Nonoccupational Postexposure Prophylaxis

Introduction

Background and History

In the mid-1990’s, postexposure prophylaxis (PEP) was recognized as a safe and effective intervention to prevent the acquisition of HIV for healthcare workers exposed to HIV-contaminated blood or body fluids. In contrast, the use of nonoccupational postexposure prophylaxis (PEP) for a sexual or injection drug use HIV-related exposure has been more controversial. In 1997, the Centers for Disease Control and Prevention (CDC) concluded there was insufficient evidence regarding the efficacy of nonoccupational PEP to recommend either for or against its use, but in 2005 the CDC and the Department of Health and Human Services revised its position and issued nonoccupational PEP guidelines.[1] These guidelines were updated in 2016 by the CDC and Department of Health and Human Services.[2] Although existing guidelines recommend PEP for non-occupational exposures to HIV, the actual use of nonoccupational PEP has not achieved widespread acceptance and implementation.[3] Strategies for preventing nonoccupational HIV acquisition include abstinence, consistent and correct use of condoms, mutually monogamous sex with a partner not infected with HIV, abstinence from injection drug use (or if this is not possible, then consistent use of sterile injection equipment), and daily use of HIV preexposure prophylaxis (PrEP).[2] Despite decades of efforts to implement these risk-reduction programs, during the past decade approximately 38,000 new HIV infections have occurred annually in the United States.[4, 5] In some instances, the need for nonoccupational PEP arises, due to condom breakage, condomless sex with a person later identified as HIV-positive, sharing injection equipment, sexual assault, or nonoccupational percutaneous injuries. Clinicians should view the use of nonoccupational PEP as one of many HIV prevention options. In addition, clinicians evaluating individuals for nonoccupational PEP should recognize these individuals may be candidates for future use of PrEP.

Challenges with Nonoccupational PEP

A number of challenges may arise during the initial evaluation of persons for nonoccupational PEP after sexual and other non-occupational exposures. First, with some exposures, the person seeking help may not actually know the HIV status (or any other information) of the source person. Second, the exposure that brings the exposed person in for medical attention may not consist of an isolated event, but instead may be among multiple recent potential HIV exposure events; if this is the case, it is still necessary to assess the need for nonoccupational PEP for any significant exposures occurring within the last 36-72 hours (depending on which guidelines are being used). Third, individuals often present for care more than 72 hours after the exposure. Fourth, certain sexual exposure events may involve concomitant exposures to other sexually transmitted pathogens, or hepatitis viruses with injection drug (or percutaneous needlestick) exposures. Fifth, some nonoccupational PEP cases involve persons recently sexually assaulted, which can involve additional medicolegal concerns and complications.[6, 7] Last, from a practical perspective, insurers may not cover the cost of the 28-day course of nonoccupational PEP, or they may only partially cover the cost. In addition, some persons
with a nonoccupational HIV exposure may not have insurance coverage or they may also choose not to submit claims through their insurance plan. Despite these challenges, nonoccupational PEP remains an important prevention tool.

**Nonoccupational PEP Guidelines**

In 2016, the CDC and Department of Health and Human Services issued revised guidelines for nonoccupational exposure to HIV in the document *Updated Guidelines for Antiretroviral Postexposure Prophylaxis After Sexual, Injection-Drug Use, or Other Nonoccupational Exposure to HIV—United States, 2016.*[2] Hereafter, these guidelines will be referred to as the “Nonoccupational PEP Guidelines”.[2] The Nonoccupational PEP Guidelines address a wide range of issues related to nonoccupational PEP, including initial evaluation, medication efficacy, potential medication risks and side effects, laboratory testing, recommended regimens, and monitoring.[2] In addition, the use of PrEP has emerged as an important HIV prevention tool, and the 2016 Nonoccupational PEP Guidelines address transitioning from nonoccupational PEP to PrEP.

**Nonoccupational PEP Expert Consultation**

The evaluation and management of persons seeking care for nonoccupational PEP is complex, and decisions regarding whether to administer nonoccupational PEP often fall into zones of uncertainty. The National Clinician Consultation Center is a federally funded program that provides free, expert decision support for clinicians managing non-occupational exposures. Medical providers can access this free service via the [Post-Exposure Prophylaxis PEPline](tel:(888)-448-4911) at (888)-448-4911. The hours for PEPline phone consultation are 9 a.m.–9 p.m. Eastern Standard Time (EST) seven days a week. The PEPline can assist clinicians calling from the United States, but it is not a direct information or consultation service for patients.
Rationale for Providing Nonoccupational PEP

Due to ethical and logistical reasons, it is unlikely that a prospective randomized, placebo-controlled trial to evaluate nonoccupational PEP in humans will ever take place. In addition, human nonoccupational PEP studies are problematic because participants may have multiple exposures over the surveillance-testing period, making it difficult to discern the true benefit of nonoccupational PEP for a single exposure event.[7] Thus, the rationale for providing nonoccupational PEP is based on extrapolation from use of PEP in other settings, animal studies, retrospective reviews, and observational trials.

