Thanks Misti for getting us off the ground with such a great start. Today, in this webinar, I will be providing a brief overview and update regarding the science and treatment of HIV and AIDS.

Content will include definitions, a brief timeline, as well as statistics regarding the current state of affairs.

Overview discussions will discuss transmission routes, stages of infection, testing, and treatment. A discussion will occur, at the end, regarding the recent use of the word “cured.”
• My first group of definitions relates to viruses, bacteria and parasites.

• Viruses are the smallest agents of infectious diseases. They are unbelievably small, round in shape, and consist of little more than a small piece of genetic material surrounded by a thin protein coating. Some viruses are also surrounded by a thin fatty envelope.

• Viruses are different from other infectious microorganisms because they are the only microorganisms that cannot replicate itself outside of a host cell. Viruses seize materials and energy from host cells by hijacking cellular machinery.

• Relevant to our topic today, retroviruses are a family of viruses that contain within its envelope a single-strand of RNA, not a double strand of DNA. The retrovirus can only replicate itself by entering a host cell. Once the retrovirus inserts the single strand of its RNA into the host cell, a process known as reverse transcription is able to produce the viral DNA from the viral RNA.
• An organism’s genotype is the unique set of genetic material within that organism.
• An organism’s phenotype is all of its observable characteristics. Phenotype can be influenced by genotype as well as the environment.
• One way to think about genotypes is to consider all the strains of HIV. One way to think about phenotypes is to consider all the mutations or errors that can occur while copying the DNA.

• HIV stands for “human immunodeficiency virus.” There are two strains or genotypes of HIV: HIV-1 and HIV-2. AIDS stands for “acquired immunodeficiency syndrome.” An individual can have HIV without receiving an AIDS diagnosis; however, the opposite is not true. A person cannot have AIDS without infection by HIV.

• Experts from the Centers for Disease Control, the U.S. National Institute of Allergy and Infectious Diseases, and the World Health Organization are currently presenting the following regarding the origin of HIV: about 100 years ago in Africa, an ancestor of HIV, which is known as simian immunodeficiency virus or SIM, evolved into a form that jumped from monkeys to humans. Humans hunted these chimpanzees for meat and had physical contact with their infected blood. Over the decades, the virus slowly spread from Africa and into other parts of the world.

• In 1981, previously healthy gay men in New York and California began dying of opportunistic infections because their immune systems had been destroyed. Within months people were dying in sub-Saharan Africa. In 1983 the discovery was made that HIV causes AIDS. In the mid-1980’s the first generation of HIV drugs were introduced.
The 2 major genotypes, or strains, of HIV are HIV-1, which was discovered first, and HIV-2. HIV-1 is the most widespread strain worldwide and HIV-2 is most common in western Africa and has now been found in Asia including India, in Europe, and the UK, and in the Americas.

There are at least 3 major groupings of HIV-1 based on transmission: Main, Outlier, and Non-Main/Non-Outlier. There are at least 10 subtypes or variations of HIV-1 grouped within the Main Group.

HIV-2 is more than 55% genetically different from HIV-1. HIV-1 and HIV-2 antigens or identifying markers are distinct enough that tests have to be sensitive to both strains of the virus.

I present genotypes, groupings, and mutations because clients need to understand there are distinctively different forms of HIV. A person can have multiple strains and mutations of HIV and pass on multiple strains and mutations. (http://www.aidsmap.com/HIV-1-subtypes/page/132296/)

Timeline notables on the first two slides:
- in 1982: disease renamed from Gay-related Immune Deficiency to AIDS
- in 1983: first woman diagnosed and the first case of AIDS is reported in Africa
- in 1984: first HIV antibody test released
- in 1986: AZT is first anti-HIV drug approved by FDA
- in 1990: FDA licenses first rapid HIV test
- in 1994: FDA approves first oral test for HIV
Timeline notables on this slide:

- **in 1996**: FDA approves viral load test which detects levels of HIV in the body.
- **in 1996**: HAART – the use of 3 antiretrovirals – becomes the standard tx for HIV.
- **in 2000**: the spermicide Nonoxynol-9 is found to increase risk of HIV transmission.
- **in 2001**: Fuzeon, which is a last resort drug as a fusion inhibitor, is introduced.
- **June 5, 2011**: 30 years since the first AIDS case reported.

Over 3 decades of research have focused on HIV infection and the disease it causes which is AIDS (acquired immunodeficiency syndrome):

- A person acquires AIDS, he/she does not inherit AIDS.
- AIDS is the disease that can result from HIV infection.
- Our immune system is the system that fights off infection or disease.
- When the immune system becomes deficient or is unable to work correctly syndromes can occur.
- A syndrome is a collection of symptoms and signs of disease – AIDS is a syndrome because it is a complex illness with a wide range of complications and symptoms.
- AIDS is the final stage of HIV infection where the risk of complications for an opportunistic infection are the greatest.

