negative results should be counseled on "preventing the transmission of HIV." HIV positive patients must be counseled on the availability of medical and support services, the importance of notifying partners that may have been exposed, and prevention of the transmission of HIV.

Florida Statute 384.25 requires all HIV testing facilities to report to local health departments all patients with positive HIV results along with patient identifiers. Failing to report positive test results may result in fines and disciplinary actions from licensing bodies. In most cases, the Florida Department of Health (DOH) requires all positive results to be reported within two weeks (Rule64D-3.029 and Rule 64D-3.030(5). The Florida DOH also requires reporting of CD4 and viral load testing results (Rule 64D-3.029). These rules ensure the most accurate data about current rates are being gathered within the state. However, a patient can undergo anonymous testing where the identity of the test subject is not known and thus cannot be reported to local public health authorities. Moreover, reporting of anonymous HIV testing is forbidden under current Florida law (384.25(3) (b)).

Conclusion

HIV/AIDS remains an important public health issue. While HIV rates have continued to decline, thousands of Floridians are still being diagnosed every year. Special attention should be paid to populations where the prevalence is growing i.e. Hispanics and older Floridians. Similar to other chronic conditions, prevention is paramount. Providers must be vigilant in screening for HIV and using appropriate prevention methods, such as PreP, if they hope to continue to decrease the rate of HIV infections.

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