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Human Immunodeficiency Virus Postexposure Prophylaxis for Adolescents and Children

Roland Clayton Merchant, MD, and Reza Keshavarz, MD, MPH

ABSTRACT. Children and adolescents are at risk for human immunodeficiency virus (HIV) infection. Transmission occurs through perinatal exposures, injecting drug use, consensual and nonconsensual sex, needle-stick and sharp injuries, and possibly some unusual contacts. Youth engaging in high-risk sexual activities are especially endangered. Half of the estimated worldwide 5.3 million new HIV infections occur in adolescents and young adults aged 15 to 24. Of 20 000 known new adult and adolescent cases in the United States, 25% involve 13- to 21-year-olds. More than 1.4 million children worldwide (aged 15 and younger) are believed to be infected, and >1640 new cases are diagnosed daily. Of the 432 000 people reported to be living with HIV or acquired immunodeficiency syndrome (AIDS) in the United States, 5575 are children under 13.

HIV postexposure prophylaxis (PEP) is a form of secondary HIV prevention that may reduce the incidence of HIV infections. HIV PEP is commonly conceived of as 2 types: occupational and nonoccupational. Occupational HIV PEP is an accepted form of therapy for health care workers exposed to HIV through their jobs. A landmark study of healthcare workers concluded that occupational HIV PEP may be efficacious. Well-established US national guidelines for occupational HIV PEP exist for this at-risk population.

Nonoccupational HIV PEP includes all other forms of HIV PEP, such as that given after sexual assault and consensual sex, injecting drug use, and needle-stick and sharp injuries in non-health care persons. Pediatric HIV PEP is typically the nonoccupational type. The efficacy of nonoccupational HIV PEP is unknown. The presumed efficacy is based on a collection of animal and human data concerning occupational, perinatal, and nonoccupational exposures to HIV. In contrast to occupational HIV PEP, there are no national US guidelines for nonoccupational HIV PEP, and few recommendations are available for its use for adolescents and children. Regardless of this absence, there is encouraging evidence supporting the value of HIV PEP in its various forms in pediatrics.

Although unproven, the presumed mechanism for HIV PEP comes from animal and human work suggesting that shortly after an exposure to HIV, a window period exists during which the viral load is small enough to be controlled by the body's immune system. Antiretroviral medications given during this period may help to diminish or end viral replication, thereby reducing the viral inoculum to a more potentially manageable target for the host's defenses.

HIV PEP is accepted practice in the perinatal setting and for health care workers with occupational injuries. The medical literature supports prescribing HIV PEP after community needle-stick and sharp injuries and after sexual assault from sources known or likely to be HIV-infected. HIV PEP after consensual unprotected intercourse between HIV sero-opposite partners has had growing use in the adult population, and can probably be utilized for children and adolescents. There is less documented experience and support for HIV PEP after consensual unprotected intercourse between partners of unknown HIV status, after prolonged or multiple episodes of sexual abuse from an assailant of unknown HIV status, after bites, and after the sharing of personal hygiene items or exposure to wounds of HIV-infected individuals.

There are no formal guidelines for HIV PEP in adolescents and children. A few groups have commented on its provision in pediatrics, and some preliminary studies have been released. Our article provides a discussion of the data available on HIV transmission and HIV PEP in pediatrics.

In our article, we propose an HIV PEP approach for adolescents and children. We recommend a stratified regimen, based on the work of Gerberding and Katz and other authors, that attempts to match seroconversion risk with an appropriate number of medications, while taking into account adverse side-effects and the amount of information that is typically available upon initial presentation. Twice daily regimens should be used when possible, and may improve compliance. HIV PEP should be administered within 1 hour of exposure. We strongly recommend that physicians trained in this form of therapy review the indications for HIV PEP within 72 hours of its provision. We advocate that due diligence in determining level of risk and appropriateness of drug selection be conducted as soon as possible after an exposure has occurred. When such information is not immediately available, we recommend the rapid treatment using the maximum level of care followed by careful investigation and reconsideration in follow-up or whenever possible. HIV PEP may be initiated provisionally after an exposure and then discontinued if the exposure source is confirmed to not be HIV-infected. In most cases, consultations with the experts in HIV care can occur after the rapid start of therapy. We also concur with other authors that HIV PEP be given in a therapeutic milieu that encourages compliance with the regimen, support for the psychological or physical trauma that is sometimes associated with the exposure, and/or intensive means to reduce additional HIV exposures.

Our article is an attempt to review the collected experience and scientific underpinnings of HIV PEP in pediatrics, as well as to offer some guidance so that health care providers can make better informed choices regarding its use. We strongly encourage the continued monitoring and research of HIV PEP provision in all of its

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forms so that its appropriate usage can be determined. *Pediatrics* 2001;108(2). URL: <http://www.pediatrics.org/cgi/content/full/108/2/e38>; HIV postexposure prophylaxis, post-exposure prophylaxis, HIV prevention, adolescents, children, pediatric HIV.

ABBREVIATIONS. HIV, human immunodeficiency virus; PEP, postexposure prophylaxis; AIDS, acquired immunodeficiency syndrome; STDs, sexually transmitted diseases; PHS, Public Health Service; SIV, simian immunodeficiency virus; NRTIs, Nucleoside reverse-transcriptase inhibitors; CDC, Centers for Disease Control and Prevention.

Human immunodeficiency virus (HIV) postexposure prophylaxis (PEP) is commonly conceived of as 2 types: occupational and nonoccupational. Occupational HIV PEP is an accepted form of secondary HIV prevention for health care workers exposed to HIV through their jobs. Well-established national guidelines exist for this at-risk population. Nonoccupational HIV PEP includes all other forms of HIV PEP, such as that given after sexual assault and consensual sex, injecting drug use, and needle-stick and sharp injuries in non-health care persons. In contrast to occupational HIV PEP, there are no national guidelines for nonoccupational HIV PEP, and few recommendations are available for its use for adolescents and children. Regardless of this absence, there is encouraging evidence supporting the value of HIV PEP in its various forms in pediatrics. In this article, we review the collected experience and scientific underpinnings of HIV PEP in adults, adolescents, and children, and present its relevance, proposed indications, and suggested regimens for its application in pediatrics.