AIDS is defined by the CDC as having a T-Cell count of less than 200 in the blood stream, and the onset of opportunistic infections. As a reference, a person who does not have HIV/AIDS has a normal T-cell count between 500 and 1,000. I will discuss T cells again on slide 13.
• the rates of HIV infections remains steady at about 50,000 per year

• the most prominent route of transmission of HIV is gay sexual contact

• injection drug users make up 11% of the possible modes of transmission.

• Anybody can get HIV: HIV does not discriminate based on age, sexual orientation, gender identification, marital status, ethnicity, socioeconomic status, or drugs of choice. For the vast majority of cases of infection by HIV, HIV was contracted through unprotected sex or by sharing needles or other equipment used to inject drugs.

• Contrary to what many people assume, infection is most prevalent amongst common people, like you and I, without a large number of sexual contacts.
Notable points on this slide:

- an estimated 18% of all diagnosed infections were attributed to heterosexual contact for females and 10% for males
- an estimated 5% of all diagnosed infections were attributed to injection drug use for males and 3% for females
- approximately 3% of diagnosed infections were attributed to male-to-male sexual contact and injection drug use
- less than 1% of diagnosed infections were attributed to other transmission categories such as hemophilia, blood transfusion, prenatal exposure, and other risk factors not reported or identified

- Heterosexual contact is with a person known to have, or to be at high risk for, HIV infection.

- Other transmission categories include hemophilia, blood transfusion, perinatal exposure, and risk factors not reported nor identified.
• youth make up 7% of the more than 1 million people living in the US with HIV

• approximately 1 in 4 newly diagnosed cases of HIV involve a youth

• more than half of the youth diagnosed are African American with another 20% including Latino

• 87% of the new HIV male youth diagnosed had male-to-male sexual contact

• of the 34% youth who identified as currently sexually active, 40% did not use a condom the last time they had sex

• 84% of the high school students were given some level of education regarding HIV infection and AIDS, which was a drop from 92% in 1997

• it is reported that only 13% of our youth were tested for HIV
• In the United States and 6 dependent areas, the estimated rate of diagnoses of HIV infection among adults and adolescents was 19.1 per 100,000 population in 2011.

• The District of Columbia (i.e., Washington, DC) is a city; please use caution when comparing the HIV diagnosis rate in DC with the rates in states.

• Data include persons with a diagnosis of HIV infection regardless of stage of disease at diagnosis.

• Areas to note:
  • The District of Columbia
  • Louisiana
  • Florida
  • Georgia
  • Maryland
  • US Virgin Islands
• The estimated rates (per 100,000 population) of stage 3 (AIDS) classifications in 2011 for persons (all ages) with HIV infection are shown for each state, the District of Columbia, American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, the Republic of Palau, and the U.S. Virgin Islands.

• Areas with the highest rates of stage 3 (AIDS) in 2011 were:
  • The District of Columbia (82.5). The District of Columbia (i.e., Washington, DC) is a city; please use caution when comparing the stage 3 (AIDS) rate in DC with the rates in states.
  • Georgia (22.8)
  • Maryland (20.1)
  • Louisiana (18.4)
  • New York (18.4)
  • Florida (18.1)
• The highest prevalence of new HIV infections is amongst white males having sex with males, followed by Black males having sex with males.
In 2011, among adult and adolescent male injection drug users (IDUs) diagnosed with HIV infection in the United States and 6 dependent areas, an estimated:

- 46% were black/African American
- 30% were Hispanic/Latino
- 21% were white

This data on injection drug use among males do not include men with HIV infection attributed to male-to-male sexual contact and injection drug use.

Among female IDUs:

- 49% were black/African American
- 30% were white
- 17% were Hispanic/Latino

Among both sexes, American Indian/Alaska Native, Asian, Native Hawaiian/other Pacific Islander, and persons of multiple races each comprised 2% or less of IDUs.
• HIV is a very tenacious virus. It cannot be spread through casual contact but instead is contracted primarily through exposure to blood and blood products (sharing needles, accidental needle sticks), semen & female genital secretions, or breast milk.

• Just as hepatitis targets the liver, HIV targets the immune system, specifically T cells.
  • T cells are a type of white blood cell called lymphocytes and they play a central role in the immune system’s ability to protect the body.
  • The surface of T cells contain specialized antibody-like receptors that detect fragments of antigens on the surfaces of infected, infectious, and cancerous cells. Antigens are either carbohydrate or protein substances that trigger our immune system to produce antibodies against it. An antigen may be a foreign substance from the environment like chemicals, bacteria, viruses, or pollen. An antigen can also be formed within the body, as with bacterial toxins, and damaged or cancerous tissue cells.
  • T cells are responsible for two important tasks: (1) directing and regulating immune system responses, and (2) directly attacking infected or cancerous cells.
  • Every T cell has a nucleus that contains genetic material in the form of DNA; the DNA has all the information (has the blueprint) that the cell needs in order to function. DNA in T cells consists of a double strand; RNA in retroviruses consist of only a single strand.

• The CD-4 Receptor site, which is located on the surface of T cells is the receptor site that the HIV virus locks onto in order to gain entrance into the T cell itself.