Extrapolation from Occupational and Perinatal PEP Data

The rationale for nonoccupational PEP is based on the efficacy of PEP following occupational exposures to HIV. Most notably, in 1997, investigators reported findings from a case-control study involving healthcare workers who sustained needlestick injuries from source individuals who have HIV infection; this study demonstrated PEP with zidovudine, taken within 4 hours by most of the participants, reduced the risk of HIV seroconversion by 81%.[8] In addition, several important perinatal transmission trials involving mothers with HIV infection have established the benefit of using PEP given to the mother during labor and to the baby following birth.[9] For instance, a Ugandan study reported that administering single-dose nevirapine to mothers during labor and to their infants within 72 hours of birth reduced the vertical HIV transmission rate from 25.1% to 13.1%.[10] Based on these studies, in which PEP prevented HIV transmission in occupational and perinatal settings, PEP use was expanded to include injection drug use, nonoccupational percutaneous needlestick injuries, and sexual exposures. Meanwhile, ongoing trials have confirmed the efficacy of antepartum and intrapartum antiretroviral therapy to prevent mother-to-child HIV transmission, as well as the efficacy of extended antiretroviral prophylaxis for HIV-exposed infants to prevent breastfeeding transmission.[11,12]

Animal Studies

The use of antiretrovirals for nonoccupational exposures is also partially derived from animal PEP studies. One of the earliest studies showed that tenofovir reduced the rate of seroconversion among macaques inoculated intravenously with simian immunodeficiency virus (SIV), with the greatest reduction in transmission achieved when prophylaxis was initiated as early as possible and continued for 28 days (Figure 1).[13] A later study showed that tenofovir-based PEP is also effective in preventing HIV after intravaginal inoculation of female macaques with HIV-2: tenofovir prevented seroconversion all 8 of the female macaques exposed to HIV-2 when initiated within 12 to 36 hours.[14] A systematic review and meta-analysis of PEP using pooled data of nonhuman primates across 18 studies (mostly involving intravenous inoculation with HIV) further substantiated the efficacy of PEP when initiated as soon as possible after HIV exposure.[15] Studies in macaques have also demonstrated the efficacy of topical PEP for vaginal and rectal exposure to HIV,[16,17] including a study that showed raltegravir gel protected female macaques against SIV infection when applied 30 minutes before or 3 hours after vaginal exposure.[18]

Nonoccupational PEP Data in Humans

Although the human data on nonoccupational PEP is observational in nature and sample sizes have been inadequate to demonstrate a statistically significant reduction in HIV transmission, multiple studies involving men who have sex with men (MSM) suggest that nonoccupational PEP reduced the risk of HIV seroconversion.[19,20] In addition, a feasibility study in San Francisco demonstrated that medical providers could identify and provide appropriate nonoccupational PEP after high-risk sexual and injection drug use-related exposures, as well as maintain exposed persons in care for the necessary follow-up period.[21] In another San Francisco study, investigators evaluated nonoccupational PEP effectiveness among persons with potential sexual or injection drug use
exposures to HIV: of 702 people taking nonoccupational PEP, there were 7 (1%) seroconversions.[7] A detailed analysis of the 7 seroconversions revealed 3 of the 7 probably represented true nonoccupational PEP “failure” since these 3 individuals had no HIV exposures after initiating PrEP; the authors were unable to determine the exact cause for why they failed nonoccupational PEP.

Available data from reports of HIV transmission in persons who received nonoccupational PEP suggest that most HIV transmissions resulted from poor adherence while taking the nonoccupational PEP medications or from exposures to HIV that occurred after completing the 28-day nonoccupational PEP regimen.[22,23,24,25] In addition, one failure occurred in a 40-year-old woman in France who started PEP more than 72 hours after a high-risk sexual exposure.[26] Multiple studies involving sexual assault victims have demonstrated very low HIV transmission rates, but there were significant logistical problems in persons receiving nonoccupational PEP, including poor adherence and high rates of failure to return for follow-up care.[27,28,29,30,31]

Rationale for Nonoccupational PEP in Persons Who Inject Drugs

In the United States, persons who inject drugs make up less than 3% of the population, but accounted for approximately 10% of new HIV infections in 2010.[32] Although the percentage of new HIV infections attributed to injection drug use decreased to 6% between 2010 to 2014, the disproportionate number of new infections among persons who inject drugs likely involves the co-occurrence of risky sexual behaviors (e.g., condomless sex, sex with multiple partners, and transactional sex), as well as overlapping social networks of risk groups.[33,34] Certain circumstances could arise whereby a person who injects drugs and normally uses safe injection practices has a high-risk exposure. Unfortunately, very limited data exist regarding the efficacy of nonoccupational PEP among persons who inject drugs. The use of nonoccupational PEP after injection drug use exposures may have considerably different efficacy compared to sexual exposures and sparse data are available regarding the practical applications or efficacy of nonoccupational PEP in the setting of injection drug use. Of interest, however, one case report described a patient who inadvertently received a large-volume transfusion of HIV-infected blood, but early initiation of PEP prevented transmission of HIV.[35] Based on this, one might extrapolate that nonoccupational PEP could be effective following injection drug use-related exposures to HIV, particularly if started early.[36]
Evaluation for Nonoccupational PEP

Multiple factors influence the risk of HIV transmission in nonoccupational exposures to HIV. The initial evaluation of persons seeking care after potential nonoccupational exposures to HIV involves gathering appropriate information to determine whether nonoccupational PEP is indicated (Figure 2).[2] Accordingly, the initial evaluation of a person with potential nonoccupational exposure to HIV should specifically address: (1) the HIV status of the potentially exposed person, (2) information related to the source person’s HIV status (3) details regarding the type of exposure involved, (4) timing and frequency of the exposure(s), and (5) any available information related to antiretroviral therapy taken by the source patient if they are known to be infected with HIV.[2] Specifically, the initial history intake should include the following:

- **Information on HIV Status of Person Potentially Exposed to HIV**: The first step in evaluating the exposure is to determine the HIV status of the person seeking medical care. Persons with established HIV infection should receive long-term continuous antiretroviral therapy, not a 28-day course of nonoccupational PEP. In the setting of a nonoccupational exposure to HIV, the HIV status of the exposed person should be determined as soon as possible, although HIV testing should not necessarily delay nonoccupational PEP initiation.

- **Information Related to Source Person’s HIV Status**: As part of the initial exposure evaluation, it is also important to determine whether the source person has HIV infection (or, if the status of the source is unknown, whether they are likely to have HIV infection). Often, the HIV status of the source person is not known (and not obtainable). The Nonoccupational PEP Guidelines recommend using nonoccupational PEP when the source person is known to have HIV infection; if HIV status of the source person is not known, the recommendation is to evaluate on a case-by-case basis, ideally in consultation with an expert.[2] When asking about information related to the source, it is important to ask whether other recent exposures occurred with this source (and/or other sources), as recent additional HIV-related exposures could potentially confound management decisions. Nevertheless, repeated exposures do not negate the need to assess whether the most recent exposure warrants nonoccupational PEP.