THE CURRENT STATE OF THE ADOLESCENT AND CHILD HIV/AIDS EPIDEMIC

HIV is a common childhood infection. More than 1.4 million children worldwide (aged 15 and younger) are believed to be infected, and >1640 new cases are diagnosed daily.¹ Of the 432 000 people reported to be living with HIV or acquired immunodeficiency syndrome (AIDS) in the United States, 5575 are children under 13.²

Of 8804 known US AIDS cases in children <13 years old, 91% are the result of perinatal exposure to HIV, 4% are secondary to transfusions, 3% are in patients with hemophilia/coagulation disorders, and 2% are from other causes.² Although perinatal exposure still accounts for the majority of new pediatric AIDS cases, new infections from this route have decreased dramatically. This decrease is likely because of programs in pregnancy prevention and HIV screening, the aggressive treatment of sexually transmitted diseases (STDs) in HIV-infected mothers, the avoidance of breastfeeding in HIV-infected mothers, and the provision of perinatal antiretroviral medications.^{2,3}

Adolescent HIV/AIDS epidemiology follows a pattern different from that in children. Half of the estimated worldwide 5.3 million new HIV infections are in people aged 15 to 24.¹ In the United States, >20 000 new adult and adolescent cases occur yearly

in the 30 states reporting data; approximately 25% are in 13- to 21-year-olds.^{2,4} Almost 100% result from sexual and/or injecting drug exposures. Gender and exposure differences are apparent when adolescents are compared with other groups. Females account for 41% of AIDS cases in adolescents 13 to 19 years old, versus 28% of cases in adults 20 to 24 years old.² For adolescent females, in contrast to adult females, injecting drug exposures are much less often the means of HIV infection.⁵

SCIENTIFIC, HISTORICAL, AND ADULT EXPERIENCE WITH HIV PEP

HIV PEP is typically divided into 2 forms: occupational and nonoccupational.⁶ Occupational HIV PEP is the provision of antiretroviral medications solely to health care workers exposed on the job to HIV through needle-stick, sharp, or splash injuries. Nonoccupational HIV PEP is used for a broader population and for a larger group of exposures. It includes sexual, injecting drug use, and various uncommon exposures (eg, bites and wound touching), and needle-stick injuries not occurring in health care workers on the job. Sexual assault HIV PEP is sometimes regarded as a separate entity from nonoccupational HIV PEP. This separation is based not on its transmission type, but on the nature of the events surrounding its exposure.⁶⁻⁹

The HIV PEP nomenclature is rooted both in the history of HIV PEP development and in an attempt to describe the circumstances of the exposures. Its failure to adequately discriminate among exposures, whether occupational or nonoccupational, is evident in several examples: children stuck by needles found at a playground, sanitation workers cut by sharps in household medical waste, commercial sex workers exposed to HIV through their trade, health care workers sexually assaulted at work, etc. The divisions endure chiefly to distinguish HIV PEP guidelines for health care workers from those for other sources and populations.

Occupational HIV PEP is now a routinely accepted medical practice for particular exposures in health care workers. The US Public Health Service (PHS) issued a statement on occupational HIV PEP in 1990, established national guidelines for its use in 1996, and revised these in 1998.¹⁰⁻¹² An additional update is expected. Public health authorities in other countries have issued similar guidelines.¹³⁻¹⁸

The PHS does not currently recommend or advise against nonoccupational HIV PEP.⁶ Although there are no national guidelines for it, several other groups do advocate and promote the use of nonoccupational HIV PEP. In 1997 and 1998, Gerberding and Katz^{19,20} first outlined the basis of nonoccupational HIV PEP after sexual and injecting drug exposures. In 1998, Bamberger et al⁸ and the New York State Department of Health⁹ proposed formal guidelines for HIV PEP after sexual assault. Coker,^{21,22} Desmond,²¹ and Mackie²² of the United Kingdom and Parschalk and Pernerstorfer-Schon of Austria²³ have published their opinions on the subject, and the French Health Ministry, the New South Wales Department of Health, and the United Kingdom Health Depart-

ments recently issued protocols addressing sexual assault and other nonoccupational exposures.^{24–26} Table 1 contains a summary of some US occupational and nonoccupational HIV PEP approaches. Nonoccupational and occupational regimens commonly stipulate that HIV PEP should be administered as soon as possible after an exposure and taken for 28 days. Gerberding and Katz and the PHS^{6,19,20,27} emphasize that HIV PEP should not occur in isolation, but instead be accompanied by counseling on HIV risk reduction and medication compliance.

The efficacy of nonoccupational HIV PEP is unknown. The presumed efficacy is based on a collection of animal and human data on occupational, perinatal, and nonoccupational exposures to HIV. The data have been reviewed extensively elsewhere.^{6,19,20,27–29} A brief summary is presented here.

Cardo et al^{30–31} examined 712 health care workers exposed to HIV through needle-stick injuries and found an 81% odds reduction of HIV seroconversion in those who took zidovudine. Despite the study's limitations (retrospective design, small sample size of persons taking zidovudine, variations in data reporting, etc), it is the largest published examination of HIV PEP in an occupational setting, and is the basis for much of the support cited for all forms of HIV PEP.

Several perinatal studies have demonstrated lower

rates of infant HIV transmission when the mother and child took a variety of antiretroviral regimens.^{32–39} Analyses of the initial zidovudine study and the New York State perinatal work suggest that antiretroviral medications can serve as both pre- and postprophylaxis against mother-to-infant HIV transmission.^{33,39} Given the striking success of zidovudine and nevirapine, investigators are now investigating multiple other antiretroviral combinations.^{40–44}

Two HIV PEP centers in the United States, the Fenway Community Health Center in Boston, and the San Francisco Department of Public Health, have released accounts of their experience with nonoccupational HIV PEP.^{45–47} The majority of the exposures resulted from nonassault sexual contacts. Most of the patients at both centers received zidovudine and lamivudine. Both centers had relatively high compliance rates, and both engaged their patients in frequent counseling against risky sexual behaviors. The San Francisco group knew of no patients (300 of 401 tested) who had seroconverted to HIV at 6 months of follow-up.

