continuing education for pharmacists

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HIV/AIDS: Overview and Resources for Pharmacists

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Goal. The goal of this lesson is to provide a basic disease state review of human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS), along with current testing, treatment strategies and resources for pharmacists.

Objectives. At the completion of this activity, the participant will be able to:

1. demonstrate an understanding of the basic pathophysiology and life cycle of HIV, as well as etiology and prevalence of HIV infection in the U.S.;
2. list current screening recommendations and testing advancements for HIV, as well as the rationale for each;
3. identify the antiretroviral agents and classes, as well as currently recommended regimens that are available to treat and prevent HIV infection;
4. compare and contrast pre- and post-exposure prophylaxis treatment; and
5. list available resources and tools to help pharmacists in improving the care of patients with HIV/AIDS.

Background

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) are prevalent in the United States and worldwide. While progress has been made in preventing and treating HIV, this disease remains a serious health issue for various parts of the world and a significant cause of death for certain populations.

HIV is believed to have originated in West Africa. Scientists propose that a type of chimpanzee in this region was the source of a simian (monkey) version of the virus, which was transmitted to humans and then mutated to HIV. Initial transmission may have occurred as early as the late 1800s. Over decades, the virus slowly spread across Africa and later other parts of the world. HIV has been prevalent in the U.S. since at least the mid- to late 1970s.

In the U.S. alone, it's estimated that 50,000 individuals become infected with HIV annually. There were 1.2 million persons living with HIV in the U.S. at the end of 2011. Data from the Centers for Disease Control and Prevention (CDC) indicate that worldwide there were 2.1 million new cases of HIV in 2013. It is believed that one in eight persons does not know he/she is infected with HIV virus.

In terms of race and ethnicity, African Americans are most affected by HIV. According to 2010 data provided by CDC, African Americans made up only 12 percent of the U.S. population, but acounted for 44 percent of all new HIV infections. Hispanics/Latinos made up 17 percent of the U.S. population, with a 21 percent HIV infection rate. Thirty-one (31) percent of HIV infections were diagnosed in Caucasians. Men who have sex with men are at the highest risk of transmission (63 percent), followed by heterosexual contact and injection drug users.

While HIV infection is presently considered incurable, antiretroviral therapy (ART) can dramatically prolong and improve the lives of many persons infected with HIV, and decrease their ability to infect others. Early detection, early medical care, and treatment have an appreciable effect.

Today, many tools are available to prevent the transmission of HIV. In addition to limiting sexual partners, not sharing needles, and the availability of antiretroviral medications for pre- and post-exposure prophylaxis, many national and state level resources are dedicated to HIV prevention and awareness initiatives.

HIV Etiology and Stages of the Disease

HIV impairs and destroys specific cells of the immune system called CD4 cells or T cells, which are responsible for fighting off infections and diseases in the body. HIV spreads through certain bodily fluids such as blood, semen, presemenal fluid, rectal fluids, vaginal fluids, and breast milk. These fluids must come in contact with a mucous membrane or damaged tissue, or be directly injected into the bloodstream for transmission to occur. In the U.S., HIV is mainly spread by having sex with someone who has HIV, or by sharing

needles, syringes, rinse water, or other equipment used to prepare injectable drugs with someone who has HIV. Other less common forms of transmission include, but are not limited to, (1) being born to an infected mother; (2) being stuck with an HIV-contaminated needle or other sharp object; and (3) receiving blood transfusions, blood products, or organ/tissue transplants that are contaminated with HIV. The latter is rare due to rigorous testing of these in the U.S. today.

There are three stages of HIV infection. Patients may transmit the disease during any one of them. The first stage of disease, termed **acute infection**, occurs within two to four weeks after infection. In this stage, patients may experience flu-like symptoms (e.g., fever, sore throat, achiness) referred to as *acute retroviral syndrome* (ARS) or *primary HIV infection*. It's important to note that some people do not develop ARS and/or have symptoms of disease during this phase. During acute infection, the viral load (numerical expression of the quantity of virus in a given volume) is high, and the potential for an infected patient to spread HIV is greatest during this stage.