- **Determination of Risk Related to Exposure**: The other key element of the initial nonoccupational PEP evaluation is to determine whether the exposure confers actual risk for HIV transmission (Table 1).[2, 36] The Nonoccupational PEP Guidelines recommend using nonoccupational PEP only in the case of “substantial risk for HIV acquisition”, defined as contact involving an area of the body known to be associated with HIV acquisition (vagina, rectum, eye, mouth or other mucous membranes, non-intact skin, or percutaneous needlestick injuries) with an infectious body fluid (e.g. blood, semen, vaginal secretions, rectal secretions, breast milk, or any body fluid visibly contaminated with blood). The risk of HIV transmission associated with nonoccupational exposures varies considerably by the type of sexual exposure, with receptive anal intercourse conveying the highest sexual risk.[2, 36, 37, 38, 39] Similarly, mucosal disruption in either the source person or the exposed person (as might occur with traumatic intercourse including sexual assault, or in the presence of ulcerative genital disease) increases risk of sexual HIV transmission: condom use markedly lowers the risk of transmission (Table 2).[36]

- **Timing of Risk Exposure**: It is important to determine the timing of exposure in persons seeking nonoccupational PEP. Available data suggest that PEP may not be effective if initiated beyond 72 hours after the exposure. Furthermore, PEP may not be the optimal long-term HIV prevention method for individuals who engage in activities involving frequent, recurrent HIV exposures, such as sex with an HIV-serodiscordant sex partners without consistently using condoms or regularly sharing needles or equipment with injecting partners; these individuals should receive intensive risk reduction counseling and may instead be better suited for PrEP.[2]

- **Source Person Antiretroviral Treatment Information**: If a source person is known to have HIV infection and takes antiretroviral medications, the provider should determine what medication the source takes, the most recent HIV RNA level, and if the source person has
developed resistance to any antiretroviral medications. The risk of HIV transmission is higher if the source person has advanced HIV disease or high HIV RNA levels.\cite{40}
Recommended Antiretroviral Therapy for Nonoccupational PEP

Indication for Starting Antiretroviral Therapy

If the following criteria are met, a 28-day course of nonoccupational PEP is recommended:[2]

- A person has had a nonoccupational exposure to blood, genital secretions, or other potentially infectious body fluids from a person known to be infected with HIV (if the HIV status of the source person is unknown, the recommendation is to evaluate on a case-by-case basis, ideally in consultation with an expert), AND
- The exposure represents a substantial risk for HIV transmission, AND
- The person seeks care within 72 hours of exposure

Note: Administering nonoccupational PEP with the goal of transitioning to PrEP can be considered beyond the 72-hour window in cases where multiple recent exposures to HIV have occurred more than 72 hours prior, but the most recent exposure occurred within the 72-hour window.

Three-Drug versus Two-Drug Regimens

The 2016 Nonoccupational PEP Guidelines recommend using a three-drug combination in all cases when nonoccupational PEP is indicated.[2] Although no evidence exists that a three-drug regimen is more effective than a two-drug regimen for nonoccupational PEP, the recommendation to use a three-drug combination is primarily based on data demonstrating that three-drug combination antiretroviral therapy achieves excellent virologic suppression as HIV treatment. This approach is supported by one study of 100 participants who received tenofovir DF-emtricitabine plus raltegravir as three-drug nonoccupational PEP, and this regimen was shown to have a high level of tolerability, good safety profile, and high adherence rates; although it was not powered to demonstrate efficacy, no HIV transmissions were observed.[41] In a similar study from Australia, investigators enrolled 86 men who had sex with men to receive tenofovir DF-emtricitabine plus raltegravir for nonoccupational PEP—no HIV seroconversions occurred and the regimen was well tolerated.[41]

Preferred and Alternative Antiretroviral Regimens

The preferred regimen for adult and adolescent patients age 13 years and older who have a baseline creatinine clearance of at least 60 mL/min consists of the fixed dose combination of tenofovir DF-emtricitabine combined with either raltegravir or dolutegravir (Table 3).[2] The alternative regimen is tenofovir DF-emtricitabine plus darunavir plus ritonavir. For adults and adolescents with a baseline creatinine clearance less than 60 mL/min, the preferred and alternative regimens listed above are modified by replacing tenofovir DF-emtricitabine with zidovudine and lamivudine; in this situation, the fixed-dose combination of zidovudine-lamivudine should not be given and doses of zidovudine and lamivudine should be adjusted individually based on renal impairment.[42] If the prescribing medical provider or the patient has concerns about the side effects, potential toxicity, cost, or adherence factors associated with three-drug nonoccupational PEP regimens, a two-drug regimen may be considered. In the Fenway Clinic report of their experience with raltegravir plus tenofovir DF-emtricitabine for nonoccupational PEP in 100 men who have sex with men, the most common adverse effects of the medication regimen were diarrhea and abdominal discomfort (Figure 3).[43] In this same report, investigators compared the regimen completion rates of the contemporary regimen of raltegravir plus tenofovir DF-emtricitabine with historical data in persons receiving zidovudine-lamivudine plus a protease inhibitor for nonoccupational PEP; persons receiving the more contemporary regimen were more likely to complete the therapy as prescribed (Figure 4).[43]

Medications Not Recommended

The antiretroviral medication abacavir, which is commonly used to treat HIV infection, is not
recommended for nonoccupational PEP. Prior to receiving abacavir, all patients should have HLA-B*5701 testing; the HLA-B*5701 test is used to predict abacavir hypersensitivity, a potentially fatal reaction. The need to immediately administer nonoccupational PEP antiretroviral medications does not allow sufficient time to obtain results from HLA-B*5701 testing. In addition, the use of nevirapine for occupational PEP has been associated with life-threatening toxicity and therefore should not be used for nonoccupational PEP.[44]

Consideration of HIV Resistance in Source Patient

If medical information is available regarding a source person known to be HIV-positive, the choice of nonoccupational PEP regimen should take into account the source person's antiretroviral medication history, most recent HIV viral load, and prior resistance testing results. In the event the source person has possible or known antiretroviral drug resistance, expert consultation should be obtained to determine the optimal nonoccupational PEP regimen for the exposed individual.