Reports of HIV PEP utilization for nonoccupational exposures also have come from Australia, Brazil, France, Ireland, Italy, and the United Kingdom.^{16,25,48–55} Some concern sexual assault, whereas others describe experience with sexual or unusual exposures. Lot et al⁵⁰ of France reported that as of

TABLE 1. Selected HIV Postexposure Prophylaxis (HIV PEP) Regimens

US Public Health Service Guidelines for HIV PEP for Healthcare Workers Exposed to HIV ¹²	New York State Department of Health AIDS Institute HIV PEP Sexual Assault Guidelines for Adults and Adolescents ⁹	Nonoccupational HIV PEP Recommendations Drs Julie Gerberding and Mitchell Katz University of California, San Francisco, and San Francisco Department of Public Health ²⁷
Step 1: Assign exposure code (EC) EC1: Small volume, short duration exposures EC2: Large volume, larger duration OR Less severe percutaneous exposures EC3: More severe percutaneous exposures	IF a significant mucosal exposure occurred AND within 36 h of exposure AND perpetrator's HIV status is unknown AND survivor is prepared to initiate HIV PEP AND no "complicating factors"* exist	Consider HIV PEP if 1. High-risk exposure† 2. Source is HIV infected or in a high-risk group, or patient was raped 3. Exposure is an isolated event or patient will reduce future HIV risk 4. Exposure is within past 72 h 5. Patient desires treatment and agrees to adhere to the treatment program
Step 2: Assign source code (SC) SC1: Low HIV viral loads SC2: High HIV viral loads UNKNOWN source/viral loads: See below	THEN: zidovudine 600 mg divided BID or TID	Basic regimen: zidovudine 600 mg divided BID or TID lamivudine 150 mg BID ++ Consider adding indinavir 800 mg q8h OR nelfinavir 750 mg TID IF + Source has a high viral load OR + Mucosal bleeding or inflammation is present OR + Antiretroviral drug resistance is suspected
Step 3: Choose HIV PEP regimen Lower risk: Basic regimen Higher risk: Expanded regimen Unknown risk and EC2 or 3: Basic regimen	lamivudine 150 mg BID indinavir 800 mg q3h OR nelfinavir 750 mg TID	Alternative regimen (IF source is taking above): stavudine 40 mg BID (30 mg if <60 kg) didanosine 200 mg BID (125 mg if <60 kg) ++ May substitute stavudine for zidovudine if source is taking zidovudine and resistance is suspected
Basic regimen (EC1/SC2, EC2/SC1) zidovudine 600 mg divided BID or TID lamivudine 150 mg BID	IF perpetrator is HIV infected OR IF "complicating factors"* exist	†High-risk exposures (decreasing risk order): unprotected anal receptive intercourse, sharing needles, unprotected receptive vaginal intercourse, unprotected insertive vaginal intercourse, unprotected receptive anal intercourse, unprotected receptive fellatio with ejaculation
Expanded regimen (EC2/SC2, EC3/SC1 or 2) zidovudine 600 mg divided BID or TID lamivudine 150 mg BID indinavir 800 mg q8h OR nelfinavir 750 mg TID	THEN: Refer to an HIV specialist IF perpetrator is HIV uninfected OR IF no significant mucosal exposure occurred THEN: No HIV PEP	
	IF survivor is not prepared to initiate HIV PEP and it is indicated, reassess situation in 24 h *"Complicating factors": pregnancy, other medical conditions, drug interactions	

April 2000, HIV PEP was prescribed in their study after 745 sexual exposures. The exposure source was known to be HIV-infected in 24% of cases. Correll et al⁴⁸ of Australia reported treating 88 persons with HIV PEP from December 1998 to February 2000, 70% of these received HIV PEP after same-sex exposures, 10% after opposite sex, 17% after percutaneous injuries, and 3% after other exposures. In those who completed follow-up, there were no HIV seroconversions at 4 weeks in 84 participants, and none at 6 months in 28. In a study from Ireland, Delamere et al⁵² described 12 patients evaluated for HIV PEP who had been assaulted in the community with a needle. Of 27 European countries represented at the XIII International AIDS Conference, 6 had developed nonoccupational protocols, albeit in different formats.⁵⁶ Of interest, even before the release of Gerberding and Katz's recommendations on nonoccupational HIV PEP, 13 of 29 genitourinary physicians surveyed in the United Kingdom had prescribed HIV PEP to 18 of 64 patients who requested it.⁵⁵

The animal data supporting the use of PEP in HIV exposures, reviewed extensively elsewhere, primarily consist of exposures of primates to simian immunodeficiency virus (SIV) and the employment of various antiretroviral compounds against the virus.^{6,19,20,27-29} Successful prophylaxis did occur in several trials, especially when given early and for a prolonged period. Timing of delivery and duration of therapy were also deemed of special importance to the efficacy of HIV PEP. Rapid implementation correlated with greater prevention of seroconversion. A study with an experimental antiretroviral medication verified this by demonstrating an absence of SIV infection in macaques treated within 24 hours and for 4 weeks, compared with delayed and shorter treatment regimens which were less effective.⁵⁷ In contrast to previous studies which predominately employed monotherapy, Le Grand et al⁵⁸ recently gave an oral regimen of zidovudine, lamivudine, and indinavir to macaques who had been intravenously inoculated with chimeric SIV. Unlike the success seen with monotherapy regimens, this combination given at 4 and 72 hours failed to prevent infection.

Although unproven, the presumed mechanism for HIV PEP comes from animal and human work suggesting that shortly after an exposure to HIV, a window period exists during which the viral load is small enough to be controlled by the body's immune system.^{19,20,27-29,59} Antiretroviral medications given during this period may help to diminish or end viral replication, thereby reducing the viral inoculum to a more potentially manageable target for the host's defenses. Failures of HIV PEP probably occur because 1) the initial viral load was too great, 2) the rate of viral replication exceeded the body's attempts to destroy the virus or the medications' ability to halt viral replication, 3) the viral strain was resistant to the medication, and/or 4) the host's immune system was somehow impaired. Time to infection is most likely greater for mucosal or subcutaneous exposures than intravenous ones, and hence a longer window period for therapy may exist in these situations. Animal and human tissue studies indicate that the win-

dow period may be up to 72 hours, although SIV studies in macaques suggest the window may be much shorter.^{6,19,20,27-29}

HIV PEP IN PEDIATRICS

There are no formal guidelines for HIV PEP in adolescents and children. A few groups have commented on its provision in pediatrics, and some preliminary studies have been released.

Adolescents and children are neither specifically mentioned nor excluded in the PHS occupational HIV PEP guidelines for health care workers.¹² The American Academy of Pediatrics has not issued guidelines for HIV PEP, but suggests consultation with a pediatric HIV specialist after needle-stick exposures.⁶⁰ Noting that needle-stick injuries obviously occur in adolescents and children who are not health care workers, Chadwick⁶¹ proposed extending PHS occupational HIV PEP guidelines to include such exposures. Blanche of France⁶² extrapolated from available guidelines on needle-stick exposures for adults and has recommended similar therapy for use in pediatrics.