• Seroconversion: When antibodies are detectable in the blood that indicates that the body has fought a specific infection and created the necessary antibodies to attack the infectious agent. The process of creating antibodies and going from a state of no antibodies to a state of having antibodies is called seroconversion.
HIV is primarily transmitted in bodily fluids by three major routes: (1) sexual intercourse through vaginal, rectal, or penile tissues, (2) direct injection with HIV-contaminated drugs, needles, syringes, blood or blood products, and (3) from HIV-infected mothers to fetus in utero, through intra-partum inoculation from mother to infant, or during breast-feeding.

There are activities with greater risk than others.

- One area of high risk centers on not using a condom when having sex with a person who has HIV. All sexual encounters, with someone who has HIV, that are unprotected invites risk. Unprotected anal sex is riskier than unprotected vaginal sex as there is more opportunity for tearing of tissue and blood exchange.
- Among men who have sex with other men, unprotected receptive anal sex is riskier than unprotected insertive anal sex. Unprotected oral sex can be a risk for HIV transmission, but it is a much lower risk than anal or vaginal sex.
- **Having multiple sex partners increases risk due to multiple exposures.**
- **The presence of herpes, hepatitis or other STDs, while sexually active, can increase the risk of infection.**
- **Sharing needles, syringes, rinse water, or other equipment used to prepare illicit drugs for injection are a source of high risk. Soaking items in alcohol will not decrease risk.**
- HIV can be passed from mother to child during pregnancy, but the risks can be reduced with good prenatal evaluation and treatment.
Less common modes of transmission include:

- Being “stuck” with an HIV-contaminated needle or other sharp object that has blood on it is worthy of attention, especially for healthcare workers.

- Receiving blood transfusions, blood products, or organ/tissue transplants that are contaminated with HIV was a risk prior to 1985. With advanced testing methods instituted in 1985, the risk is extremely remote due to the rigorous testing of the U.S. blood supply and donated organs/tissue. The US blood supply is now among the safest in the world.

- HIV may also be transmitted through unsafe or unsanitary injections or other medical or dental practices. However, the risk is also remote with current safety standards in the U.S.

- Eating food that has been pre-chewed by an HIV-infected person. The contamination occurs when infected blood from a caregiver’s mouth mixes with food while chewing. This appears to be a rare occurrence and has only been documented among infants whose caregiver gave them pre-chewed food. (CDC)
A human bite by someone who is HIV positive results in a very small number of cases. This is related to severe trauma with extensive tissue damage and the presence of blood. There is no risk of transmission if the skin is not broken.

Infected fluids (blood, semen, vaginal secretions, breast milk, spinal fluid, fluid around bone joints, and fluids surrounding an unborn baby) have to come into contact with mucous membranes or damaged tissue to allow transmission.

Tattooing or body piercing present a potential risk of HIV transmission, but no cases of HIV transmission from these activities have been documented. Only sterile equipment should be used for tattooing or body piercing. HIV does not live in ink for very long; hepatitis can live in ink much longer.
### Primary Modes of Transmission: HIV

- **specific bodily fluids**: blood, semen/cum, pre-seminal fluid/pre-cum, rectal fluids, vaginal fluids, breast milk
- **direct blood-to-blood contact**: injection or damaged tissues or mucous membranes
- **having unprotected sex**: anal sex has the highest risk, vaginal sex has the second highest risk; abstinence has lowest risk
- **sharing needles**, syringes, rinse water, or other equipment/works used to prepare injection drugs

### Summary Slide

- **You can’t get infected by scratches, spit, shaking hands, using a toilet, drinking from the same glass, mosquitoes, playing sports (bleeding should be stopped and covered), restaurant careless-ness, sneezing, or coughing.**

- **Can I get another kind of HIV if I am already infected?**
  - **There are 2 types of dual, or multiple, HIV infection. The initial infection with HIV is known as acute or primary infection.**
    1. **Coinfection** is infection with one or more viral strains at or near the same time.
    2. **Reinfection** with a different strain, also known as superinfection or serial infection, takes place later on during the acute phase of initial infection, or later on during the chronic long-term stage of infection. The effects of superinfection differ from person to person. For some people, superinfection may cause them to get sicker faster because they become infected with a new strain of the virus that is resistant to the medicines they are currently taking to treat their original HIV infection. Research suggests that the kind of superinfection where a person becomes infected with a new strain of HIV that is hard to treat is rare, less than 4%.

- **Regarding mutations, while HIV is furiously reproducing there are bound to be errors. Because millions of copies can be made daily, some will be called mutants. HIV mutations occur naturally all the time in everyone with HIV, whether on medications or not.**
These two diagrams show us how HIV interacts with T cells in the immune system.

- Recent explorations are discovering that the immune system cells targeted by the HIV virus include macrophages, T-4 Helper T cells, and B cells. Helper T-cells, which are the primary target of HIV are necessary for producing specific antibodies which destroy numerous bacteria and viruses.

- **HIV is a retrovirus which is visually represented in the picture on this slide. A retrovirus is able to insert its genetic material (HIV RNA) into the host’s genetic material (host DNA). These cells then reproduce and HIV is reproduced in the process.**

- A person is infectious if he or she is capable of transmitting HIV to a susceptible individual. Any one who is HIV positive is considered infectious for life. Compared to other STDs, HIV is not considered highly infectious. What makes one person more infectious than another depends on the efficiency of transmission. *(Hatcher, 2010)*

- HIV can exist for long periods of time in the immune system without causing symptoms. The person could appear healthy for 10 years or longer. The length of time that a person could appear healthy or asymptomatic (without clinical symptoms) is influenced by the health of the infected person. As the body is stressed and the immune system is compromised, the virus multiplies more rapidly, causing overt symptoms to appear. *(Hatcher, 2010)*

- The concern with HIV progression relates to opportunistic infections, which are infections that the body is unable to fight off or suppress due to the fact that the body’s immune system has already been seriously compromised by HIV. Opportunistic infections that could prove deadly include: chronic wasting syndrome, Kaposi’s sarcoma (a cancer more prevalent in men), bacterial pneumonia and yeast infections (more likely in women), herpes simplex co-infection, tuberculosis, dysplasia, candidiasis (thrush, fungal infections), diseases of the eyes, infections to the brain, and meningitis.
HIV disease progression occurs along a continuum. There are three major stages.

**The 1st stage is the acute infection period.** In this stage, which can last for several weeks, the virus is establishing itself in the body. Up to 70% of people newly infected experience “flu-like” symptoms (fevers, chills, night sweats, rashes). After experiencing these initial flu-like symptoms, people resume feeling and looking normal. During this initial stage the virus makes its way to the lymph nodes where it actively replicates itself. This burst of rapid HIV replication usually lasts two months. At this stage, the person has a very high viral load. Detection and formation of antibodies take roughly 6 to 12 weeks and the person will not test positive for HIV antibodies. During the period of early infection, a person has the greatest chance of passing HIV infection to others.

**The 2nd stage is the clinical latency period.** This stage has two phases: (1) the asymptomatic stage and (2) the early- and medium-stage of HIV symptomatic disease. During the asymptomatic stage, people feel normal and can feel well for many years. During this time the only indication of HIV infection is through testing or the presence of swollen lymph glands. During this time, even though, the person feels great – the virus is slowly dismantling their immune system and this can go on for longer than 10 years.

**Early and Medium Stage HIV Symptomatic Disease is when people being experiencing mild HIV disease symptoms such as skin rashes, fatigue, night sweats, slight weight loss, mouth ulcers, and fungal skin and nail infections.** It can take 5 to 7 years for the mild symptoms to appear. As the disease progresses, typical problems include chronic oral or vaginal thrush, recurrent herpes blisters, ongoing fevers, persistent diarrhea, and significant weight loss.

**The 3rd stage is late-stage HIV disease also known as AIDS.** With AIDS, the T-cell count drops down to 200 or less, and opportunistic infections develop. These are infections and illnesses that the normal immune system can suppress or present. According to the CDC, an AIDS diagnosis includes an HIV infection, a T-cell CD4 count under 200 cells/mm³ of blood, and 1 or more OIs. Having AIDS is not an imminent death sentence. With treatment it may be possible to keep HIV from progressing to AIDS.
HIV testing tells a person if they have been infected by HIV. Most tests are “antibody” tests that look for the antibodies that the body would have created in response to infection. Antibodies are proteins produced by the immune system to fight off a specific germ. Seroconversion is the process of going from having no antibodies in one’s blood (a seronegative result) to having detectable antibodies (a seropositive result). 99% of the cases of seroconversion occur within 6 months.

The most common HIV test is a blood test. Newer tests can detect antibodies in mouth fluid, a scraping from inside the cheek, or urine. Antibody tests are the most common and look for HIV antibodies, not HIV, within bodily fluids. Rapid HIV tests results are available within 10 – 30 minutes after giving a sample of blood, oral fluid, or urine. In November 2010 the FDA approved the INSTI test which gives results within 60 seconds. In 2012, the FDA approved the first true “in-home” HIV test which uses a mouth swab and shows results in 20 – 40 minutes. The Enzyme Immunoassay (EIA) tests blood, oral fluid and urine and can take up to 2 weeks for results.

Antigen tests require a blood sample and look for the HIV-specific antigens; antigen tests can test a person within 1-3 weeks of infection. PCR test is a polymerase chain reaction test, which detects the genetic material of HIV itself and can identify HIV within 2-3 weeks of infection.

Babies are tested using a special PCR test that does not pick up the mother’s antibodies; the special PCR test is able to determine if the baby has HIV.

A viral load test will measure how quickly the virus is multiplying and the strength of the immune system based on a CD4 count.
HIV testing:

- Types of HIV tests:
  - Antibody tests
  - Antigen tests
  - PCR (Polymerase chain reaction) test
  - Home test kits

- Test locations
- Testing frequency
- Pre-post test counseling
- Opt-out testing
- Confidential and anonymous testing - HIPAA

MITA ADD-ON SLIDE (not NAADAC visible)

- HIV test results fall under the same privacy rules as all of your medical information and cannot be released without your permission. HIPAA ensure the privacy of individuals’ health information is protected while ensuring access to care.