Recommendation if Source Patient has Undetectable HIV RNA Level

Although the risk of HIV transmission from a partner with an undetectable serum viral load is thought to be very low, it is still possible.[45] The Nonoccupational PEP Guidelines do not specifically discuss whether or not to initiate nonoccupational PEP after an exposure to a source person with HIV infection who has a recent undetectable HIV RNA level.[2] The US Public Health Service 2013 Occupational PEP guidelines recommend offering antiretroviral PEP to health care workers in the setting of occupational exposures to source persons with HIV infection who have an undetectable HIV RNA level.[46] The occupational guidelines emphasize that plasma viral load measurements reflect only the level of cell-free virus in the peripheral blood, not the persistence of HIV in latently infected cells or the level of virus in mucosal tissues.[46]

Duration of Therapy

The Nonoccupational PEP Guidelines recommend that individuals who initiate antiretroviral therapy for nonoccupational PEP should complete a 28-day course.[2] Studies involving macaques have shown that PEP given for 28 days is more effective than 10 days, which is more effective than 3 days.[13] In addition, available data and experience with occupational postexposure prophylaxis support the use of a 28-day regimen.[8,46] From a conceptual standpoint, it is believed that PEP, in most instances, aborts a very early and limited HIV infection, rather than truly preventing any cell in the body from becoming infected with HIV. Thus, early initiation of nonoccupational PEP, when combined with a 28-day duration of therapy, is believed adequate to minimize tissue involvement and contain any local HIV replication while allowing sufficient time for localized immune responses to clear out the limited HIV infection.

Expert Consultation

The Nonoccupational PEP Guidelines provide recommendations for scenarios that warrant expert consultation related to nonoccupational HIV exposure events.[2] Expert consultation is recommended when the healthcare provider has limited experience with prescribing antiretroviral medications or is considering nonoccupational PEP for pregnant or breastfeeding women, children, or persons with renal dysfunction. In addition, consultation is indicated when the source person has known or suspected antiretroviral resistance. Expert consultation can obtained by calling the National Clinician Consultation Center’s Post-Exposure Prophylaxis PEPline at at 888-448-4911; this service is available 9 a.m.-9 p.m. Eastern Standard Time (EST) 7 days a week.
Laboratory Testing for Source and Exposed Persons

The Nonoccupational PEP guidelines provide recommend baseline laboratory studies for the source and the exposure person as well as a schedule of laboratory tests for monitoring the exposed person (Table 4).[2] For the HIV testing, the Nonoccupational PEP guidelines recommend a fourth-generation combination HIV p24 antigen-HIV antibody test using a blood specimen (preferably using a rapid test), or antibody testing if fourth-generation antigen antibody testing is not available. Oral HIV tests are not recommended. Although it is very important to confirm the negative HIV status of the individual presenting for nonoccupational PEP, most experts do not advocate ordering an HIV RNA level (on the exposed person) unless they have signs or symptoms that suggest an acute retroviral illness.

Baseline Laboratory Evaluation

The baseline laboratory evaluation should include the following tests for the individual exposed to HIV:[2]

- HIV Ag/Ab testing (or HIV antibody testing if Ag/Ab test unavailable)
- Serologic testing for hepatitis B virus and hepatitis C virus
- Site-specific screening for sexually transmitted infections (chlamydia, gonorrhea, syphilis)
- Pregnancy test and emergency contraception, as indicated
- Serum creatinine (for calculating estimated creatinine clearance)
- Hepatic aminotransferase levels

Follow-Up Laboratory Studies

According to the Nonoccupational PEP Guidelines, all patients seeking care for nonoccupational PEP need follow-up HIV testing at 4 to 6 weeks after exposure and at 3 months after exposure to determine if HIV transmission has occurred.[2] Ideally, a fourth-generation HIV Ag/Ab test should be used, but HIV antibody testing is acceptable if the fourth-generation HIV antigen-antibody test is not available. Patients should be instructed about the signs and symptoms associated with acute retroviral infection and asked to return for evaluation if these occur during or after nonoccupational PEP.[2] If the exposed person becomes hepatitis C antibody positive as a result of the original exposure, an additional HIV test should be conducted at 6 months postexposure.[2] Of note, the current Nonoccupational Guidelines recommend HCV testing for susceptible exposed persons at baseline and at 6 months, but not at 4 to 6 weeks or 3 months. Many experts recommend HCV RNA (viral load) testing at 4 to 6 weeks for persons who have been exposed to a known HCV-positive source, as evidence of new HCV infection would warrant additional laboratory and timely clinical evaluation. For exposed persons not immune to HBV at baseline, providers should ascertain HBV status of the source if possible and administer HBV postexposure prophylaxis as indicated. Follow-up HBV testing should then be conducted at 6 months.[2]
Nonoccupational PEP in Special Populations and Circumstances

The Nonoccupational PEP Guidelines identify additional considerations for certain special populations as outlined below.