For nonoccupational HIV PEP, the PHS advises that "clinicians expert in the specific medical needs, consent issues, and other factors (eg, sexual abuse) involved in their treatment, including the use of antiretroviral medicines" be contacted before the initiation of HIV PEP in adolescents and children under 16 years old.⁶ In a review of childhood sexual abuse, Atabaki and Paradise⁶³ stated, "The demonstrated effectiveness of PEP for occupational HIV exposure suggests that, in certain high-risk instances, its benefits for sexually abused children and adolescents will outweigh its costs and risks." Bamberger et al⁸ also advocate HIV PEP for adolescents and children who have been sexually assaulted, but while in consultation with a pediatric HIV specialist. The New York State Department of Health guidelines on HIV PEP after sexual assault include adolescents as HIV PEP candidates, but do not define the group or mention any special considerations for them.⁹ Children are not mentioned in their guidelines.

Babl et al⁶⁴ of the Boston Medical Center Pediatric Emergency Department recently published their experience with HIV PEP in a case series of 10 children and adolescents. Four patients in their review were offered HIV PEP after a needle-stick injury, and 6 after sexual assault. Two patients were aged 2 and 3 years and had suffered a needle-stick injury; the other patients were 14 to 20 years old. Eight patients offered HIV PEP accepted it. One sexual assault survivor recanted her story and did not receive medications, and the 2-year-old child's parents declined HIV PEP because of their concerns about its cost and adverse effects.

All of the patients who accepted HIV PEP were prescribed 2 nucleoside reverse transcriptase inhibitors (NRTIs) and a protease inhibitor: zidovudine and lamivudine with indinavir for the 14- to 20-year-olds, and nelfinavir for the 3-year-old. All were offered medications if the sexual assault or needle-stick injury occurred within 72 hours of presentation to the Pediatric Emergency Department. Six of the ex-

posures occurred within 24 hours. Follow-up was conducted in the Boston Medical Center pediatric infectious disease clinic. Only 2 patients, the 3-year-old who suffered the needle stick injury and a 17-year-old sexual assault survivor, completed a 4-week course of HIV PEP. Many of the patients were lost to follow-up. Those who could be contacted cited adverse side effects of the medications and financial hardship as reasons for not completing the medications. Of those who obtained follow-up, 3 patients were HIV negative at 20 weeks of testing, and another at 28 weeks. All 10 patients were negative at baseline testing.

Over a 6-month period in 1999, Neu et al⁶⁵ evaluated 15 patients (11–19 years old) who presented to the New York Presbyterian Hospital Emergency Department after sexual assault. Thirteen were female; 2 were male. Ten were considered eligible for HIV PEP because they presented within 72 hours. Five were excluded because they either presented greater than 72 hours, were pregnant, or had multiple episodes of sexual assault. Seven patients agreed to participate in the study. Four completed 6 months of follow-up. Three patients completed a 28-day course of Combivir. One quit after 14 days. All 4 were HIV negative at 6 months. Protease inhibitors were not included in their protocol.

On a final note, 3 brief reports of HIV PEP usage in children and adolescents come from South Africa, Brazil, and France. In September 1999, medical waste was illegally dumped in a children's playground in Cape Town.⁵⁶ Fifty-five children consequently suffered needle-stick injuries. Forty-four received HIV PEP. At 6 months of follow-up, none who received HIV PEP had seroconverted to HIV. Enel⁵¹ of France and Harrison⁴⁹ of Brazil have indicated that they provided HIV PEP to older adolescents (19+) after sexual exposures, but details are not yet available.

HIV TRANSMISSION IN ADOLESCENTS AND CHILDREN

The risks of seroconversion after contact with an HIV-infected source have been estimated for various adult populations and circumstances. The estimates have a number of failings, and may not be current or even reflective of pediatric transmission and seroconversion. Nevertheless, for the most common modes of exposure, they suggest a 5–30/1000 risk for unprotected receptive anal intercourse per sexual contact, a 0.5–1.5/1000 risk for receptive vaginal intercourse per sexual contact, and a 3.2/1000 risk per injury for occupational needle sticks.^{59,66,67} Several factors may increase the rate of HIV transmission, such as multiple episodes of intercourse, failure to use barrier contraception methods, intercourse with an uncircumcised male insertive partner, the presence of other infections, an elevated HIV viral load, sexual assault, the lack of use of antiretroviral medications by the HIV source, etc.^{6,8,20,68}

Maternal to child HIV transmission, through pregnancy, delivery, and breastfeeding, has decreased dramatically in the United States, probably from HIV screening, pregnancy prevention, and perinatal HIV prophylaxis campaigns.³ The risk of transmission to

infants via pregnancy and delivery without HIV prophylaxis is between 15% to 30%.^{69–71} Breastfeeding an infant without HIV prophylaxis confers a 3% to 9% risk per year of transmission.^{72–76} Trials using antiretroviral medications, primarily zidovudine, during pregnancy and delivery have yielded a 51% to 67.5% reduction in HIV transmission to infants.^{34,37,38} Guay et al's⁷⁷ nevirapine-based regimen resulted in a 47% greater reduction of HIV transmission than zidovudine in infants of breastfeeding women at 14 to 16 weeks of age. In the United States, perinatal HIV prophylaxis has yielded a 2% or less transmission rate.

Sexual transmission of HIV is the most common form of transmission among adolescents. Almost 50% of high school students report having had sexual intercourse, 16% with >4 partners, and only 50% used a condom their last time.^{78,79} STDs are known to increase the risk of sexually transmitted HIV.⁵ An estimated 25% of STDs sustained annually in the United States occur in teenagers. Many groups are considered at greater risk of HIV infection from their typically higher-risk sexual encounters, including gay, bisexual, transgender, homeless, runaway, incarcerated, abused, mentally ill, and foster care children.⁵ Data collected between 1981 and 2000 showed that 34% of US adolescent males (ages 13–19) contracted AIDS from male-male sex and 4% from male-female sex.² An additional 5% of those with AIDS had male-male sex and injected drugs. In comparison, 52% of same aged females contracted AIDS through male-female sex.