Clinical latency, the second stage, is sometimes called *asymptomatic HIV infection* or *chronic HIV infection*. Patients in this stage may or may not have symptoms, and can live for up to a decade without ART. Patients who are on ART may live with clinical latency for several decades. The use of ART during this phase reduces the viral load and, therefore, reduces the risk of transmission to others. But it's important for patients to understand that transmission can still occur.

As the disease progresses, the viral load increases, CD4 cell counts begin to drop, and patients progress into the the third phase, **AIDS**. In this stage of disease, the immune system is overwhelmed and the body becomes vulnerable to infections and opportunistic illnesses (such as infection-related cancers). Without ART, most HIV-infected individuals will eventually progress to this immunosuppressive state. A diagnosis of AIDS is made based on CD4 counts less than 200 cells/mm^3 and/or the presence of opportunistic illness.

HIV Screening and Testing

The U.S. Preventive Services Task Force recommends routine HIV screening, regardless of the patient's or physician's perception of risk level, for everyone between the age of 15 and 64 years, at least once as part of routine healthcare testing, unless the patient refuses. CDC recommends ages 13 to 64. The rationale for routine testing is to reduce the stigma of testing, and identify patients who are unaware of their exposure while still allowing the patient to opt out. Patients who are outside this age range should also be tested if he/she has risk factors for HIV infection. Questionnaires have also been developed to identify patients who engage in behaviors increasing their risk of HIV transmission as they may require more frequent testing. Anyone who has been sexually assaulted, all pregnant females, and females planning on becoming pregnant should also be tested.

A recent advancement in serological testing has been achieved with the development of fourth-generation testing. The fourth-generation algorithm is a step-wise approach using combined antibody/antigen immunoassay (as opposed to antibodies alone) to identify and differentiate HIV-1 and HIV-2.

Upon a positive primary assay, the differentiation of HIV-1 and HIV-2 assists clinicians in selecting the appropriate combination antiretroviral therapy (CART). HIV-1 is most common worldwide. HIV-2, which is mostly found in West Africa, is resistant to non-nuceloside reverse transcriptase inhibitors and enfuvirtide therapy. If the results of the second-tier HIV-1/HIV-2 immunoassay are negative, a nucleic acid amplification test is performed to detect HIV RNA viral activity instead of HIV antibodies. A positive result indicates acute HIV-1 infection.

The fourth-generation algorithm is advantageous as it can screen for and confirm HIV infection in several hours instead of weeks, and can detect HIV-1 infection within two to three weeks of exposure. This early identification allows for prevention of new infections through risk reduction counseling, earlier intervention with CART, and partner notification.

The second advancement in testing to be highlighted is FDA approval of the OraQuick In-Home HIV Test. It is a rapid test that does not require sample shipment for laboratory confirmation. The test should be used by persons who are 17 years of age or older. When the test is used by a trained professional, it is 99 percent sensitive in detecting HIV-1. However, when self-administered, the sensitivity in up to one in 12 decreases resulting in a false negative due to user-error. The test will provide results in 20 to 40 minutes.

When possible, patients who choose this test should be counseled that positive results should be confirmed with a Western blot or fourth-generation test. Alternatively, a negative result does not guarantee that the patient is not infected with HIV, especially when exposure may have been within the previous three months. Repeat testing is advised for patients who engage in activities increasing their risk of HIV transmission.