Pregnant Women and Women of Childbearing Potential

The recommended regimens for nonoccupational PEP are generally considered safe during pregnancy. Several antiretroviral medications are considered problematic for use in pregnancy. Due to the risk of potential teratogenicity, efavirenz is classified as FDA pregnancy Category D and should be avoided during the first trimester of pregnancy or in women with childbearing potential. The combination of stavudine and didanosine should not be used due to the risk of lactic acidosis. Indinavir should be avoided due to the risk of nephrolithiasis. Nevirapine should never be used for postexposure prophylaxis due to risk of severe hepatotoxicity. Furthermore, because the efficacy of hormonal contraception can be altered by some antiretroviral medications, women using such methods should be advised to use a secondary form of contraception (i.e. barrier methods) while taking nonoccupational PEP. Among the preferred and alternative recommended regimens for nonoccupational PEP, only darunavir boosted with ritonavir causes significant drug interactions with oral contraceptives. Specific information is not provided in the guidelines regarding use of antiretroviral regimens for nonoccupational PEP in women who are breastfeeding. Expert consultation should be obtained for these cases.

Children and Adolescents

In many pediatric/adolescent nonoccupational PEP cases, expert consultation will be necessary. In the current Nonoccupational PEP Guidelines, the preferred regimen for children aged 4 weeks to less than 2 years of age is a 3-drug regimen of oral zidovudine and lamivudine plus either raltegravir or lopinavir-ritonavir, all adjusted for age and weight. For children aged 2 to 12 years, the preferred regimen is tenofovir DF plus emtricitabine plus raltegravir (dosed according to age and weight). For children age 13 and older with normal renal function, the adult and adolescent preferred and alternative nonoccupational PEP regimens can be used.

Sexual Assault Survivors

Survivors of sexual assault may be less likely to seek care for nonoccupational PEP and may require additional psychological support, clinical follow-up, and adherence counseling. Testing and treatment for other sexually transmitted infections, emergency contraception evaluation, and supportive counseling are also highly recommended in cases of sexual assault.

Inmates

The Nonoccupational PEP Guidelines recommend that correctional facilities establish HIV prevention programs. Elements should include confidential and voluntary HIV testing, risk reduction services, and nonoccupational PEP protocols. The Federal Bureau of Prisons published a clinical practice guideline based on the 2005 CDC Nonoccupational PEP guidelines and recommends that each facility develop its own protocol, but the CDC recommends that the most updated guidelines be used whenever possible.

HIV Postexposure Prophylaxis in Mass Casualty Events

In response to concerns for a potential mass casualty event within the United States, the Centers for Disease Control and Prevention convened a working group to address management of blood-borne pathogen exposure in persons who are injured in bombings and other mass-casualty events, as well as for emergency responders in these catastrophic events. This particular situation does not fall
neatly under the guidelines for either occupational or nonoccupational PEP. Accordingly, a separate
document was published in 2008, which specifically addresses postexposure prophylaxis for HIV,
hepatitis B, hepatitis C, and tetanus in the setting of mass casualties.\[47\] Postexposure prophylaxis
for HIV is not routinely indicated for persons exposed to blood or tissue in bombings or mass-
casualty events. In certain situations, however, nonoccupational PEP might be indicated if the risk for
HIV exposure was determined to be high, such as with bombing of a research facility with HIV-
infected blood specimens or culture vials growing HIV. If postexposure prophylaxis is indicated, the
same principles of timing, laboratory testing, and antiretroviral medication selection should apply.
Initial Medication Prescription and Follow-up after Evaluation

Initial Medication Prescription and Timely Follow-Up

The guidelines recommend that providers should consider giving an initial prescription for 3 to 7 days of antiretroviral medication (e.g. a starter pack) or providing a prescription for an entire 28-day course. Ideally, at the initial visit, the facility would supply the starter pack medication or the full 28-day supply of medication, both to minimize any delay in receiving the first dose and to address any barriers that could prohibit the patient from filling the prescription. In addition, prior to leaving the facility, the person evaluated for nonoccupational PEP should have an early follow-up visit scheduled to assess adherence to nonoccupational PEP, monitor for toxicity, and provide any additional counseling or education that might be needed.[2] If this individual receives only a 3 to 7 day supply of antiretroviral medication, coordination of timely follow-up is essential to ensure the patient does not run out of medication.

Challenges to Follow-Up

A recent study reported significant patient attrition between initial emergency department visit for nonoccupational PEP and first follow-up clinic appointment.[6] Only about half of nonoccupational PEP patients attended their follow-up appointment, and less than a quarter of those initially started on nonoccupational PEP completed the full 28-day regimen. Older age and self-pay status predicted lower rates of follow-up and poor adherence; women were less likely than men to complete the full course of nonoccupational PEP.

HIV Prevention Counseling

Patients who are evaluated for nonoccupational PEP should receive HIV prevention counseling. This includes counseling on risk-reduction behaviors (e.g. using a barrier method with sex partners, not sharing equipment used to inject drugs) and referral to local community resources, if available). At follow-up visits, healthcare providers should assess for ongoing risk behaviors, provide additional counseling, and connect patients with services as needed.
Transition to Preexposure Prophylaxis

Preexposure Prophylaxis (PrEP)

Multiple studies conducted in recent years have demonstrated that daily use of PrEP (most commonly given as a fixed-dose combination of tenofovir DF-emtricitabine) protects against HIV infection among heterosexuals at high risk for HIV acquisition,[48, 49, 50, 51] men who have sex with men (MSM) and transgender women,[49, 52, 53] and persons who inject drugs.[54] These studies show that PrEP is a feasible and effective HIV prevention strategy that may be more protective than repeated courses of nonoccupational PEP. In July 2012, the FDA approved tenofovir DF-emtricitabine for use as PrEP in individuals with ongoing high risk of HIV acquisition. In May 2014, the U.S. Public Health Service issued a clinical practice guideline, “Preexposure Prophylaxis for the Prevention of HIV Infection in the United States”. The guideline recommends that individuals with frequent and multiple exposures to HIV, such as MSM who report condomless anal sex with a partner who has HIV infection, should not be managed with repeated courses of nonoccupational PEP, but instead strongly considered for PrEP. Clinicians with questions about PrEP can call the National Clinician Consultation Center’s Pre-Exposure Prophylaxis PrEPline at 1-855-448-7737 for expert consultation. The PrEPline is available Monday – Friday, 11 a.m.–6 p.m. EST.