HIV has been transmitted to children and adolescents through sexual abuse and assault. Although in the United States >125 000 children are sexually abused and an estimated 25% of sexual assaults occur annually in adolescents and children, the HIV seroconversion rate under these circumstances is not known.^{80–82} A review of all pediatric HIV/AIDS cases reported to the Centers for Disease Control and Prevention (CDC) through December 1996 revealed that 26 children (22 female and 4 male) 12 years old and younger (range: 3–12 years; mean: 8.8 years) were sexually abused by confirmed or suspected HIV assailants, and believed to have become HIV-infected by them.⁸³ An earlier report from Duke University described 4 children who acquired HIV through sexual abuse, and another 6 who might have.⁸⁴ The long-term, multiple-exposure nature of sexual abuse, the mucosal trauma sustained, the thinness of vaginal epithelia, and the cervical ectopy of female children may increase the risk of children acquiring HIV in sexual abuse.⁸⁵

A risk estimate of transmission or seroconversion after oral sex in adults, adolescents, and children is not available. The United Kingdom Department of Health recently published an extensive review examining the data available.⁸⁶ A few points are presented here. Transmission from oral sex is presumed to occur in primates, as demonstrated by 1 study with macaques and SIV.⁸⁷ In an examination of adult patients with a primary HIV infection, 20 of 122 patients initially claimed that oral sex had been their mode of infection.⁸⁸ After a thorough investigation,

only 8 cases (6.6%) were considered to be possibly linked to oral-genital transmission. Schacker et al⁸⁹ also reported 4 of 46 adult patients with primary HIV infection who claimed oral-genital contact was their mode of transmission. However, these claims could not be verified or discounted. A risk estimate for oral transmission cannot be established from these and the other few cases. The risk is presumed to be greater for exposures involving receptive fellatio with ejaculation, multiple contacts, known HIV-infected sources, concomitant STDs and/or oral lesions, current menstruation (cunnilingus), and late-stage HIV infection.⁸⁶

In 1989, the US PHS estimated a 1 in 4000 to 100 000 risk of HIV transmission from a discarded needle, depending on the local HIV prevalence.⁹⁰ The user's viral load and use of antiretroviral medications, the amount of blood in the syringe and needle, wound depth, and time since injection most likely modify this risk. Multiple HIV-era out-of-hospital needle-stick and other sharp injuries have occurred since the first pediatric cases (3 in 1985) were reported from Liverpool.⁹¹ Nourse et al⁹² from Dublin discovered 50 documented cases of children aged 23 months to 14 years (mean 7 years) who suffered community needle-stick injuries and presented to accident and emergency departments between 1995 and 1996. Most of the injuries happened in public places in sections of the city with a high prevalence of injecting drug use. About one-third transpired around the home or near schools, at least 3 were from another family member's needles, and 4 were children stuck by another child. One child received zidovudine prophylaxis, but no details were provided in the article. No HIV seroconversions were known to occur. Wyatt et al⁹³ reported 67 children (<13 years old) who sustained needle-stick injuries and presented to 2 accident and emergency departments in Edinburgh from 1987 to 1992. Three children presented with injuries on 2 separate occasions. One child's mother was an injecting drug user and 39 lived in areas known to have a high prevalence of injecting drug users. Ten suffered injuries while feigning injecting drug use. No patients received HIV PEP. None were known to become HIV-infected, but only 3 received follow-up. Aragon-Pena et al⁹⁴ described 249 children (<15 years old) in Spain who had been injured by discarded needles between May 1988 and April 1995. One hundred one children completed HIV serologies, and none became infected. None received HIV PEP.

Injecting drug use and associated risky sexual behavior plays an important role in new HIV cases among adolescents. An estimated 14% of 13- to 19-year-old US females contracted HIV through injecting drug use.² Six percent of males in this age group became HIV-infected in this manner, while another 5% had sex with other men and injected drugs. Heroin use by US high school seniors has increased from an estimated 0.90% in 1990% to 2.1% in 1997.^{95,96} In 1999, 6.2% of US high school seniors reported a history of cocaine use.⁹⁵ The percentage of injecting drug users of these drugs is believed to be decreasing. However, injected anabolic steroids are report-

edly used by ~2.9% of US high school seniors and 2.7% of middle school students.⁹⁷⁻⁹⁸ A study of injected anabolic steroid use found that 25% of students acknowledged needle sharing, although studies in older populations showed lower rates.⁹⁹⁻¹⁰⁴ Three adult cases of HIV seroconversion have been attributed to needle sharing in anabolic steroid use.¹⁰⁵⁻¹⁰⁹ Anabolic steroid use has also been associated with a greater likelihood of perpetrating sexual assault.¹¹⁰ Although discussed in the literature, HIV PEP after injecting drug use is apparently rarely used.^{19,20,27,111} Kahn et al⁴⁵ acknowledge that only 2% of their 401 adult patients sought HIV PEP after injecting drug use.

The uniqueness of adolescence and childhood poses possible uncommon opportunities for exposures to HIV.¹¹² For example, Nourse et al⁹² noted 1 child who partially ingested a used condom from an unknown source, and another who ingested a blood sample from a known hepatitis B and C and HIV-infected parent. Childcare and schools bring together children with caregivers or other children who may be HIV-infected. Athletic activities sometimes involve close contact among players. Biting and picking at wounds is common in younger children. In some unusual manner in these settings, children or adolescents may come in contact with open body surfaces or bodily fluids of HIV-infected individuals. However, significant exposures are extremely rare, and the likelihood of transmission is even more remote and probably not quantifiable. No school-related transmissions are known.¹¹² Of interest, a physician in Australia described diaper-pin injuries to caregivers of HIV-infected infants as a possible source of HIV transmission, but there are no documented cases of transmission.¹¹³

A few case reports of household HIV transmission in adolescents and children not involving sex or needle sharing exist, but the mechanisms of transmission are presumed or unknown.¹¹² One case concerned a 5-year-old who may have acquired HIV from contacting his mother's bleeding skin and sharing her toothbrush. An adolescent with hemophilia contracted a genetically similar HIV strain from his hemophiliac brother, possibly through razor sharing or inadvertent contamination of home intravenous therapy. In 1993, from studies of large numbers of household contacts, Simonds et al¹¹⁴ estimated the household transmission rate to be 0 to 0.2 infections per 100 patient years.

HIV PEP INDICATIONS FOR ADOLESCENTS AND CHILDREN

It logically follows that those who are at significant risk for seroconversion after an exposure should receive HIV PEP. Which risks are appropriate for HIV PEP is less obvious. HIV PEP is accepted practice in the perinatal setting and for health care workers with occupational injuries. The medical literature supports prescribing HIV PEP after community needle-stick and sharp injuries, and after sexual assault from sources known or likely to be HIV-infected. HIV PEP after consensual unprotected intercourse between HIV sero-opposite partners has had growing use in

the adult population, and can probably be used for children and adolescents. There is less documented experience and support for HIV PEP after consensual unprotected intercourse between partners of unknown HIV status, after prolonged or multiple episodes of sexual abuse from an assailant of unknown HIV status, after bites, and after the sharing of personal hygiene items or exposure to wounds of HIV-infected individuals.

