Prevention of Sexual Transmission of HIV/AIDS
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Objectives
1. Review the factors associated with the sexual transmission of human immunodeficiency virus (HIV).
2. Evaluate the risk factors related to the sexual transmission of HIV.
3. Address the importance of safer-sex education.
4. Analyze key components of a successful prevention program to stop sexual transmission of HIV.

Key Points
1. HIV can be transmitted through exposure to any of four body fluids: blood, semen, vaginal fluids, and breast milk.
2. Sexual intercourse is the major route of transmission throughout the world.
3. Prevention of transmission is the most realistic strategy for slowing the HIV pandemic.
4. To sustain a sexually transmitted pandemic, an individual must have unprotected sex with at least two partners, becoming infected by one and passing the infection on to at least one other.
5. The presence of another sexually transmitted infection may increase the risk of HIV transmission.
6. Safer-sex practices reduce the risk of acquiring HIV.
7. Correct and consistent use of latex condoms during sexual intercourse can greatly reduce the chances of acquiring or transmitting HIV.
8. Even when both partners are infected, latex condoms should still be used to prevent transmission of different strains of HIV.
9. Evidence suggests that male circumcision can reduce the chances that a man will acquire HIV during a sexual encounter.
10. Combination prevention should be encouraged as the risk-reduction standard.

Overview
Sexual intercourse is the major route of transmission of human immunodeficiency virus (HIV) throughout the world. Although we maintain hope that an effective anti-HIV treatment or vaccine will be made available on a wide scale in the future, a cure or vaccine for AIDS is unlikely within the next several years. Therefore, prevention remains the most realistic strategy for slowing the HIV pandemic. The power of preventive interventions makes it theoretically possible to eradicate HIV from the planet. If everyone who is currently infected with HIV did not transmit it to anyone else, the virus would burn out and disappear. Thus it is vitally important to design, implement, analyze, and continually improve our prevention efforts. This module reviews facts about the sexual transmission of HIV. These include risk factors for sexual transmission of the virus and specific interventions known to be effective in reducing its spread. This module also provides evidence that prevention programs can be effective and describes essential elements found in most successful interventions.

Risk Factors for Sexual Transmission
The precise risk of HIV transmission from one act of sexual intercourse is not known. Whereas some people have had multiple sexual contacts with an infected person without acquiring HIV, others have become infected from one sexual encounter. Repeated intercourse with an HIV-infected person increases the risk of infection. The risk of becoming infected with HIV as a result of sexual intercourse depends on the following:
- Probability that the sexual partner is infected
- Number of sexual partners
- Type of sexual contact involved
- Amount of virus present in the blood or secretions of the infected partner
Presence in either partner of other sexually transmitted infections (STIs) and/or genital lesions, which increase the risk of HIV transmission

**Probability that Sexual Partner Is HIV Infected**
The prevalence of HIV infection among sexually active people varies in different areas and among population subgroups within each area. The extent to which HIV spreads between groups with high-risk behavior and the larger population depends on whether members of those high-risk groups have sex with people who do not share their high-risk behaviors and on whether condoms are used in those sexual encounters. For example, a married man who has sex with a sex worker is engaging in a high-risk behavior. If that man also has sex with his wife without a condom, the wife is at risk of acquiring HIV. If the wife becomes HIV infected, she may pass the virus to the couple’s children during pregnancy, birth, or breastfeeding. This is an example of how HIV spreads from high-risk groups into the general population. As infection rises in the general population, so does the likelihood of encountering an infected person early in one’s sexual career.

To help sustain a sexually transmitted pandemic, a person must have unprotected sex with at least two partners, becoming infected by one and passing the infection on to at least one other. In fact, because not every encounter between an HIV-positive and an HIV-negative partner results in a new infection, a sustained heterosexual pandemic suggests that a substantial proportion of the population, both male and female, have several sexual partners over their lifetimes. The risk of acquiring HIV from each sexual encounter depends, in part, on the likelihood that the partner is infected. This risk varies based on regional HIV prevalence rates and the type of risk behavior of each potential partner.

**Number of Sexual Partners**
The probability that a person has acquired an STI is, in general, proportional to the number of sexual partners that person has had in recent years. However, in areas where the prevalence of HIV is high, people may become infected who have had only one partner. This fact was illustrated in a study done to determine behavioral and demographic risk factors for HIV infection in Rwanda. Infection rates were higher among women who were single and reported more than one lifetime sexual partner. Women in legal marriages or monogamous partnerships had lower rates of infection, but even among low-risk women, the prevalence of HIV was about 20%. For most of these women, a steady male partner was the source of their HIV risk.

In places where efforts to reduce HIV prevalence have been successful, reducing the number of sexual partners has been a consistent element of prevention programs. Partner reduction was a key factor in the drop in HIV transmission in the homosexual populations of the United States and Europe in the mid-1980s. Community education and a dramatic reduction in the number of gay bathhouses (where men often met for casual sex) were strategies that limited the spread of HIV. Partner reduction is also credited for the drop in HIV prevalence in Uganda in the 1990s. Slogans such as “zero grazing” (faithfulness to one partner) and “love faithfully” were an important part of Uganda’s early response to HIV.

**Type of Sexual Contact Involved**
All types of sexual intercourse carry a risk of HIV transmission. Although existing data suggest differences in the relative risks of various types of intercourse, the precise level of risk associated with each is not known. Trauma to the mucous membranes of the rectum or vagina may make transmission of HIV more efficient, but it is not essential for transmission to occur. The highest risk of HIV infection occurs among women and men who engage in receptive anal intercourse with an infected partner. Vaginal intercourse carries a higher risk for men and women than oral sex.

Sexual intercourse refers to penetration of the penis into an orifice: vagina, rectum, or mouth. Sexual behavior is any act of sexual gratification, whether between two or more individuals or by oneself. Sexual intercourse is a risk behavior for acquiring HIV and other STIs, but not all sexual behaviors promote risk. Sexual behavior in which the exposure of infectious body fluids is minimized, such as intercourse using a condom, is considered risk reduction, or safer sex. Sexual practices with no exposure or exchange of infectious body fluids are considered prevention, or safe sex. These include but are not limited to hugging, dry kissing, masturbation, and frottage (rubbing).

HIV can be transmitted through exposure to blood, semen, vaginal fluids, or breast milk. Any activity that...
directly exposes a person to any of these body fluids is risky.

Amount of Virus Present in Blood or Secretions of the Infected Partner
A person infected with HIV remains infectious throughout their or her lifetime and may transmit the virus sexually at any time or stage of disease. Although a person may be tested for HIV-infection, screening alone will not prevent transmission because an HIV-infected person may transmit the virus for a period of time before the infection can be detected. The period between initial infection and detection of the virus by such means as PCR (polymerase chain reaction) is called the “eclipse period,” and the period between initial infection and the time antibodies are detected is referred to as the “window period.” An HIV-infected person is infectious during both the eclipse and window periods regardless of diagnosis of infection. This is an important aspect of prevention that underscores the need for consistent risk reduction behaviors even if a partner appears healthy and their or her HIV status is negative.

HIV-infected individuals are believed to become more infectious if newly infected (during the acute retroviral period) or as they progress to AIDS. In theory, those who have fewer particles of virus circulating in their bodies have fewer particles of virus to pass to their partners during unprotected sex. However, even newly infected persons who show no overt signs of immune compromise can transmit HIV infection. Also, they are more likely to have many sexual partners than do people who have clear symptoms of disease. Mathematical models suggest that the primary HIV infection interval—the time before an infected person shows symptoms of HIV—may account for as many as half of all infections. If this is true, the primary infection interval presents a special window within which it is possible to have a major effect on the spread of HIV.

Presence of Other STIs
There is increasing evidence that the presence of another STI in one or both partners increases the risk of HIV transmission. Genital ulceration, such as may occur with chancroid, syphilis, or herpes simplex virus infection, appears to increase susceptibility to infection. This may be because blisters, small tears, and other openings in the mucosal lining of the vagina or on the skin of the penis provide a portal that allows HIV to enter the body.

Prevention of Further Sexual Transmission Within the HIV-Positive Population
This module focuses on prevention of sexual transmission of HIV from an infected partner to an uninfected partner. However, even if both partners are infected, condoms still should be used to prevent further transmission. There are different types (strains) of HIV, and partners infected with different types might infect each other. Some researchers believe that certain types of HIV may be stronger and inflict more damage on the immune system than others. Reinfection occurs when a person gets more (different) HIV types in his or her system. If partners have different treatment histories with antiretroviral medications, medication-resistant strains could be transmitted from one partner to another. Safer-sex practices such as condom use help protect against reinfection. They also protect against other STIs, such as hepatitis, syphilis, gonorrhea, parasites, and herpes.

Safer-Sex Education
A person can take certain actions to reduce the risk of acquiring HIV. Education about these actions is an essential element of every successful prevention campaign. Everyone must be made aware of how to avoid acquiring HIV and must be empowered to act on that information. The following concepts are widely known as the elements of ABC prevention campaigns.

ABC Prevention Campaign Elements
Know Your Status. This element encourages individuals to seek voluntary counseling and testing (VCT) services in order to assess personal risk and determine their HIV status and is considered by many as a prerequisite to
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the ABC prevention campaign. The Kingdom of Lesotho launched the world’s first nationwide testing campaign on December 1, 2005, to encourage testing of all persons by 2007 through VCTVoluntary counseling and testing and door-to-door testing.

Abstinence. Refraining from sexual intercourse is the best way to prevent transmission of HIV and other STIs. Abstinence means not engaging in any sexual activity in which there is a direct or theoretical risk of exposure to blood, semen, or vaginal fluid.

Be faithful. If two partners are tested for HIV and found to be uninfected, they may enter into a strictly monogamous sexual relationship, and neither will be at risk of contracting HIV infection sexually. However, if one partner engages in sex with a third party, even one time, both partners are at risk of acquiring the virus. Monogamy works as a prevention strategy only if both partners are known to be uninfected when their sexual relationship begins and if neither partner has sex, even one time, outside this relationship.

Condoms. Correct and consistent use of latex condoms during sexual intercourse (vaginal, anal, and oral) can greatly reduce the chances of acquiring or transmitting HIV and other STIs. Natural-membrane condoms, often made from sheep gut, are not recommended, because they have tiny pores through which HIV can pass.

“Consistent use” means using a condom with each act of intercourse. Correct condom use involves all the following steps:

- Use a new condom for each act of vaginal, anal, or oral intercourse.
- Always check the expiration date on the condom package. Discard expired condoms.
- Put on the condom as soon as erection occurs and before any vaginal, anal, or oral contact with the penis.
- Hold the tip of the condom and unroll the condom onto the erect penis, leaving space at the tip of the condom but ensuring that no air is trapped in the tip.
- Adequate lubrication is important to prevent condom breakage, but use only water-based lubricants, such as glycerin. Oil-based lubricants, such as petroleum jelly, cold cream, hand lotion, and baby oil, can weaken the condom.
- Withdraw from the partner immediately after ejaculation, holding the condom firmly at the base of the penis to keep it from slipping off.
- Dispose of condoms after each and every use. Never reuse or share a condom.

The promotion and supply of condoms should be viewed as specific disease-control measures. Condoms should not be seen merely as contraceptives or as associated with a particular social or sexual lifestyle.

Common myths about condom use include the following:

- Condoms don’t work: If used correctly and consistently (during every sexual encounter), latex condoms are highly effective in preventing transmission of HIV and other STIs.
- Condoms often break: Condom breakage is extremely rare when condoms are used correctly. Using oil-based lubricants can weaken latex, causing the condom to break.
- HIV can pass through condoms: Intact latex condoms provide a barrier to HIV and much smaller microorganisms, such as hepatitis B. Natural-membrane condoms, often made from sheep gut, have tiny pores through which HIV can pass, so they are not recommended.
- Education about condom efficacy promotes sexual activity: The World Health Organization (WHO) reviewed 19 studies and found no evidence that sex education programs increased sexual activity among young people. In fact, five of the studies showed that such programs can lead young people to delay or decrease sexual activity.

Postponement

Another potentially powerful prevention message is postponement. Postponement means delaying intercourse until two partners are tested and found to be uninfected. Postponement is an empowering concept, especially for young people, for whom abstinence may have an “eternal” or “forever” connotation.

Microbicides

Microbicides are substances that are designed to block the transmission of or inactivate HIV when applied vaginally or rectally prior to intercourse. The advantage of such agents is that they are receptive partner controlled and could be used by both men and women. The ideal microbicide would
1. come in many forms (e.g., cream, gel, suppository, films, lubricants),
2. prevent other STIs,
3. have both contraceptive and noncontraceptive forms,
4. be stable at tropical temperatures,
5. be nonteratogenic (not causing birth defects),
6. be compatible with latex,
7. be inexpensive,
8. be easy to use, and
9. be accessible to all.

To date, however, microbicides are still under development and have not yet been found to be effective in preventing the transmission of HIV or other STIs. Recent trials studying the microbicidal effects of a detergent with antifertility activities (cellulose sulfate) were discontinued by an independent data monitoring committee because preliminary results suggested a potential increased risk of HIV in women who used the compound. There has been no further explanation for why cellulose sulfate was associated with a higher risk of HIV infection than placebo. Previous studies with the use of a spermicidal compound containing nonoxynol-9 also demonstrated an increased risk of HIV acquisition, but this was postulated to be due to the vaginal irritation associated with its use. This does not appear to be the case with cellulose sulfate because colposcopy, evaluation of the microflora, and the assessment of inflammatory cytokines did not demonstrate genital irritation after 6-14 days or at 6 months of use. According to a review of microbicidal drug candidates by the WHO, many candidate compounds are still under development and evaluation. There are possibilities that first-generation microbicidal products could be available by 2009. If they fail, second-generation products could become available by 2012.

**Male Circumcision**

There is now evidence from three randomized, controlled clinical trials conducted in Kenya, Uganda, and South Africa that male circumcision reduces the risk of heterosexually acquired HIV infection in men by approximately 60%. These results support long-term observations of a lower prevalence of HIV infection in countries where male circumcision is most commonly practiced. There are several factors that may contribute to the biologic basis for this finding. First, the foreskin of the penis has a more dense concentration of certain cells (called Langerhans cells) that are known to be more susceptible to HIV infection than other skin cells. Also, the foreskin may be more likely to get microscopic tears during intercourse that could provide a “door” portal for HIV to enter the body. Third, HIV-containing secretions may stay in the retracted foreskin for a longer period of time after intercourse, which would increase the duration of exposure to the virus. Finally, there is also a higher prevalence of other sexually transmitted infections in non-circumcised men, and the presence of other STIs can increase the risk of acquisition of HIV. The evidence for a reduction of HIV acquisition risk in the context of male circumcision has led the World Health Organization to formally announce recommendations on male circumcision for HIV prevention. The WHO has stated that male circumcision should be a part of a comprehensive HIV prevention package. Of course, male circumcision services should be offered with full adherence to principles of basic human rights, including informed consent, confidentiality, and absence of coercion. Male circumcision is an important aspect to a comprehensive and integrated HIV/STI prevention campaign. It is an additive component and when included with the ABCs provides for an effective combination prevention spectrum of interventions.

**Female Condom**

The recent marketing of the female condom has generated considerable interest, especially among those who are allergic to latex. The female condom is made of polyurethane, not latex, so someone who is allergic to latex can use it without reaction. Although laboratory studies indicate that the device serves as a barrier to HIV, further research is needed to determine its effectiveness in preventing transmission of HIV. If a male condom cannot be used, consider using a female condom.

In settings with limited or no access to condoms (e.g., prisons and rural or remote areas), promoting “anything is better than nothing” with respect to risk reduction should always be encouraged. Helpful steps include limiting a person’s number of sexual partners, withdrawal prior to ejaculation, and abstaining from intercourse during menstruation.

**Preexposure Prophylaxis for HIV Infections**

Preexposure prophylaxis (PrEP) describes the use of antiretroviral treatments by HIV-seronegative people at
high risk for exposure to HIV in an attempt to prevent the infection. Limited animal data suggest that medications taken prior to and at the time of exposure can prevent the development of HIV infection. Individuals would therefore begin antiretroviral medications prior to the HIV exposure and continue the medications throughout the risk period. PrEP studies to date have been done using tenofovir alone or in a fixed-dose combination with emtricitabine (known as combo-PrEP). PrEP is one of the most promising HIV prevention methods currently being tested, but its safety and effectiveness are currently unknown. Many of the medical trials have been stopped because of ethical concerns such as exposing members of control groups to HIV. Also, there is concern that PrEP might provide people with a false sense of security, thereby encouraging risky sexual behavior. PrEP is not intended to be an alternative to condom use or other accepted preventive approaches. Although PrEP will not be able to rid the world of HIV, it will be widely used if its efficacy and safety are demonstrated because compared with vaccines or microbicides, these medications are currently widely available. This intervention will therefore require substantial resources and infrastructure support as well as continued medical education for users and providers.

ABC campaigns have been shown to be effective in helping prevent the spread of HIV.

Challenges for Sexual Prevention Programs

The design and implementation of interventions to reduce sexual HIV transmission confront several challenges:

- A reluctance to discuss sexual matters publicly has been a constant hindrance in the battle against HIV. An example is the failure of many political leaders of the most HIV-affected countries to embrace prevention through safer-sex education. This silence has been observed on national, regional, and local scales.
- Inaccurate risk perception often leads to unsafe sex. This has been described as the “downhill phenomenon,” in which people always compare their own risk with that of someone who is at much greater risk. Doing so leads to an incorrect assessment in which the person sees himself or herself as being at lower risk for HIV than objective evidence would suggest.
- Most models of behavior change have been developed in North America and emphasize actions that an individual can take to reduce his or her risk of HIV infection. However, much of the world’s population lives in collectivistic rather than individualistic societies. In this context, the emphasis on and opportunity for individual behavior change are decreased.
- Those most exposed to HIV prevention messages often acquire “prevention fatigue.” In high-income countries, this phenomenon has been implicated in the rise of HIV-infection rates among risk groups who are well educated and well informed about HIV and HIV prevention.
- Myths about how to cure HIV exist in all parts of the world. There currently is no cure for HIV. One particularly damaging myth that is prevalent in southern Africa is that having sex with a virgin will cure a person of HIV infection. This myth is responsible for a growing epidemic of child sexual
assault and rape. Having sex with a virgin will not cure HIV and will expose the virgin (often a child) to the infection.

- In developed countries where access to effective treatments has dramatically improved healthy survival rates, prevention efforts have been stymied by attitudes among risk subpopulations that there is a “cure.” This will be a challenge in other regions as populations see a marked improvement in health outcomes because of access to antiretroviral therapy.

**Aspects of Successful Sexual Prevention Interventions**

Stopping HIV transmission through behavior change is a complicated challenge, but data indicate that HIV prevention efforts can indeed work. Even modest gains through behavior change in key subpopulations (e.g., commercial sex workers and at-risk adolescents) can produce substantial gains for the entire population. In Uganda, reduction of HIV transmission through behavior change has been equivalent to a vaccine of 80% effectiveness. Aspects of successful HIV prevention campaigns include the following:

- **Education** on how HIV is transmitted and how exposure to it can be minimized or eliminated is a central element of all HIV prevention campaigns. Consistent and persistent education over time is important. Complicated behavior changes (such as those involving an person’s decision making regarding sexual practices) are unlikely after a one-time-only intervention. Because sexual behavior is private and many sexual behaviors meet with community disapproval, education must be provided for the entire population to reach all those at risk. Particular attention should be paid to adolescents and young adults, who are entering the age of sexual exploration.

- **Successful interventions** are usually based on a clear understanding of the realities of target populations and involvement of members of those populations in the development of prevention efforts. Support from the community is crucial. If HIV is so heavily stigmatized that people do not even discuss it, prevention interventions such as condom distribution are unlikely to be effective.

- **Interventions** that emphasize clarity, simplicity, and feasibility for the target population have the greatest chance of success. The concept of harm reduction is helpful in guiding feasible interventions. This concept emphasizes specific behaviors that can minimize risk when eliminating risk is not feasible. For example, if it is not feasible to shut down the industry of sex workers in a region, providing education and condoms to sex workers and their customers may minimize the number of cases of HIV transmission that occur.

- **Successful prevention programs** often include training in interpersonal skills, such as talking about sexual practices, discussing the avoidance of risks with a partner, and asserting personal preference in a sexual relationship (including abstinence from sex, nonpenetrative sex, or the use of condoms).

An example of a successful behaviorally based prevention model comes from Uganda. In Uganda, HIV prevalence nationally among pregnant women peaked in 1991 at 21.1% and by 1998 declined to 9.7%. By 2000, prevalence had declined further to 6%. Although population-based surveys show that there was an increase in the age of sexual debut and an increase in condom use during this period, this striking reduction in HIV prevalence is believed to be due largely to a decrease in the number of casual or nonregular sexual partners. From the beginning of the Ugandan HIV/AIDS pandemic, the government communicated a clear warning and prevention recommendation: AIDS, or “slim,” was fatal and required an immediate population response based on “zero grazing” (faithfulness to one partner). In addition to the government’s efforts, data suggest that social networks played a crucial role in information dissemination in Uganda. By 1995, 91.5% of men and 86.4% of women in Uganda were aware of AIDS as having infected or killed someone they knew. This finding suggests that credible communication of alarm and advice had taken root in discussions in social networks to a greater extent in Uganda than in neighboring countries. Furthermore, the communication process may have provided greater personal exposure to the fear-evoking consequences of the pandemic and thus catalyzed the process of behavior change.
**Summary**

This module provides educates and informs on the prevention of sexual transmission of HIV. Other modules go into more detail about issues such as counseling and common psychological responses to a positive HIV test result. The precise risk of HIV transmission from one act of sexual intercourse is not known. The risk of becoming infected with HIV as a result of sexual intercourse depends on several factors, including the number of sexual partners a person has, the presence of other STIs, and the type of sexual contact involved. Refraining from sexual intercourse with an infected partner is the best way to prevent transmission of HIV and other STIs. Correct and consistent use of latex condoms during sexual intercourse (vaginal, anal, and oral) can greatly reduce the chances of acquiring or transmitting HIV and other STIs. Finally, there is the encouraging fact that HIV prevention programs can indeed work. At this point, prevention is the most realistic strategy for slowing the HIV pandemic. Thus it is vitally important to design, implement, analyze, and continually improve our prevention efforts.

**References**