General Approach to Transition from Nonoccupational PEP to PrEP

Many individuals who present for nonoccupational PEP following a sexual or injection drug use exposure may be candidates for PrEP, particularly if they report ongoing high-risk behavior(s) for HIV acquisition. The US Public Health Services 2014 Preexposure Prophylaxis Guideline states that persons who repeatedly seek nonoccupational PEP should be evaluated for PrEP eligibility (after completing nonoccupational PEP if indicated); this includes confirming their HIV-negative status.[55] The Nonoccupational PEP Guidelines build on the Preexposure Prophylaxis Guideline by describing the transition from nonoccupational PEP to PrEP, recommending immediate PrEP initiation following nonoccupational PEP completion and documentation of the person’s HIV-negative status, preferably with a fourth-generation HIV Ag/Ab test.[2] This approach removes the interval between completing nonoccupational PEP and starting PrEP, which diminishes the risk of HIV transmission to individuals with significant ongoing risk. The guidelines state there is no evidence that receipt of nonoccupational PEP delays HIV seroconversion.[2] Some experts, however, have expressed concern that delayed HIV seroconversion might occur following nonoccupational PEP, complicating the timely detection of acute HIV and inadvertently leading to partial HIV treatment (with only tenofovir DF and emtricitabine) for a person with HIV infection. Two alternative options for transitioning from nonoccupational PEP to PrEP include (1) complete nonoccupational PEP and wait until the 3-month post nonoccupational PEP follow-up HIV p24 antigen-antibody test is negative, or (2) complete nonoccupational PEP and perform HIV RNA testing 2 to 3 weeks after completing nonoccupational PEP and, if testing is negative, then start PrEP. Given the complexity of transitioning patients from nonoccupational PEP to PrEP, we recommend non-expert clinicians obtain expert consultation to discuss timing and testing strategies for patients transitioning from nonoccupational PEP to PrEP.
Concerns with Nonoccupational Postexposure Prophylaxis

Toxicity of Antiretroviral Therapy

Initial concerns about severe side effects and pharmacological toxicities in otherwise healthy persons have been ameliorated by the use of less toxic, well-tolerated antiretroviral agents.\[56\]

Use of Nonoccupational PEP and Drug Resistance Mutations

Selection of drug-resistant HIV can potentially result from the use of nonoccupational PEP. The development of HIV drug resistance during receipt of nonoccupational PEP is highly unlikely because few individuals receiving nonoccupational PEP will develop HIV infection and emergence of new resistant strains would be uncommon following a 28-day course of a potent three-drug antiretroviral nonoccupational PEP regimen. Nonoccupational PEP should not be withheld due to theoretical concerns about the potential selection of drug-resistant HIV.

Use of Nonoccupational PEP and Changes in High-Risk Behavior

Some clinicians have expressed concern that availability of nonoccupational PEP could theoretically result in behavioral disinhibition among individuals at risk for HIV infection.\[3\] Multiple studies involving MSM have shown that risk behavior does not necessarily increase after individuals receive nonoccupational PEP.\[21, 57, 58\] In one study in San Francisco, 72% of nonoccupational PEP recipients reported a decrease in risk behavior over the next 12 months, 13% reported no change, and 14% reported an increase in risk behavior; in that study, 17% of participants requested a repeat course of nonoccupational PEP within the following year.\[57\] In a separate study, investigators reported that 12% of individuals requested a second course of nonoccupational PEP within 6 months of the initial nonoccupational PEP course.\[21\] In a study that specifically examined whether the knowledge of nonoccupational PEP availability would lead to an increase in risk behavior, there was no difference in risk behavior among men who have sex with men exclusively and who knew about nonoccupational PEP versus those who had never heard of it.\[58\] Taken together, the available data suggest that receipt of nonoccupational PEP (consisting of both antiretroviral prophylaxis and counseling) does not increase HIV risk behaviors nor has it been linked to an increase in HIV prevalence. Of note no studies have been published that have examined changes in injection drug use patterns among persons who inject drugs who have received a course of nonoccupational PEP.
Summary Points

- Nonoccupational PEP represents an important tool in the arsenal of HIV prevention but remains an underutilized strategy.
- As a whole, there is a body of data that supports use of nonoccupational PEP and indicates it may reduce the risk of HIV infection after nonoccupational exposures to HIV.
- The use of antiretroviral medications for nonoccupational PEP is recommended for HIV-negative persons following an exposure that has a substantial risk for HIV acquisition, if started within 72 hours of the exposure.
- A 28-day course of three-drug antiretroviral medications is recommended for nonoccupational PEP.
- The preferred nonoccupational PEP regimen for adult and adolescents aged 13 years and older who have a baseline creatinine clearance of at least 60 mL/min consists of the fixed dose combination of tenofovir DF-emtricitabine plus either raltegravir or dolutegravir.
- The person exposed to HIV should have baseline laboratory studies that include HIV testing, screening for sexually transmitted infections, serum creatinine, aspartate aminotransferase (AST) and alanine transaminase (ALT) levels, testing for viral hepatitis, and a pregnancy test (if indicated).
- Expert consultation should be sought for all situations that fall outside the scope of the guidelines, including situations when exposure to drug-resistant HIV has occurred. Consultation can be obtained through local expertise (if available) or by calling the National Clinician Consultation Center’s Post-Exposure Prophylaxis Hotline (PEPline) at 888-448-4911.
- All patients seeking care for nonoccupational PEP should have follow-up HIV testing at 4 to 6 weeks and again at 3 months to determine if HIV infection has occurred. The fourth-generation combination HIV p24 antigen-HIV antibody test is preferred for all testing. Additional HIV testing should be conducted at 6 months if the exposure resulted in HCV transmission.
- Nonoccupational PEP has not been linked to high rates of adverse side effects, selection of resistant HIV virus, or increases in risky behaviors.
- Some patients who seek nonoccupational PEP should be evaluated as potential candidates to receive PrEP following completion of nonoccupational PEP.
Citations