In an attempt to stratify the risk of exposures and their possible benefit from HIV PEP, the following general rules are proposed. Exposures with the highest level of risk and with the best evidence supporting their use should receive HIV PEP. Exposures with high risk and lesser evidence should be strongly considered for HIV PEP, and those with lower risk and lesser evidence can be evaluated on a case-by-case basis. HIV PEP is likely most efficacious when provided within 1 hour of exposure, and ideally should be given within 72 hours. HIV PEP after longer periods could be considered if the exposures and circumstances are compelling. Rapid implementation is important, as available data indicate reduced success in avoiding seroconversion when HIV PEP is delayed. HIV PEP can be initially provided after an exposure until evidence appears that it is not indicated.

There are few contraindications to prescribing nonoccupational HIV PEP. It should not be prescribed to those who have already seroconverted, have known allergies to the medications, and whose exposure would have no likelihood for HIV transmission, eg, touching intact skin, closed-mouth kissing, mosquito bites, etc. Some authors propose other "relative contraindications" to HIV PEP. Gerberding and Katz^{19,20,27} recommend that nonoccupational HIV PEP be issued only when a risky behavior occurs in isolation and when the recipient agrees to prevent its recurrence. "Relapses" could be treated with additional counseling and HIV PEP, but frequent or long-term administration is not advised. Kahn et al⁴⁵ did note that 13% of their patients requested nonoccupational HIV PEP a second time. The PHS also cautions against the cavalier use of HIV PEP as a "morning-after pill" or as a means of pre-exposure prophylaxis, such as by women who wish to be pregnant by HIV-infected men.⁶ This "relative contraindication" can best be viewed as a means to protect the patient from committing self-harm with the medications or the risky behavior itself, and not as a condemnation of the behavior or a means of abandoning them to the infection. Gisoni¹¹⁵ has cautioned against the latter character judgments that establish "doctors as moral entrepreneurs" meting out therapies only to "innocent victims." Thorough discussions of the ethical considerations of HIV PEP are included in papers by Gisoni¹¹⁵ and Lurie et al.¹¹⁶

HIV PEP Regimens

Controversy exists on the most appropriate approach to prescribing HIV PEP. For occupational HIV PEP, the PHS follows a risk stratified algorithm that provides 3 drugs to the highest risk exposures,

and 2 drugs to lesser ones.⁶ However, the National Institute of Health reports typically prescribing an initial 3-drug (2 NRTIs and a protease inhibitor) regimen for all occupational exposures despite the PHS guidelines.²⁸ Puro¹¹⁷ of the Italian Registry of PEP recommends an initial 3-drug regimen for occupational HIV PEP, unless contraindicated, and suggests modifying the regimen should adverse events occur. The United Kingdom Department of Health also endorses a 3-drug regimen after occupational exposures.²⁶ Gerberding,^{19,29} Katz,^{19,20} Bamberger,⁸ and the New South Wales Department of Health²⁴ endorse a stratified regimen that matches risks of transmission to drug selection for nonoccupational exposures (including sexual assault), whereas the New York State Department of Health,⁹ the Italian Registry,¹¹⁷ the French Ministry of Health,²⁵ and the United Kingdom Departments of Health²⁶ advocate a 3-drug regimen for sexual assault survivors.^{8,9,19,20,24-26,117} For pediatric sexual assault survivors, Neu et al⁶⁵ used a 2-drug regimen, whereas Babl et al⁶⁴ initially tried a 3-drug course for sexual assault and nonoccupational needle stick injuries.

Because no efficacy studies have been performed for nonoccupational HIV PEP, the optimum medication regimen is unknown. Multi-drug regimens are preferred over single-dose regimens based on the demonstrated reductions in HIV viral load in patients with HIV,¹¹⁸ and the belief that it may counteract against resistance and enhance potency.²² Zidovudine and lamivudine are in most HIV PEP regimens because of their demonstrated reduction in HIV transmission in occupational exposures and their general well tolerability by patients.^{12,19,20,27,28,59} Although nevirapine, a non-nucleoside reverse transcriptase inhibitor, has shown great promise in reducing perinatal HIV transmission, it is not recommended for HIV PEP. In fact, the CDC recently reported 22 cases of serious adverse side effects possibly related to nevirapine use in HIV PEP.¹¹⁹ Two of the cases involved life-threatening liver failure, 12 hepatotoxicity, and 14 skin reactions that included 1 or 2 instances of possible Stevens-Johnson syndrome. Because of these findings, nevirapine's manufacturer has recommended against using it in HIV PEP.¹²⁰

Gerberding and Katz^{19,20,27} encourage substituting other NRTIs for zidovudine and lamivudine when the source patient has been taking these medications, or is known to have HIV strains resistant to them. The PHS has a similar recommendation for occupationally exposed patients.¹² Yerly et al¹²¹ observed that 9% of 82 HIV primary infected patients carried zidovudine-resistant strains. Brenner et al¹²² of Quebec observed that of HIV samples from 80 primary HIV-infected patients in their study, 10% showed mutations that may confer high-level multidrug resistance to nucleoside and nonnucleoside reverse transcriptase inhibitors and protease inhibitors. Cheingsong et al¹²³ studied HIV resistance in 42 source patients of occupational exposures to health care workers. Their study found a 38% rate of primary mutations to nucleoside or nonnucleoside reverse transcriptase inhibitors or protease inhibitors.

Eighty-eight percent had mutations to zidovudine and or lamivudine.

Protease inhibitors are the main item of controversy in HIV PEP regimens because of their added expense, unpleasant side effects, unknown benefit for this type of therapy, and possible association with reduced compliance.^{8,19,20,27,29} Groups that advocate their use emphasize protease inhibitors' great efficacy in reducing HIV viral load, and the theoretical need to use all possible means to halt viral replication after an HIV exposure.^{9,117,124} Parkin et al¹²⁵ observed that the rate of side-effects dropouts were higher in health care workers taking occupational HIV PEP regimens containing indinavir than those not taking indinavir. The reported rate of side effects were greater than those previously reported for patients with HIV taking indinavir. The authors postulated that the anxiety associated with the exposure might account for this difference. On the other hand, the Italian Registry of Post Exposure Prophylaxis found no difference in frequency of reported side effects reported in regimens containing indinavir versus those with zidovudine or zidovudine and lamivudine.¹¹⁷ However, they saw a tendency toward a higher discontinuation rate with indinavir.

The Italian Registry concluded that the side effects associated with protease inhibitors do "not justify the initial use of a less potent regimen." In an attempt to improve compliance, Babl⁶⁴ reported that the Boston Medical Center Pediatric Emergency Department dropped protease inhibitors from their HIV PEP regimen for needle-stick injuries and sexual assault exposures.

We propose an HIV PEP approach for adolescents and children seen in Table 2. The dosages of commonly used HIV PEP medications are in Table 3. We recommend a stratified approach, based on the work of Gerberding and Katz and other previously mentioned authors, that attempts to match seroconversion risk with an appropriate number of medications, while taking into account adverse side-effects and the amount of information that is typically available on initial presentation. Twice daily regimens should be used when possible, and may improve compliance. HIV PEP should be administered within 1 hour of exposure. We strongly recommend that physicians trained in this form of therapy review the indications for HIV PEP within 72 hours of its provision. We advocate that due diligence in determining level of risk and appropriateness of drug selection be con-

TABLE 2. Suggested Approach to HIV PEP for Adolescents and Children

Prerequisites	Suggested Regimens
<ol style="list-style-type: none"> 1. Offer HIV PEP only to patients who are not known to be HIV infected. 2. Do not give HIV PEP after exposures to sources who are known to be HIV negative, or after exposures that cannot result in an HIV infection, eg, kissing, casual touching. 3. Acceptance of HIV PEP should be voluntary. 4. Acceptance of HIV PEP requires that the patient and/or caretaker commit to completing a 28-d regimen and engage in a well-conducted follow-up program with a provider experienced in this type of therapy. 5. Patients must be notified that HIV PEP is not a cure for HIV infections and that its efficacy is unknown. 6. Patients taking HIV PEP after risky sexual encounters or intravenous drug exposures should agree to participate in appropriate therapies that will reduce their future risk of contracting HIV. 	<p>Exposures to KNOWN HIV-infected sources:</p> <p>If the HIV source's medication regimen is UNKNOWN, prescribe zidovudine, lamivudine and either indinavir or nelfinavir.</p> <p>If the source's regimen is KNOWN, then choose a combination of NRTIs and a protease inhibitor different than the source's regimen. Do not combine stavudine with zidovudine or zalcitabine, or didanosine with zalcitabine.</p>
<p>Goals</p> <ol style="list-style-type: none"> 1. Provide the first dose of HIV PEP as soon as an exposure is suspected. Attempt to treat within 1 h of presentation. 2. HIV PEP is ideally offered for patients who present within 72 h of their exposure, but can be considered after longer periods if compelling circumstances exist. 3. Provide the highest level of treatment available initially when the available information is unknown, missing or unclear. 	<p>Exposures to HIGH-RISK* HIV sources and unknown HIV status:</p> <p>For significant exposures†, prescribe zidovudine, lamivudine and either indinavir or nelfinavir</p> <p>For exposures of unclear significance‡, prescribe zidovudine, and lamivudine. Add a protease inhibitor if compelling circumstances exist.</p>
<p>Maintenance</p> <ol style="list-style-type: none"> 1. Prescribe at least a 72-h supply of HIV PEP. 2. Refer all patients to follow-up within 72 h to a provider experienced with HIV PEP in adolescents and children. 3. Refer patients with special concerns and needs, eg, patients who have been sexually assaulted, to the appropriate supportive and therapeutic groups. 	<p>Exposures to LOW-RISK HIV sources and unknown HIV status:</p> <p>For significant exposures†, prescribe zidovudine and lamivudine. Add a protease inhibitor if compelling circumstances exist.</p> <p>For exposures of unclear significance‡, consider zidovudine and lamivudine.</p> <p>*High-Risk HIV sources: discarded intravenous needles, bloody needles or sharps from areas of high HIV seroprevalence; sharps used for intravenous drug use; sexual partners who engage in male-male sex, have multiple partners and practice unprotected intercourse, or who engage in intercourse with known or suspected HIV infected persons, or trade sex for drugs or money; or sexual assault from an unknown HIV status assailant.</p> <p>†Significant exposures: unprotected receptive anal or vaginal intercourse, intravenous drug use, and exposure to semen or blood on mucosal or nonintact surfaces.</p> <p>‡Exposures of unclear significance: cunnilingus, fellatio, semen or blood on healing wounds, bites, sharing of personal hygiene equipment, etc.</p>

TABLE 3. Pediatric Dosages for Antiretrovirals Used for HIV PEP (132–136)

Nucleoside Reverse Transcriptase Inhibitors		
First line		
zidovudine (AZT/ZDV)	3 mo–12 y: 160 mg/m ² po q6h Neonates: 2 mg/kg	
lamivudine (Epivir)	Over 12 y: 300 mg po BID 3 mo–16 y: 4 mg/kg po BID Neonates: 2 mg/kg	Oral syrup available
combivir (AZT/Epivir)	Over 16 y: 150 mg po BID Not available in pediatric dosages Over 16 y: 1 tablet po BID	Oral solution available
Alternatives		
abacavir (Ziagen)	3 mo to 16 y: 8 mg/kg (up to 300 mg po BID) Over 16 y: 300 mg po BID	Oral syrup available
didanosine (ddI/Videx)	Pediatrics: 90–150 mg/m ² po BID Adolescents >60 kg, 200 mg po BID, <60 kg, 125 mg po BID	Powdered solution available
stavudine (d4T/Zerit)	1 mg/kg po BID for <30 kg Adolescents >60 kg, 40 mg po BID, <60 kg, 30 mg po BID	Oral solution available
zalcitabine (HIVID/ddC)	Pediatrics: 0.005–0.01 mg/kg po q8h Adolescents: 0.75 mg po TID	Oral syrup available
Protease Inhibitors		
First line		
indinavir (Crixivan)	Currently not recommended for patients under 16 y Over 16 y: 800 mg po q8h	
nelfinavir (Viracept)	2–13 y: 20–30 mg/kg po TID Over 13 y: 750 mg po TID or 1250 mg po BID	Powdered form available
Alternatives		
amprenavir (Agenerase)	4–12 y or 13–16 y <50 kg: 22.5 mg/kg BID or 17 mg/kg TID 13–16 y >50 kg or >16 y: 1400 mg BID Contraindicated for <4 y	Oral solution available
saquinavir (Fortovase)	Over 16 y–1200 mg po TID after meals Safety and effectiveness not established for under 16 y	
lopinavir/ritonavir (Kaletra)	6 mo to 12 y: 7–15 kg: 12 mg/kg, 15–40 kg: 10 mg/kg BID >40 kg or over 12 y: 5 mL or 3 capsules BID	Oral solution available
Nucleoside Reverse Transcriptase Inhibitor and Protease Inhibitor Combination		
zidovudine/lamivudine/ abacavir (Trizivir)	Over 13 y and >40 kg: 1 tablet BID	

nevirapine (Viramune; nonnucleoside reverse transcriptase inhibitor) is not recommended for HIV PEP.