HIV Life Cycle and Targeted Antiretrovirals

A working knowledge of the HIV replication cycle is essential in understanding the mechanism of action of retrovirals that are now used to treat and prevent HIV. An appreciation for how the different agents work together to synergistically interrupt the replication of HIV will be useful as the currently accepted CART regimens are reviewed later in this lesson. There are six classes of agents. Tables 1 and 2 include FDA-approved HIV

Table 1
FDA-approved HIV medicines

Drug Class	Drug
Nucleoside Reverse Transcriptase Inhibitors (NRTIs)	abacavir (Ziagen) didanosine (Videx) emtricitabine (Emtriva) lamivudine (Epivir) stavudine (Zerit) tenofovir disoproxil fumarate (Viread) zidovudine (Retrovir)
Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs)	delavirdine (Rescriptor) efavirenz (Sustiva) etravirine (Intelence) nevirapine (Viramune) rilpivirine (Edurant)
Protease Inhibitors (PIs)	atazanavir (Reyataz) darunavir (Prezista) fosamprenavir (Lexiva) indinavir (Crixivan) nelfinavir (Viracept) ritonavir (Norvir) saquinavir (Invirase) tipranavir (Aptivus)
Fusion Inhibitor	enfuvirtide (Fuzeon)
Entry Inhibitor	maraviroc (Selzentry)
Integrase Inhibitors (INSTIs)	dolutegravir (Tivicay) elvitegravir (Vitekta) raltegravir (Isentress)
Pharmacokinetic Enhancer	cobicistat (Tybost)

Adapted from AIDSinfo.nih.gov Fact Sheet, updated 4/28/2015

medicines by drug class.

HIV is an enveloped virus that contains two copies of genomic RNA in its core. The viral core also contains enzymes required for HIV replication – reverse transcriptase, integrase, and protease. Antiretrovirals have been developed to antagonize the actions of these enzymes. HIV can infect multiple cells in the body, but its main target is the CD4 lymphocyte (T cell or CD4 cell). Once HIV infects a CD4 cell, the virus goes through multiple steps to reproduce itself and create more virus.

The first step is termed *binding and fusion*. This step resembles a key entering a lock. Once the virus binds to a specific CD4 receptor, it is unlocked and HIV can fuse with the host cell and release its genetic material into the cell. Entry inhibitor or CCR5 coreceptor antagonist, maraviroc (Selzentry, 2007), blocks proteins on the CD4 cell that HIV needs to enter. Fusion inhibitor enfuvirtide (Fuzeon, 2003) blocks HIV from entering the CD4 cell.

The second step is *reverse transcription*. Here, reverse transcriptase changes the RNA into DNA so that it can be integrated into the CD4 cell host DNA. There are two major classes of Reverse Transcriptase Inhibitors (RTIs), each with varying characteristics and structures which effect their mechanisms and subsequent toxicities. Nucleoside Reverse Transcriptase Inhibitors (NRTIs) block reverse transcriptase. These include abacavir (Ziagen, 1998), didanosine (Videx, 1991), emtricitabine (Emtriva, 2003), lamivudine (Epivir, 1995), stavudine (Zerit, 1994), tenofovir disoproxil fumarate (Viread, 2001), and zidovudine (Retrovir, 1987). Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs) bind to, and later alter reverse transcriptase. The NNRTIs currently approved are delavirdine (Rescriptor, 1997), efavirenz (Sustiva, 1998), etravirine (Intelence, 2008), nevirapine (Viramune, 1996, Viramune XR 2011), and rilpivirine (Edurant, 2011).

The step in which the HIV's DNA is incorporated into the CD4 cell's DNA is termed *integration*.

Table 2
FDA-approved combination HIV medicines

- abacavir, lamivudine (Epzicom)
- abacavir, dolutegravir, lamivudine (Triumeq)
- abacavir, lamivudine, zidovudine (Trizivir)
- atazanavir, cobicistat (Evotaz)
- darunavir, cobicistat (Prezcobix)
- efavirenz, emtricitabine, tenofovir disoproxil fumarate (Atripla)
- elvitegravir, cobicistat, emtricitabine, tenofovir disoproxil fumarate (Stribild)
- emtricitabine, rilpivirine, tenofovir disoproxil fumarate (Complera)
- emtricitabine, tenofovir disoproxil fumarate (Truvada)
- lamivudine, zidovudine (Combivir)
- lopinavir, ritonavir (Kaletra)

Adapted from AIDSinfo.nih.gov Fact Sheet, updated 4/28/2015

Integrase strand transfer inhibitors (INSTIs) block the HIV integrase enzyme which inhibits the enzyme from inserting its viral DNA into the DNA of the CD4 cell. Integrase inhibitors are a relatively newer class of antiretrovirals and may be more effective in individuals who are resistant to other classes. Three INSTIs are available, at the time of writing this lesson, including dolutegravir (Tivicay, 2013), elvitegravir (Vitekta, 2014), and raltegravir (Isentress, 2007).

Transcription is the process in which the host cell becomes activated and the virus uses host enzymes to create more of its own genetic material. Following transcription, viral protease enzymes cut the longer HIV proteins into individual proteins. In this step, called *assembly*, the cut proteins come together along with the virus' genetic material and *assemble* into a new virus. Protease Inhibitors (PIs) block HIV protease, thus preventing HIV from making copies of itself. The PIs currently available include atazanavir (Reyataz, 2003), darunavir (Prezista, 2006), fosamprenavir (Lexiva, 2003), indinavir (Crixivan, 1996), nelfinavir

(Viracept, 1997), ritonavir (Norvir, 1996), saquinavir (Invirase, 1995), and tipranavir (Aptivus, 1995).

Cobicistat (Tybost, 2014) is a pharmacokinetic enhancer used in HIV treatment to increase the effectiveness of atazanavir or darunavir in combination regimens.

Treatment Goals

The first antiretroviral drug to be licensed was zidovudine in 1987. Until December 1995, ART was limited to five drugs belonging to a single class of antiretroviral agents called nucleoside analog reverse transcriptase inhibitors. Since then, numerous new agents and new classes of drugs have been introduced, and treatment guidelines dramatically changed. While not all of these agents are still widely used or recommended in the U.S. due to resistance, there are now more than 20 agents in six drug classes approved by FDA.

Today, clinicians have access to detailed treatment guidelines and resistance testing that utilize laboratory values and patient characteristics to select the correct CART for both treatment-naïve and treatment-experienced patients. Additionally, there are multiple combination HIV medications created to enhance medication adherence and reduce pill burden. Table 2 lists currently available combination ARTs.

Current treatment guidelines are available on AIDSinfo.nih.gov and are updated regularly. AIDSinfo is a service of the U.S. Department of Health and Human Services (HHS). Also included are preferred and alternate CART for treatment-naïve patients. The regimens have comparable efficacy, but vary in dosing frequency, pill burden, drug interactions, and potential side effects. Individual regimen choice is based on considerations such as expected side effects, convenience, comorbidities, interactions with concomitant medications, and results of pretreatment genotypic drug-resistance testing.

The goals of CART are to reduce HIV-associated morbidity and prolong the duration and quality of survival; restore and preserve immunological function; maximally and durably suppress HIV plasma viral load; and prevent transmission. In order to achieve viral suppression, regimens generally contain three active drugs from two or more drug classes. Due to the latency of infected CD4 T cells during the earliest stages of acute HIV infection, which persists despite suppression of the virus in the plasma, eradication of the disease is currently not achievable.

Historically, HIV-infected individuals have had low CD4 counts at presentation to care. Due to concerted efforts to increase testing, some patients are now being linked to care before they have advanced HIV disease. The decision to initiate ART in individuals with high CD4 counts is based on growing evidence that untreated HIV (i.e., uncontrolled viremia) may lead to the development of non-AIDS defining illnesses such as cardiovascular disease (CVD), kidney disease, liver disease, neurological complications, and malignancies.

The Strategic Timing of Antiretroviral Treatment (START) trial began in March 2009. It was a large, multi-national, randomized controlled clinical trial designed to evaluate the role of early ART in asymptomatic HIV-infected patients in reducing a composite clinical endpoint of AIDS-defining illnesses, serious non-AIDS events or death. The 4,685 participants were HIV-infected ART-naïve adults, aged >18 years, with CD4 counts >500 cells/mm^3. This trial demonstrated that the clinical benefits of ART are greater when ART is started early, with pre-treatment CD4 T lymphocyte counts >500 cells/mm^3. The HHS Panel on Antiretroviral Guidelines recommends ART for all HIV-infected patients regardless of pre-treatment CD4 cell counts.

While ART was previously recommended for all HIV-infected individuals to reduce the risk of disease progression and prevent transmission, the strength of this treatment was recently increased to A1 (*strong*; data from randomized controlled trials) following the results of two randomized controlled trials. In July, 2015 that HHS Panel posted a statement on the AidsInfo website regarding this change. Prior to this recommendation revision, the strongest recommendation for initiating CART was for individuals with pretreatment CD4 <350 cells/mm^3 followed by those with CD4 cell count 350-500 cells/mm^3. For those with a CD4 cell count >500, the level of strength was only *moderate*. The results of the SMART trial have changed the strength of recommendation to *strong* in starting CART for all patients regardless of CD4 cell count.

ART is also strongly recommended for prevention of transmission in individuals at risk for perinatal, heterosexual, or other means of transmission. There is a growing acceptance among experts that "treatment is prevention" and that treating patients in order to prevent transmission may have a considerable effect on communities largely affected by HIV and for the greater public health.

Pre- and Post-Exposure Prophylaxis Therapy

In May 2014, the U.S. Public Health Service (PHS) released the first comprehensive clinical practice guideline supporting the use of **Pre-Exposure Prophylaxis (PrEP)** to prevent the transmission of HIV. *PrEP* is a term used to describe a medication prevention strategy that has been studied and proven to be highly effective in reducing the transmission of HIV in people who are HIV-negative, but who are at substantial risk of acquiring HIV.

In 2012, Truvada (emtricitabine and tenofovir disoproxil fumarate) became the first FDA-approved agent to reduce the risk of HIV infection in uninfected individuals who are at high risk of HIV infection, and who may engage in sexual activity with HIV-infected persons. Studies have shown that when one

tablet daily is taken consistently, the risk of HIV infection in high risk individuals can be reduced by up to 92 percent. However, PrEP is much less effective when it is not taken consistently.

Only confirmed HIV-negative persons are candidates for PrEP as part of a prevention strategy that also includes ongoing counseling on risk reduction and condom use. Patients must also agree to repeat testing every three months. The new federal guidelines outline the patient populations that are considered to have ongoing substantial risk for HIV and can be found at: www.cdc.gov/hiv/pdf/PrEPguidelines2014.pdf .

Common adverse reactions with Truvada include headache, abdominal pain, and weight loss. Safety concerns include impairment of kidney and liver function, as well as decrease in bone mineral density. Long-term safety of the drug in healthy persons is not yet known.

Other considerations for clinicians to evaluate prior to initiation of PrEP with Truvada include (1) determining hepatitis B status, (2) assessing for kidney dysfunction, (3) concomitant sexually transmitted disease, (4) pregnancy status, and (5) financial burden. Safety information for fetuses and breastfeeding infants is unknown. Breastfeeding women should not receive PrEP. Patients must adhere to PrEP therapy and follow-up appointments, with the understanding that it is not meant as a "just before sex pill." PrEP is not effective if used intermittently. The decision to stop PrEP should be discussed with the provider. A change in lifestyle that reduces the risk of HIV infection is a valid reason that may warrant stopping therapy.

Post-exposure Prophylaxis (PEP) differs from PrEP in many ways. Most importantly, PEP is the use of antiretroviral drugs after the occurrence of a single high-risk event in which an individual becomes vulnerable to acquiring HIV.

The components and treatment duration of PEP and PrEP regimen differ as well. PEP may be used following occupational and non-occupational exposures. The decision to initiate PEP is based on the principles of transmission and perceived risk. Because these agents are associated with adverse events, including toxicity and drug interactions, the CDC recommendations emphasize that the selection of antiretroviral medications for PEP must balance the risk of HIV acquisition with the risks of PEP.

Significant risk of acquiring HIV can occur with non-occupational exposures following sexual and needle-sharing activities, needlesticks outside of occupational settings, and trauma including human bites. All potentially exposed individuals are advised to promptly seek treatment at their doctor's office, emergency department, urgent care clinic, or a local HIV clinic in order to begin PEP as quickly as possible. Patients without prescription coverage requiring PEP may be able to utilize medication assistance programs sponsored by drug manufacturers to pay for the medication. These can be handled urgently to avoid delay in initiating therapy.

PEP is not a substitute for the regular use of other HIV prevention methods such as PrEP, correct and consistent condom use or the use of sterile injection equipment; and it is not always effective. Research shows that PEP has little to no effect in inhibiting the replication of HIV in the body after 72 hours. Following exposure, it takes HIV approximately three days to spread throughout the body. Therefore, in order for PEP to work, it must be started promptly. This type of regimen is not recommended for individuals who are frequently exposed to HIV (i.e., after each episode of unprotected sex). Repeated PEP courses may lead to resistance and reduced efficacy.

In 2013, PHS updated its recommendations for the management of occupational exposures to HIV. The PHS working group considered the availability of newer, better tolerated agents with more preferable toxicity profiles, in order to minimize the risk of PEP non-completion which had been previously reported.

In summary, PEP should begin as soon as possible for healthcare personnel who experience occupational exposure to blood and/or bodily fluids that might contain HIV, with regimens that consist of three or more antiretroviral agents and are continued for four weeks. The preferred HIV PEP regimen is raltegravir (Isentress) 400 mg orally twice daily, plus Truvada (tenofovir 300mg/emtricitabine 200mg) orally once daily.

The advantage of this regimen is that it may be taken without regard to food, is well tolerated and is associated with minimal adverse events and drug interactions. Common adverse events include nausea, fatigue, headache, diarrhea, and insomnia. Gastrointestinal side effects may be anticipated; proactive prescribing of antiemetics and antispasmodics may improve PEP regimen adherence. Patients with hepatitis C or kidney injury may consider alternate regimens.

Additionally, the HIV status of the exposure source patient should be determined. If PEP is initiated and the source is confirmed to be HIV negative, PEP may be discontinued immediately with no follow-up testing in the exposed patients. Expert consultation may be indicated in situations where the exposure report is delayed, unknown source (e.g., needle in sharps disposal), suspected pregnancy, breastfeeding, toxicity of initial PEP regimen, or serious medical illness in exposed patient or underlying illness (e.g., renal disease). PHS also lists recommendations for follow-up and monitoring.

The complete and comprehensive guidelines can be found at www.jstor.org/stable/10.1086/672271. Another good resource is the National Clinicians' PEPline at 888.448.4911.

The Role of the Pharmacist in HIV Care and Education

Pharmacists are not only the most accessible health care professional, but also one of the most trusted. This places pharmacists in a position to work as partners in health care for HIV-infected patients. Available literature widely accepts and supports this role of the pharmacist.

The most documented role of the pharmacist in HIV care is in relation to increasing medication adherence to ART. Strict adherence to ART is key to virologic suppression, lower rates of resistance, better quality of life, improved survival, and decreased risk of HIV transmission. Patients must be counseled that in order to achieve best results, they must take their medications >95 percent of the time. Numerous factors may lead to adherence failures including (1) regimen complexity and pill burden, (2) low literacy, (3) younger age, (4) polypharmacy, (5) vision loss, (6) cognitive impairment, (7) stigma, (8) medication adverse events [tolerability], (9) treatment fatigue, (10) lack of patient education, (11) psychosocial stressors, and (12) cost or insurance coverage issues.

While advancements in ART now offer simpler and better-tolerated regimens, suboptimal adherence still occurs. Other factors that have been found to increase adherence success include multidisciplinary care, trusted patient-provider relations, and the use of motivational strategies. Adherence is difficult to monitor outside of directly observed therapy. Pharmacists can assist in monitoring adherence by reviewing pharmacy records (i.e., refill records), pill counts, and patient self-reporting. Caution should be exercised with self-reporting as patients may overestimate their adherence. Creating a nonjudgmental relationship with HIV-infected patients may facilitate open communication and an opportunity for pharmacists to reiterate the necessity of compliance, educate the patient on the role of ART, and empower the patient to effectively manage their disease. Additionally, some patients may be more comfortable discussing adherence problems with their pharmacist rather than their prescriber such as experiencing undesirable side effects and the financial burden associated with treatment.

Table 3
HIV resources

Source	Internet Address
AIDS*info*, US Department of HHS	aidsinfo.nih.gov/guidelines
CDC, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention	www.cdc.gov/nchhstp/Default.htm
CDC HIV/AIDS info	www.cdc.gov/hiv
HIV/AIDS Resource Center	www.hivaidsresource.org
American Academy of HIV Medicine (AAHIVM): HIV Specialist and HIV Expert certification	aahivm.org
Johns Hopkins HIV Guide	www.hopkinsguides.com/hopkins/ub#hiv
University of Liverpool HIV Pharmacology Group	www.hiv-druginteractions.org
Database of Antiretroviral Drug Interactions, HIV InSite, University of California, San Francisco	http://hivinsite.ucsf.edu/insite?page=ar-00-02

In a systematic review of published literature documenting the impact of HIV clinical pharmacists on HIV-treatment outcomes, Saberi *et al.* concluded that literature supports a positive association between HIV pharmacist activities and improvements in ART adherence and viral load suppression. The majority of the reviewed studies examined the impact of pharmacists in HIV ambulatory care clinics, followed by outpatient community pharmacies. The main pharmacist role was the provision of medication adherence counseling and tools for adherence improvement such as pill boxes, refill reminders, beepers, alarms, medication schedules, blister packs, and medication diaries. Other pharmacist activities included patient education regarding dosing, adverse effects, drug interactions, medication storage, missed doses, adherence, methods of improving adherence; ART regimen selection; ART initiation, discontinuation, and dose adjustment for renal/hepatic impairment; and monitoring for ART adverse effects, and drug interactions. In all but one study, Saberi *et al.* found that the involvement of an HIV pharmacist in patient care was associated with clinically and statistically significant improvements in ART adherence. The authors also concluded that a high percentage of pharmacist recommendations were accepted by physicians or others on the health care team. Pharmacists who work in practice models incorporating Medication Therapy Management (MTM) or patient-centered care approaches are well positioned to make an impact on HIV care.

Remaining current and confident in HIV pharmacotherapy serves as a challenging task due to rapidly changing guidelines, along with the intricacies of each antiretroviral agent and regimen. The American Academy of HIV Medicine offers a Practicing HIV Pharmacist (AAHIVP) credentialing to pharmacists who work in HIV care.

The MichRx HIV Pharmacy Online Certification Training Program is an ACPE-accredited program which is also available. Numerous other online resources available to support healthcare professionals in HIV care are listed in Table 3.

Summary

The treatment of HIV/AIDS has greatly improved in the last 20 years, but remains a serious health issue in the U.S. and worldwide. Treatment and prevention strategies continue to evolve, thereby prolonging and improving the lives of HIV/AIDS patients and preventing spread of the disease. Pharmacists in many practice areas have the unique opportunity to impact the care and quality of life of HIV patients, particularly in improving medication adherence through education and counseling. A basic understanding of the role of antiretroviral therapy, the uses of pre- and post exposure prophylaxis, and accessibility of current resources is vital for all pharmacists.

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This lesson is a knowledge-based CPE activity and is targeted to pharmacists in all practice settings.

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CE Hours: 1.5 (0.15 CEU)

The Ohio Pharmacists Foundation Inc. is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education.

continuing education quiz

HIV/AIDS: Overview and Resources for Pharmacists

1. Which of the following races/ethnicities is most affected by HIV?
   a. Caucasian
   b. African American
   c. Hispanic/Latino

2. Which of the following populations is the at the highest risk of transmission of HIV infection?
   a. Men who have sex with men
   b. Injection drug users
   c. Heterosexual contact

3. The potential for an infected patient to spread HIV is greatest in which of the following stages of the disease?
   a. Acute infection
   b. Clinical latency
   c. AIDS

4. Both the U.S. Preventive Services Task Force and CDC recommend routine screening for everyone 13 to 64 years of age.
   a. True
   b. False

5. Fourth-generation testing for HIV is advantageous for all of the following reasons EXCEPT it:
   a. tests for both antibodies and antigen.
   b. differentiates between HIV-1 and HIV-2.
   c. is available as a home quick test.
   d. confirms HIV infection in hours, rather than weeks.

6. OraQuick In-Home HIV Test:
   a. can be used for persons 15 years and older.
   b. is usually greater than 99 percent sensitive due to user error when self-administered.
   c. provides results in two to four hours.
   d. with positive results should be confirmed with a Western blot or fourth-generation test.

Completely fill in the lettered box corresponding to your answer.

1. [a] [b] [c]	6. [a] [b] [c] [d]	11. [a] [b] [c]
2. [a] [b] [c]	7. [a] [b] [c] [d]	12. [a] [b]
3. [a] [b] [c]	8. [a] [b] [c] [d]	13. [a] [b]
4. [a] [b]	9. [a] [b] [c] [d]	14. [a] [b] [c] [d]
5. [a] [b] [c] [d]	10. [a] [b] [c] [d]	15. [a] [b] [c] [d]

❑ **I am enclosing $5 for this quiz made payable to Ohio Pharmacists Association.**

1. Rate this lesson: (Excellent) 5 4 3 2 1 (Poor)
2. Did it meet each of its objectives? ❑ yes ❑ no
   If no, list any unmet_____
3. Was the content balanced and without commercial bias?
   ❑ yes ❑ no If no, why?_____
4. Did the program meet your educational/practice needs?
   ❑ yes ❑ no
5. How long did it take you to read this lesson and complete the quiz? _____
6. Comments/future topics welcome.

Please print.

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Name_____

Address_____

City, State, Zip_____

Email_____

NABP e-Profile ID_____Birthdate_____ (MMDD)

Return quiz and payment (check or money order) to Correspondence Course, OPA, 2674 Federated Blvd, Columbus, OH 43235-4990

7. The step in which HIV's DNA is incorporated into the CD4 cell's DNA is called:
   a. binding and fusion.
   b. assembly.
   c. integration.
   d. reverse transcription.

8. Which of the following classes of drugs works by inhibiting HIV RNA from changing into DNA?
   a. Entry Inhibitor
   b. Fusion Inhibitor
   c. NRTI
   d. INSTI

9. Which of the following drugs is a Protease Inhibitor?
   a. Indinavir
   b. Lamivudine
   c. Nevirapine
   d. Raltegravir

10. Which of the following agents is used to increase the effectiveness of other HIV medications in the regimen?
   a. Atazanavir
   b. Cobicistat
   c. Dolutegravir
   d. Efavirenz

11. Which of the following may be more effective in individuals who are resistant to the other classes of ART?
   a. Protease Inhibitors
   b. Pharmacokinetic Enhancers
   c. Integrase Strand Transfer Inhibitors

12. Which regimen may be indicated for an HIV-negative patient who is at substantial risk of HIV?
   a. Pre-Exposure Prophylaxis
   b. Post-Exposure Prophylaxis

13. Which regimen is indicated for an individual with a single needlestick incident from an HIV-positive patient?
   a. Pre-Exposure Prophylaxis
   b. Post-Exposure Prophylaxis

14. Factors that may lead to non-adherence to CART include all of the following EXCEPT:
   a. regimen complexity.
   b. lack of education.
   c. adverse medication events.
   d. older age.

15. The main role of the pharmacist in treating HIV patients is providing counseling on medication:
   a. dosing.
   b. drug interactions.
   c. adverse effects.
   d. adherence.

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