[PubMed Abstract]

[PubMed Abstract]

[PubMed Abstract]

[PubMed Abstract]

[PubMed Abstract]

[PubMed Abstract]

[PubMed Abstract]

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[PubMed Abstract] -

[PubMed Abstract] -

[PubMed Abstract] -
In this study, investigators inoculated 24 macaques with simian immunodeficiency virus (SIV) and then instituted various postexposure prophylaxis regimens with tenofovir, which is (R)-9-(2-phosphonylmethoxypropyl). Source: Tsai CC, Emau P, Follis KE, et al. Effectiveness of postinoculation (R)-9-(2-phosphonylmethoxypropyl) adenine treatment for prevention of persistent simian immunodeficiency virus SIVmne infection depends critically on timing of initiation and duration of treatment. J Virol. 1998;72:4265-73.

<table>
<thead>
<tr>
<th>Study Hour</th>
<th>SIV Inoculation</th>
<th>Start PEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Placebo x 28d</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>TFV x 3d</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>TFV x 10d</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>TFV x 28d</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>TFV x 28d</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>TFV x 28d</td>
<td></td>
</tr>
</tbody>
</table>

Tenofovir (PMPA) = (R)-9-(2-phosphonylmethoxypropyl) adenine
Among animals that received placebo, all became infected with simian immunodeficiency virus (SIV). The most effective tenofovir prevention regimen consisted of early initiation of tenofovir (at 24 hours) and long duration of postexposure prophylaxis (28 days).

**Figure 2 Algorithm for Evaluation and Treatment of possible nonoccupational HIV exposures**

Figure 3 Symptoms Associated with Raltegravir plus Tenofovir DF-Emtricitabine for Nonoccupational PEP

This graph shows the side effect profile of 100 men who have sex with men who received raltegravir plus tenofovir DF-emtricitabine for nonoccupational PEP. The most common adverse effects were diarrhea and abdominal pain.

Figure 4 Fenway Clinic Experience with Completion of Nonoccupational PEP Therapy

Abbreviations: PI = protease inhibitor  This graphic compares the Fenway clinic nonoccupational PEP experience with a contemporary regimen of tenofovir DF-emtricitabine plus raltegravir with historical data with zidovudine-lamivudine plus a protease inhibitor. Individuals taking the more contemporary regimen were more likely to complete the therapy as prescribed.

Table 1.

**Estimated Per-Act Probability of Acquiring HIV from an Infected Source, by Exposure Act**

<table>
<thead>
<tr>
<th>Exposure Type</th>
<th>Rate for HIV Acquisition per 10,000 Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parenteral</strong></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>9,250</td>
</tr>
<tr>
<td>Needle sharing during injection drug use</td>
<td>63</td>
</tr>
<tr>
<td>Percutaneous (needlestick)</td>
<td>23</td>
</tr>
<tr>
<td><strong>Sexual</strong></td>
<td></td>
</tr>
<tr>
<td>Receptive anal intercourse</td>
<td>138</td>
</tr>
<tr>
<td>Insertive anal intercourse</td>
<td>11</td>
</tr>
<tr>
<td>Receptive penile-vaginal intercourse</td>
<td>8</td>
</tr>
<tr>
<td>Insertive penile-vaginal intercourse</td>
<td>4</td>
</tr>
<tr>
<td>Receptive oral intercourse</td>
<td>Low</td>
</tr>
<tr>
<td>Insertive oral intercourse</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>Biting</td>
<td>Negligible</td>
</tr>
<tr>
<td>Spitting</td>
<td>Negligible</td>
</tr>
<tr>
<td>Throwing body fluids (including semen or saliva)</td>
<td>Negligible</td>
</tr>
<tr>
<td>Sharing sex toys</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

Factors that may increase the risk of HIV transmission include sexually transmitted diseases, acute and late-stage HIV infection, and high viral load. Factors that may decrease the risk include condom use, male circumcision, antiretroviral treatment, and preexposure prophylaxis. None of these factors are accounted for in the estimates presented in the table.

HIV transmission through these exposure routes is technically possible but unlikely and not well documented.

Source:

Table 2.

**Relative Risks of Factors that Alter Per-Act HIV Transmission Risk for Sexual Exposures***

<table>
<thead>
<tr>
<th>Cofactor</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factors that Increase Transmission Probability</strong></td>
<td></td>
</tr>
<tr>
<td>High plasma viral load (log_{10} copies/mL)</td>
<td>2.89</td>
</tr>
<tr>
<td>Genital ulcer disease</td>
<td>2.65</td>
</tr>
<tr>
<td>Acute versus asymptomatic stage of disease</td>
<td>7.25</td>
</tr>
<tr>
<td>Late versus asymptomatic stage of disease</td>
<td>5.81</td>
</tr>
<tr>
<td><strong>Factors that Decrease Transmission Probability</strong></td>
<td></td>
</tr>
<tr>
<td>Use of antiretrovirals by HIV-infected partner</td>
<td></td>
</tr>
<tr>
<td>Early versus delayed</td>
<td>0.08</td>
</tr>
<tr>
<td>Received treatment versus no treatment</td>
<td>0.08</td>
</tr>
<tr>
<td>Preexposure Prophylaxis of HIV-Uninfected Partner</td>
<td></td>
</tr>
<tr>
<td>Among heterosexual couples</td>
<td>0.29</td>
</tr>
<tr>
<td>Among men who have sex with men</td>
<td>0.56</td>
</tr>
<tr>
<td>Among injection drug users</td>
<td>0.52</td>
</tr>
<tr>
<td>Condom use</td>
<td>0.20</td>
</tr>
<tr>
<td><strong>Male Circumcision (heterosexual partners)</strong></td>
<td></td>
</tr>
<tr>
<td>HIV-uninfected partner is male</td>
<td>0.50</td>
</tr>
<tr>
<td>HIV-uninfected partner is female</td>
<td>0.80</td>
</tr>
<tr>
<td><strong>Male circumcision (men who have sex with men)</strong></td>
<td></td>
</tr>
<tr>
<td>Insertive partner is HIV-uninfected partner</td>
<td>0.27</td>
</tr>
<tr>
<td>Receptive partner is HIV-uninfected partner</td>
<td>1.2</td>
</tr>
</tbody>
</table>

*For a detailed description of data and factors used to generate estimates, see original table in article referenced below.