The manufacturers' and The Working Group on Antiretroviral Therapy's recommended dosages for HIV/AIDS are presented here. Other dosing regimens are possible.

Drugs are listed as first line based on history of usage in HIV PEP and not on their efficacy.

ducted as soon as possible after an exposure occurred. When such information is not immediately available, we recommend the rapid initiation of treatment using the maximum level of care followed by careful investigation and reconsideration in follow-up or whenever possible. HIV PEP may be initiated provisionally after an exposure and then discontinued if the exposure source is confirmed to not be HIV-infected. In most cases, consultations with experts in HIV care can occur after the rapid start of therapy. We also concur that HIV PEP be given in a therapeutic milieu that encourages compliance with the regimen, support for the psychological or physical trauma that is sometimes associated with the exposure, and/or intensive means to reduce additional HIV exposures.

HIV PEP ADVERSE SIDE EFFECTS

Adverse side-effects of antiretroviral medications in adults with HIV have been extensively reviewed. A summary of the commonly reported ones for HIV PEP medications is in Table 4. With few exceptions,

the adverse effects are predominantly similar to those seen in pediatric patients.¹²⁶ In adults receiving zidovudine for occupational HIV PEP, 75% of those taking zidovudine prophylaxis reported adverse symptoms in a PHS study, 73% in a New York Medical College report, and 49% in the Italian Registry.^{127–129} In the Italian Registry, most adverse effects were noted during the first week of prophylaxis, and all resolved after discontinuing the medications. Higher dosages (1.2–3 mg/d) correlated with the vast majority of reported side effects. Mild anemia and elevated liver enzymes were uncommonly observed (2%–3%), resolved within 1 to 2 weeks after completing the therapy, and did not lead to early medication termination. For combination therapies, Kahn et al⁴⁵ noted a 59% rate of complaints in non-occupational HIV PEP (primarily with zidovudine and lamivudine with and without a protease inhibitor), and Puro reported a 31% rate using two NRTIs (typically zidovudine and lamivudine), and 52% in regimens containing a protease inhibitor (predominately indinavir) in mostly occupational and a few

TABLE 4. Adverse Side Effects of Commonly Used Antiretroviral Medications (126, 132–137)

Drug	Side Effects
Nucleoside reverse transcriptase inhibitors	
abacavir (Ziagen)	Fatal hypersensitivity reactions, lactic acidosis with hepatic steatosis
didanosine (ddI/Videx)	Diarrhea, abdominal pain, nausea, vomiting, pancreatitis, stomatitis and peripheral neuropathy
lamivudine (3TC/Epivir)	Fatigue, headache, weakness, nausea, vomiting, diarrhea, cough, rash, abdominal pain
stavudine (d4T/Zerit)	Headache, gastrointestinal distress, rash, peripheral neuropathy, elevated liver enzymes, pancreatitis
zalcitabine (HIVID, ddC)	Headache, gastrointestinal distress, malaise, stomatitis and peripheral neuropathy
zidovudine (AZT/ZDV)	Weakness, nausea, dyspepsia, anorexia, insomnia, anemia, leukopenia, vomiting, headache, myalgias, dizziness, constipation
Protease inhibitors	
amprenavir (Agenerase)	Stevens-Johnson syndrome, rash, nausea, vomiting, diarrhea, abdominal pain
indinavir (Crixivan)	Nausea, abdominal pain, gas, headache, dyspepsia, flatulence, diarrhea, nephrolithiasis, hyperglycemia
lamivudine/ritonavir (Kaletra)	Nausea, abdominal pain, rash, headache, weakness
nelfinavir (Viracept)	Diarrhea, gas, dyspepsia, asthenia, rash, abdominal pain, hyperglycemia
saquinavir (Fortovase)	Diarrhea, nausea, abdominal discomfort, headache, hyperglycemia/diabetes, increased liver enzymes and triglycerides

sexual assault exposures.¹¹⁷ Nausea, vomiting, diarrhea, gastric pain, asthenia, and headache were the common complaints in the Italian Registry.¹¹⁷ Henderson²⁸ observed that for patients taking occupational HIV PEP, the symptoms typically resolve soon after medications are discontinued, and that no long-term adverse sequelae have been reported in health care workers taking occupational HIV PEP. The true rate of adverse events in HIV PEP is not yet known.

In Babl et al's⁶⁴ study of pediatric patients taking HIV PEP, 4 of 5 patients for whom follow-up could be obtained and who took at least a partial course of antiretrovirals complained of nausea, vomiting, diarrhea, and abdominal pain. Three patients discontinued HIV PEP because of medication side-effects. Neu et al⁶⁵ reported that 1 patient in their study complained of abdominal pain, and 3 patients had a transient decrease of their hematocrit by 4.7% at 2 weeks of treatment, but this value returned to normal 2 weeks later. HIV PEP perinatal studies to date have not observed increased infant mortality or morbidity directly attributable to antiretroviral medications.^{130,131} A slight reduction in infants' hematocrit was noted in an initial zidovudine perinatal trial.³² A complete discussion of HIV perinatal therapy by the US Public Health Service is available and updated frequently.¹³⁰

SUMMARY AND FINAL RECOMMENDATIONS

Children and adolescents are at risk for HIV infection. Transmission occurs through perinatal exposures, injecting drug use, consensual and nonconsensual sex, needle-stick and sharp injuries, and possibly through some unusual contacts. Youth engaging in high-risk sexual activities are especially endangered. HIV PEP can serve as a means of secondary prevention in selected situations. HIV PEP should be given within 1 hour of exposure, and may be provided provisionally until additional evaluation is complete. Treatment for 28 days is most likely best. Two and 3 drug regimens are possible and

therapy can be stratified by exposure type and circumstances. HIV PEP should only be provided in the context of intensive HIV reduction counseling and overseen by providers knowledgeable of antiretroviral medications in children and adolescents. Patients and their parents and caregivers should be advised of the HIV PEP's possible side-effects and its unknown efficacy. Providers are encouraged to help monitor the continued evaluation of HIV PEP, and report their experiences with nonoccupational HIV PEP to the PHS National Nonoccupational HIV Postexposure Prophylaxis Registry. The registry can be contacted via phone (877-HIV-1PEP), fax (877-HIV-7PEP), Internet (<http://www.hivpepregistry.org>), and mail (HIV PEP Registry, 44 Farnsworth St, 7th Floor, Boston, MA 02217).

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