- There are two types of HIV tests:
  - Confidential testing means your name and other identifying information will be attached to your test results and will be in your medical record.
  - Anonymous testing means that noting ties your test results to you. You receive a unique identifier that allows you to get your test results. Not all HIV testing sites offer anonymous testing.

- Since the beginning of the epidemic, AIDS cases have been reported to state health departments using names based reporting. The state tracks all STDs including HIV for the purposes of public health surveillance. The state health department removes all personal information about you (name, address, etc.) and shares the remaining non-identifying information with the Centers for Disease Control so they can best track national health trends. The CDC does not share the information they receive from the states with anyone.

- In 2006, Opt-Out Testing was adopted as a policy so that routine testing for everyone occurs between ages 13 – 64 and all pregnant women. For HIV this means that HIV tests will be done routinely unless a patient explicitly refuses to take an HIV test. This Opt-Out Testing helps more people find out if they have HIV, helps those infected to find out sooner, decreases numbers of babies born with HIV, reduces stigma associated with HIV testing, and enables those who are infected to take steps to protect partners.
• **Who should be tested?** Anyone who is sexually active should get tested regularly for HIV, including IV drug users, and meth or other drug users. In 2013, a panel of U.S. experts recommended that everyone between the age of 16 and 65 be tested, even if they have no known risks of HIV infection. A person, for the most part, has the right to refuse an HIV test (those who can’t refuse include: blood/organ donors, military applicants, active duty personnel, Federal and state prison inmates, newborns in some states, and immigrants).

• **What is a False Negative?** It is possible to be recently infected but not have developed antibodies yet. The time of infection could have been in close timing to the blood test or the infection has not been detected by the body yet in order to mount an immune system response/attack. For someone who has had a high risk exposure, and their blood test comes back negative, it is recommended that they be retested in 3 to 6 months. If it is still negative at the second testing, the person is considered HIV negative.

• **If a person engages in risky behavior – they should get tested once a year.** HIV testing is available, at no cost, nationwide. Clients can contact their local health department, public health clinics, doctor’s office, STD clinics, or local AIDS service organizations.

• **Treatment involves medications and lifestyle changes.** As this slide shows, medications are needed to fight the viral activity at each stage of the HIV life cycle.
• Being diagnosed as HIV+ means that 2 HIV tests have both come back positive for antibodies for HIV or HIV virus has been detected. The confirmation blood test is called the Western blot test.

• Once you have been infected with HIV, you will always carry it in your body. Being HIV + does not mean you have AIDS. HIV is a serious infectious disease that can lead to death if left untreated.

• Today, with the many scientific and technological advances HIV is now a chronic manageable disease. People can lead normal productive lives while coping with the HIV.

• HIV, like diabetes, require lifestyle changes and regular monitoring for successful treatment. The difficulty of managing either diabetes or HIV will depend on the overall health of the person living with the condition, the severity of the disease itself, adherence to treatment, and many other factors.

• In the early 1980s when the HIV/AIDS pandemic began, people with AIDS were not likely to live longer than a few years. Today, there are 37 antiretroviral drugs (ARV) approved by the FDA for treating HIV infection. These treatments do not cure people of HIV/AIDS; these medications suppress the virus even to undetectable levels. Having undetectable levels does not mean that the virus has been eliminated completely. By suppressing the virus or interrupting the virus’s ability to engage T cells or attacking it directly, people infected with HIV can lead longer and healthier lives. They are still infectious and must continuously take ARV drugs in order to maintain their quality of health.
There are 6 major types or categories of drugs used to treat HIV/AIDS. These are called antiretroviral (ARV) drugs because they act against the HIV virus.

- There are two types of Reverse Transcriptase Inhibitors (RTIs). The process of converting RNA into DNA is called reverse transcription. Reverse transcriptase inhibitors work to prevent the HIV enzyme reverse transcriptase (RV) from converting single-stranded HIV RNA into double-stranded HIV DNA.

- One type of RTI is called: nucleoside/nucleotide reverse transcriptase inhibitors (NRTIs). NRTIs are faulty DNA building blocks. When one of these faulty building blocks is added to a growing HIV DNA chain, no further correct DNA building blocks can be added on – which stops the HIV DNA synthesis.
Drug Categories – based on their actions

✓ Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs):

- NNRTIs are “non-nukes” that act in a manner very similar to NRTIs; non-nukes block HIV’s ability to use the enzyme reverse transcriptase to correctly build the new genetic material (DNA) that the virus needs
- NNRTIs work directly on the enzyme to prevent it from working correctly

- Medications that act as NNRTIs include:
  - Edurant (rilpivirine, or RPV) • Intelence (etravirine, or ETR)
  - Rescriptor (delavirdine, or DLV) • Sustiva (efavirenz, or EFV)
  - Viramune XR and Viramune (nevirapine, or NVP)

• Non-nucleoside reverse transcriptase inhibitors (NNRTIs) bind to the enzyme reverse transcriptase (RT), interfering with the enzyme’s ability to convert HIV RNA into HIV DNA.
Protease inhibitors interfere with the HIV enzyme called protease. The enzyme protease normally cuts long chains of HIV proteins into smaller individual proteins. When protease does not work properly, new virus particles cannot be assembled.
Drug Categories – based on their actions

✓ Entry/Fusion Inhibitors:

• These medications work to block the virus from ever entering your cells in the first place.
• HIV needs a way to attach and bond to your CD4 cells, and it does that through special structures on cells called receptor sites. Receptor sites are found on both HIV and CD4 cells (they are found on other types of cells too).
• Fusion inhibitors can target those sites on either HIV or CD4 cells and prevent HIV from "docking" into your healthy cells.

• Medications that act as Entry/Fusion Inhibitors include:
  ▪ Fuzeon (enfuvirtide, T-20, ENF)  ▪ Selzentry (maraviroc, or MVC)

• Entry inhibitors interfere with the virus’ ability to bind to receptors on the outer surface of the cell it is trying to enter. When receptor binding fails, HIV cannot infect the cell.

• Fusion inhibitors interfere with the virus’s ability to fuse with the cellular membrane, preventing the HIV virus from entering a cell.
Drug Categories – based on their actions

✓ Integrase Inhibitors:

• HIV uses your cells’ genetic material to make its own DNA (a process called reverse transcription) – think “photocopy machine”. Once that happens, the virus has to integrate its genetic material into the genetic material of your cells. This is accomplished by an enzyme called integrase.

• Integrase inhibitors block this enzyme and prevent the virus from adding its DNA into the DNA in your CD4 cells. Preventing this process prevents the virus from replicating and making new viruses.

• Medications that act as Integrase Inhibitors include:
  - Isentress (raltegravir, or RAL)
  - Dolutegravir (or DTG) (investigational drug)
  - Elvitegravir (or EVG) (investigational drug)

• Integrase inhibitors block the HIV enzyme Integrase, which the virus uses to integrate its genetic material into the DNA of the cell it has infected, like the T-cell.
Drug Combinations: Fixed-dose Combinations

- These are not a separate class of HIV medications but combinations of the above classes and a great advancement in HIV medicine.

- They include antiretrovirals which are combinations of 2 or more medications from one or more different classes. These antiretrovirals are combined into **one single pill** with specific fixed doses of these medicines.

- Multi-class combination products combine HIV drugs from two or more categories, into a single product.

- To prevent strains of HIV from becoming resistant to a category of antiretroviral drugs, the CDC and National Institute of Allergy and Infectious Diseases recommends that people infected with HIV take a combination of antiretroviral drugs in an approach called highly active antiretroviral therapy (HAART).
• People infected with HIV who take ARV treatments sometimes find it difficult to adhere to their drug regimens. This can be caused by the complexity of having to take several drugs every day or the unpleasant side effects that may result from some medicines, such as nausea and vomiting. However, when patients fail to take their medicines, HIV has an opportunity to create variations of itself, including drug-resistant variations or mutations.
• The goal of HIV treatment is to find the right combination of medicines at the right dosage that will be powerful enough to find the HIV in the body, without too many side effects.
• Short term side effects include: anemia, diarrhea, dizziness, fatigue, headaches, nausea and vomiting, pain, nerve problems, and rashes.
• Long-term side effects include:
  • problems with how body produces, uses and stores fat
  • abnormalities in blood sugar levels
  • increase in cholesterol and triglycerides
  • decrease in bone density, which increases the risk for injury & fractures
  • and the build-up of lactate, which is a cellular waste product that can cause problems ranging from muscle aches to liver failure
The next group of slides are geared towards clinicians who work with addictive behaviors: we can work towards decreasing HIV transmission amongst clients.

• Unfortunately, despite the advances in treatment and prevention, roughly 50,000 new HIV infections still occur annually in the Nation. A main reason for the epidemic’s stubborn persistence is that an estimated 1 in 5 individuals with HIV do not know they are infected. As a result, they do not receive HAART and are less likely than those who know they are HIV-positive to take precautions to avoid passing the virus to others.

• Patients were more likely to take a rapid HIV test when substance abuse treatment programs offered the test onsite rather than referring to offsite testing. Patients were more to determine their HIV status when they were offered onsite testing accompanied by 30 minutes of risk reduction counseling or 5 minutes of brief information on the testing procedure.

• Highly active antiretroviral therapy (HAART) not only benefits the health of individuals with HIV and a history of injection drug use but also reduces transmission of the virus to others in the community.

• HAART treatment, which has already been demonstrated to dramatically reduce mother-to-child and sexual transmission of HIV, also markedly reduces HIV transmission amongst people who have a history of illicit injection drug use.
Research demonstrates unequivocally that drug abusers benefit most from HAART when they also receive treatment for their substance use disorders. Effective therapy enables patients to remain in anti-HIV treatment, adhere to HAART, and better maintain healthy lifestyles that reduce their risk of infecting others. Studies have shown that, for example, HIV-positive opioid injectors who are treated with methadone or buprenorphine adhere to HAART as strictly as HIV-infected patients who do not use drugs. In another study, providing methadone therapy to HIV-positive patients who had been using heroin weekly or more often was associated with a rise in immune system cells. Treatment of stimulant abuse may be particularly important, as cocaine and methamphetamine have been shown to accelerate HIV replication in patients’ blood.

- Crack cocaine and methamphetamine, in particular, reduces HAART effectiveness by increasing the number of specialized receptors that HIV to attaches to.
- According to two recent studies by NIDA-funded investigators, one found that crack cocaine users who are infected with HIV experience an accelerated decline in immune function that is independent of their adherence to therapy. In the other, cocaine and methamphetamine increased both the ease with which the HIV virus entered immune cells in laboratory cultures and its replication rate once inside the cells. When the data were analyzed, they showed an association between crack cocaine use and more plentiful virus in users' blood that was independent of their degree of antiretroviral adherence. There were no significant differences in viral load associated with use of powdered cocaine, marijuana, or alcohol. Alcohol and marijuana have been shown to slow down the immune system’s response to problems.
- "We need to get these patients into drug treatment, not only because drug use affects adherence to HIV medications, but because we now know that drug abuse impacts disease progression itself."
• As clinicians, we can help clients rethink “I don’t want to know.” The earlier HIV can be detected, the greater our chances of infection containment and the greater the person’s chances of slowing down the progression of the disease. As demonstrated by the picture on this slide, brain tissue loss can be devastating.

• It is anxiety-provoking to be testing for HIV. It can be anxiety-provoking to get a negative antibody test result, especially if you know you have been exposed or have engaged in high risk behavior. It is anxiety-provoking to get a positive antibody test result. “What is going to happen to me?” Clinicians can help clients develop coping strategies for their anxiety and concern.

• Drug abuse and addiction have been inextricably linked with HIV/AIDS since the beginning of the epidemic. While intravenous drug use is well known in this regard, less recognized is the role that drug abuse plays more generally in the spread of HIV by increasing the likelihood of high-risk sex with infected partners. The intoxicating effects of many drugs can alter judgment and inhibition and lead people to engage in impulsive and unsafe behaviors. Also, people who are abusing or addicted to drugs may engage in sexually risky behaviors to obtain drugs or money for drugs. Nearly one-quarter of AIDS cases stem from intravenous drug use, and one in four people living with HIV/AIDS in the period of 2005–2009 reported use of alcohol or drugs to an extent that required treatment.
Cultural considerations:

• “African Americans report less risky behavior than other groups yet are still most heavily impacted by HIV. It has been said that the intense focus on privacy in many African-American communities creates a “veil of secrecy” around HIV, making it profoundly difficult for many individuals to be open about their HIV status.”

• Another cultural consideration: “People who live in poverty are more concerned with food and housing than condom negotiation and safe sex behaviors … Let’s be real, if I can’t afford my next meal or next month’s rent, do you think I’m going to make a big deal about using condoms?”

• By 2015, experts predict that more than half of all HIVers in the U.S. will be 50 or older. Yet we have only begun to truly grasp exactly what it means to be getting older while living with HIV – physically, mentally and emotionally. Aging with HIV presents a plethora of issues and challenges that include stigma and isolation; the physical aging that comes with age and HIV; the responsibility among doctors to improve the quality of life of their patients; and the importance of seniors being empowered.

• Among Latinos, both HIV and the behaviors associated with it are highly stigmatized. Latino gay men often carry enormous shame, a sense of isolation and loneliness, and the belief that they hurt their families by being gay. For Latinos with HIV, the decision to disclose is shrouded in feelings of fear, shame, and anticipated rejection, and is greatly influenced by familismo (family is the primary unit within Latino culture) and simpatia (desire to maintain harmony, politeness, respect in relationships).

• More than 1 in 3 women in the United States has experienced rape, physical violence, or stalking by an intimate partner in her lifetime; of these women, 69% report experiencing intimate partner violence at age 25 or younger, and 22% experience IPV for the first time as girls between the ages of 11 and 17 years. Furthermore, approximately 280,000 women in the United States were living with HIV in 2009, with an estimated 15% unaware of their status. Women account for 20% of new HIV infections in the United States, with over three-quarters of these new infections occurring among black and Latina women.
For people who are currently living with HIV, substance abuse negatively affects their health and well-being in a variety of ways, including:

- **Examples of physical effect include:**
  - the fact that Methamphetamine can lead to tooth decay, significant weight loss, impaired blood circulation, liver damage, kidney damage, and damage to specific receptors in the brain.
  - the fact that drugs like methamphetamine and cocaine have been known to affect your immune system, making you more susceptible to infection
  - the fact that use of some substances interfere with HIV medications and other medications that may be a part of the plan of care

- **Examples of behavioral effects include:**
  - the fact that recreational drugs can make you feel really good—but what goes up must come down. Coming down from a high from many substances can create feelings of exhaustion, pain, confusion, irritability, and/or depression.
  - Getting high can make it hard for you to remember to take your HIV meds.
  - Getting high can make it hard for you to remember to make or keep doctor appointments and clinic visits.
  - Using drugs may impair your judgment about sexual risk behaviors—making you less likely to use safer-sex practices and increasing the risk that you could transmit HIV or get another sexually transmitted disease (STD) that could complicate your HIV infection.
What are examples of scientific research focused on decreasing the risk of contracting HIV?

- The HIV prevention strategy in which people at risk of exposure to HIV take antiretroviral drugs to reduce their chance of becoming infected (often referred to as pre-exposure prophylaxis or PrEP) - may be a cost-effective method of preventing HIV in populations with high risk of exposure and/or infection by HIV. [http://dx.doi.org/10.1371/journal.pmed.1001401](http://dx.doi.org/10.1371/journal.pmed.1001401)

- A new medical device will begin clinical trials on human. This new intravaginal ring filled with an ARV drug is easy to use, long lasting, and has had 100% success protecting primates from simian IDV. This ring has been the product of 10 years of research – this intravaginal ring can prevent against multiple HIV exposures over an extended period of time, with consistent prevention levels throughout the menstrual cycle. The active drug is tenofovir, which is used worldwide with millions of people orally. [http://dx.doi.org/10.1073/pnas.1311355110](http://dx.doi.org/10.1073/pnas.1311355110)

- The persistence of HIV is partially due to its ability to disable the cell’s altruistic suicide pathway, which is normally activated when a cell becomes infected or damaged.

- According to a study at Rutgers New Jersey Medical School, the topical anti-fungal drug Ciclopirox causes HIV-infected cells to commit suicide by jamming up the cells’ power. Ciclopirox eradicates infectious HIV from cell cultures, with no rebound of virus when the drug is stopped. [http://dx.doi.org/10.1371/journal.pone.0074414](http://dx.doi.org/10.1371/journal.pone.0074414)
• Broad use of a rapid HIV test is encouraged due to the fact that 60% of persons tested do not return for the test results. The results are available in 10 minutes.

• Co-occurring disorders can be intertwined and difficult to diagnose and treat. Therefore it is important to identify all health and mental health conditions that may be impacting an individual or family, and to address and treat all of the conditions in an integrated and comprehensive manner. (NIDA)

• Concurrent medical conditions that are particularly difficult: hypertension, chronic liver disease, and hepatitis C. Life on the streets makes it difficult for individuals to avoid malnutrition and to receive appropriate care for diabetes, HIV/AIDS, tuberculosis, and pulmonary and heart disease.

• In addition, some anti-HIV drugs can have mental health side effects. Receiving an HIV diagnosis can produce strong emotional reactions. Initial feelings of shock and denial can turn to fear, guilt, anger, sadness, and a sense of hopelessness. Some people even have suicidal thoughts. It is understandable that one might feel helpless and fear illness, disability, and even death. (APA)
Studies showed that faster overall progression to AIDS came with increasing age, an effect noticeable after the age of 40.

The rate of disease progression was also faster among younger children, especially newborn HIV-positive babies.
The slowest rate of progression to AIDS was seen in teenagers.
Faster rates of disease progression have been reported in Africa compared to Europe and North America.
Most research suggests that pregnancy alone does not hasten HIV disease progression.

Poverty, poor nutrition, poor living conditions, homelessness, lack of access to testing and/or medical care are the most significant co-factors for enhancing disease progression.
Herpes, chlamydia, and hepatitis are STDs that are significant co-factors for disease progression.
HARM REDUCTION:

- A rumor persists on the street that alcohol is a disinfectant and therefore, dipping one’s needle in beer is sufficient. Seventy percent rubbing (isopropyl) alcohol does destroy HIV in less than a minute, however 3.2% beer will have no effect. Soaking the equipment for 20 minutes in 70% alcohol is thought to be better insurance. The person who wants to get high is not going to wait that long nor will they typically have that strength of alcohol readily available. (Hatcher, A., 2010)

- Bleach destroys other disease organisms as well as HIV and therefore provides the least expensive yet effective means for cleaning drug works. (Hatcher, A., 2010)

- Needle exchange programs across the US have been effective for infectious disease containment. This has been a controversial procedure that some equate with endorsing drug use – but in fact, addicts have gone back to agencies where they got needles to get treatment when ready to tackle sobriety.

- Nonoxynal-9 has been shown to increase risk for HIV due to micro-tears caused by the spermicide.
• *Latex condoms, when used consistently and correctly, are highly effective in preventing the sexual transmission of HIV.*

• HIV infection is, by far, the most deadly STD, and considerably more scientific evidence exists regarding condom effectiveness for prevention of HIV infection than for other STDs. The body of research on the effectiveness of latex condoms in preventing sexual transmission of HIV is both comprehensive and conclusive. The ability of latex condoms to prevent transmission of HIV has been scientifically established in “real-life” studies of sexually active couples as well as in laboratory studies. *(CDC)*
• We have had international as well as national cases of people who have been “functionally cured” of their HIV. Their viral