Source:

# Table 3. 2016 CDC and HHS Guidelines for Nonoccupational Exposure to HIV

## Preferred and Alternative 28-Day Regimens for Nonoccupational PEP

**Adults and adolescents aged ≥13 years, including pregnant women, with normal renal function (creatinine clearance ≥60 mL/min)**

**Preferred Regimens:**
- Raltegravir (400 mg twice daily) plus tenofovir DF-emtricitabine (300-200 mg once daily)
- Dolutegravir (50 mg once daily) plus tenofovir DF-emtricitabine (300-200 mg once daily)

**Alternative Regimen:**
- Darunavir (800 mg once daily) plus ritonavir (100 mg once daily) plus tenofovir DF-emtricitabine (300-200 mg once daily)

**Adults and adolescents aged ≥13 years with renal dysfunction (creatinine clearance ≤59 mL/min)**

**Preferred Regimens:**
- Raltegravir (400 mg twice daily) plus zidovudine (dose adjusted) plus lamivudine (dose adjusted)
- Dolutegravir (50 mg once daily) plus zidovudine (dose adjusted) plus lamivudine (dose adjusted)

**Alternative Regimen:**
- Darunavir (800 mg once daily) plus ritonavir (100 mg once daily) plus zidovudine (dose adjusted) plus lamivudine (dose adjusted)

---

*a* These recommendations do not reflect current Food and Drug Administration-approved labeling for antiretroviral medications listed in this table.

*b* Ritonavir is used in clinical practice as a pharmacokinetic enhancer to increase the trough concentration and prolong the half-life of darunavir, lopinavir, and other protease inhibitors. Ritonavir is not counted as a drug directly active against HIV in the above “3-drug” regimens.

+c* The dose adjustments for zidovudine and lamivudine are made based on degree of renal function

---

**Source:**
## Table 4.

**nPEP: Recommended Laboratory Monitoring of Source and Exposed Persons**

<table>
<thead>
<tr>
<th>Test</th>
<th>Source</th>
<th>Exposed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Baseline</td>
</tr>
<tr>
<td>HIV Ag/Ab testing* (or antibody testing if Ag/Ab test unavailable)</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Hepatitis B serology, including: hepatitis B surface antigen</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>hepatitis B surface antibody</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hepatitis B core antibody</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis C antibody test</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Syphilis serology*</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Gonorrhea</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Chlamydia</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Pregnancy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serum creatinine (for calculating estimated creatinine clearance)</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Alanine transaminase, aspartate aminotransferase</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>HIV viral load</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>HIV genotypic resistance</td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

For all persons considered for or prescribed nPEP for any exposure

For all persons considered for or prescribed nPEP for sexual exposure

For persons prescribed:
- Tenofovir DF-emtricitabine + raltegravir
- Tenofovir DF-emtricitabine + dolutegravir

For all persons with HIV infection confirmed at any visit

### Abbreviations
- Ag/Ab, antigen/antibody combination test
- HIV, human immunodeficiency virus
- nPEP, nonoccupational postexposure prophylaxis
- tenofovir DF, tenofovir disoproxil fumarate
For all persons considered for or prescribed nPEP for any exposure

<table>
<thead>
<tr>
<th>Test</th>
<th>Source</th>
<th>Exposed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Baseline 4-6 Weeks after exposure 3 Months after exposure 6 months after exposure</td>
</tr>
</tbody>
</table>

a Any positive or indeterminate HIV antibody test should undergo confirmatory testing of HIV infection status.
b Only if hepatitis C infection was acquired during the original exposure; delayed HIV seroconversion has been seen in persons who simultaneously acquire HIV and hepatitis C infection.
c If exposed person susceptible to hepatitis B at baseline.
d If exposed person susceptible to hepatitis C at baseline.
e If determined to be infected with syphilis and treated, should undergo serologic syphilis testing 6 months after treatment.
f Testing for chlamydia and gonorrhea should be performed using nucleic acid amplification tests. For patients diagnosed with a chlamydia or gonorrhea infection, retesting 3 months after treatment is recommended.
g For men reporting insertive vaginal, anal, or oral sex, a urine specimen should be tested for chlamydia and gonorrhea.
• For women reporting receptive vaginal sex, a vaginal (preferred) or endocervical swab or urine specimen should be tested for chlamydia and gonorrhea.
• For men and women reporting receptive anal sex, a rectal swab specimen should be tested for chlamydia and gonorrhea.
• For men and women reporting receptive oral sex, an oropharyngeal swab should be tested for gonorrhea.
h If not provided presumptive treatment at baseline, or if symptomatic at follow-up visit.
i If woman of reproductive age, not using effective contraception, and with vaginal exposure to semen.
j eCrCl = estimated creatinine clearance calculated by the Cockcroft-Gault formula; eCrClCG = \(\frac{[(140 - \text{age}) \times \text{ideal body weight}] + (\text{serum creatinine} \times 72)}{72} \times 0.85 \text{ for females}\).
k At first visit where determined to have HIV infection.

Source:
