

Intrapartum Care for People With HIV

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Panel's Recommendations

HIV Testing for Pregnant People with Unknown HIV Status in Labor

- Pregnant people who present in labor with unknown HIV status and people with increased risk of HIV infection who were not retested in the third trimester should undergo expedited antigen/antibody HIV testing (AII). See [Maternal HIV Testing and Identification of Perinatal HIV Exposure](#) for more information.
 - If results are positive, an HIV-1/HIV-2 antibody differentiation test and an HIV-1 RNA assay should be done as soon as possible, and intravenous (IV) zidovudine (ZDV) should be initiated pending the result of the differentiation test (AII).
 - If acute or recent HIV infection is suspected or if a person has had recent HIV exposure, an HIV RNA assay also should be done at the time of expedited antigen/antibody testing (AII). See [Early \(Acute and Recent\) HIV Infection](#).

Intrapartum Antiretroviral Therapy (ART), ZDV Prophylaxis, and Mode of Delivery for Pregnant People with HIV

- See Table 9: [Intrapartum Care and Recommended Interventions to Prevent Perinatal HIV Transmission for Pregnant People with HIV Based on HIV RNA Levels at the Time of Delivery](#) below.
- Patients should continue taking their antepartum ART on schedule during labor and before scheduled cesarean delivery (AIII).
- For individuals with HIV RNA >1,000 copies/mL or unknown HIV RNA near the time of delivery (within 4 weeks of delivery)
 - Intrapartum IV ZDV should be administered in the following situations based on laboratory and clinical information near the time of delivery: (a) HIV RNA >1,000 copies/mL, (b) unknown HIV RNA, (c) known or suspected lack of adherence since the last HIV RNA result, or (d) a positive expedited antigen/antibody HIV test result during labor (AI). Begin IV ZDV when patients present in labor or at least 3 hours prior to scheduled cesarean delivery (AII).
 - When HIV RNA is >1,000 copies/mL or is unknown near the time of delivery, scheduled cesarean delivery at 38 weeks of gestation is recommended to minimize perinatal HIV transmission, irrespective of administration of antepartum ART (AII).
 - Management of patients originally scheduled for cesarean delivery because of HIV RNA >1,000 copies/mL who present in labor or with ruptured membranes must be individualized at the time of presentation (BII). In these circumstances, evidence is insufficient to determine whether cesarean delivery reduces the risk of perinatal HIV transmission. Consultation with an expert in perinatal HIV (e.g., telephone consultation with the [National Perinatal HIV/AIDS Clinical Consultation Center](#) at 1-888-448-8765) may be helpful in rapidly developing an individualized delivery plan.
- For individuals receiving ART with HIV RNA ≤1,000 copies/mL near the time of delivery (within 4 weeks of delivery)
 - IV ZDV is **not** required for people who meet **ALL** of the following three criteria: (1) are receiving ART, (2) have HIV RNA <50 copies/mL within 4 weeks of delivery, and (3) are adherent to their ARV regimen (BII).
 - IV ZDV may be considered for people with HIV RNA ≥50 copies/mL and ≤1,000 copies/mL within 4 weeks of delivery (BII). Data are insufficient to determine whether administration of IV ZDV to people with HIV RNA levels between 50 copies/mL and 1,000 copies/mL provides any additional protection against perinatal HIV transmission. This decision can be made on a case-by-case basis, taking into consideration their recent ART adherence and preferences, and involving expert consultation if needed (CII).
 - Scheduled cesarean delivery performed solely for prevention of perinatal HIV transmission in those receiving ART with HIV RNA ≤1,000 copies/mL near the time of delivery is **not recommended** given the low rate of perinatal transmission in this group (AII).

- In pregnant people with HIV RNA levels $\leq 1,000$ copies/mL, if scheduled cesarean delivery or induction of labor is indicated for non-HIV-related reasons, it should be performed at the standard time for obstetric indications (AII). Labor should not be induced to prevent perinatal HIV transmission.
- In pregnant people on ART with HIV RNA $\leq 1,000$ copies/mL, duration of ruptured membranes is not associated with an increased risk of perinatal transmission and is not an indication for cesarean delivery to prevent HIV transmission (BII).

Other Intrapartum Management Considerations (see [Table 9](#) below)

- Fetal scalp electrodes for fetal monitoring should be avoided, particularly when maternal HIV RNA is not suppressed (≥ 50 copies/mL) or is unknown, because of the potential risk of HIV transmission (BIII).
- Artificial rupture of membranes and operative vaginal delivery with forceps or a vacuum extractor should follow standard obstetric indications but should be avoided if possible in those with HIV RNA ≥ 50 copies/mL (BIII).
- The ARV regimen a patient is receiving should be taken into consideration when using methergine to treat excessive postpartum bleeding caused by uterine atony.
 - In patients who are receiving a cytochrome P450 (CYP) 3A4 enzyme inhibitor (e.g., a protease inhibitor or cobicistat), methergine should be used only if no alternative treatments for postpartum hemorrhage are available and the need for pharmacologic treatment outweighs the risks. If methergine is used, it should be administered at the lowest effective dose for the shortest possible duration (BIII).
 - In patients who are receiving a CYP3A4 enzyme inducer—such as nevirapine, efavirenz, or etravirine—additional uterotonic agents may be needed because of the potential for decreased methergine levels and inadequate treatment effect (BIII).

Rating of Recommendations: A = Strong; B = Moderate; C = Optional

Rating of Evidence: I = One or more randomized trials with clinical outcomes and/or validated laboratory endpoints; II = One or more well-designed, nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Overview of Intrapartum Care for Pregnant People With HIV

Pregnant people with HIV require specialized care during labor and delivery to optimize maternal health outcomes and to prevent perinatal HIV transmission. Documentation of HIV status should be assessed in all people during labor, and HIV testing should be offered to those with unknown or undocumented HIV status, recent HIV exposure, and/or signs of acute HIV (see [Maternal HIV Testing and Identification of Perinatal HIV Exposure](#) and [Early \(Acute and Recent\) HIV Infection](#)). Because maternal HIV RNA level is linked directly to the risk of perinatal HIV transmission,¹ the Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission (Panel) recommends viral load testing throughout pregnancy and specifically at approximately 36 weeks gestation (or within 4 weeks of anticipated delivery) to inform decisions about intrapartum care. The risk of perinatal HIV transmission is reduced to very low levels (to 1% or less) in pregnant people receiving antiretroviral therapy (ART) who have documented viral suppression (< 50 copies/mL) near delivery.¹⁻³ Panel recommendations about intrapartum care to prevent HIV transmission are based on maternal HIV RNA levels and encompass continuation of maternal ART, intrapartum intravenous (IV) zidovudine (ZDV) during labor and delivery, scheduled cesarean delivery, and other intrapartum management considerations. [Table 9](#) provides an overview of the Panel’s recommendations for intrapartum care based on maternal HIV RNA. These recommendations are discussed in the following sections.

Pregnant People Who Present in Labor Without Documentation of HIV Status

All pregnant people without documentation of HIV status at the time of labor should be screened for HIV with expedited testing unless they decline (i.e., “opt-out” screening) (see [Maternal HIV Testing and Identification of Perinatal HIV Exposure](#)). Expedited repeat HIV testing also is recommended for those who present in labor and tested negative for HIV in early pregnancy, but are at increased risk of HIV infection and were not retested in the third trimester.^{4,5} Factors that may increase the risk of infection include diagnosis of a sexually transmitted infection, **substance use disorder**, exchange of sex for money or drugs, multiple sexual partners during pregnancy, a sexual partner who is at risk of HIV infection or who is known to have HIV, signs or symptoms of acute HIV Infection, or living in a region with an elevated incidence of HIV in women of childbearing age.⁴ **Those who test positive on the initial HIV test during labor should be presumed to have HIV until follow-up testing clarifies their HIV status.** Expert consultation should be obtained regarding starting patients on **combination oral antiretroviral therapy during labor and is available through the [National Perinatal HIV/AIDS Clinical Consultation Center](#) at 1-888-448-8765.** To prevent perinatal HIV transmission, intrapartum IV ZDV should be started immediately, as discussed below, and patients should not initiate breastfeeding until HIV infection is ruled out definitively, **see [Infant Feeding for Individuals with HIV in the United States](#).** For additional information, see [Postpartum Follow-up of People with HIV](#), [Antiretroviral Management of Newborns with Perinatal HIV Exposure or HIV Infection](#), and [Table 11](#).

Initial testing for HIV should be done with a Food and Drug Administration (FDA) approved antigen/antibody combination immunoassay that detects HIV-1 and HIV-2 antibodies. No further testing is required for specimens that are nonreactive on the initial immunoassay, unless the patient has had recent HIV exposure or acute infection is suspected, in which case an HIV RNA assay should be obtained (see [Maternal HIV Testing and Identification of Perinatal HIV Exposure](#)). Patients with an initial positive antigen/antibody combination immunoassay result should be tested with an FDA-approved antibody immunoassay that differentiates HIV-1 antibodies from HIV-2 antibodies and an HIV RNA assay to screen for both acute and chronic HIV-1 infection (see [Revised Recommendations for HIV Testing of Adults, Adolescents, and Pregnant Women in Health-Care Settings](#) and the resource page for [laboratory testing for HIV](#) from the Centers for Disease Control and Prevention). If the follow-up antibody test result is negative, results of the HIV RNA test should be reviewed to rule out acute infection as a cause of the initial positive test result before ART is stopped (see [Early \(Acute and Recent\) HIV Infection](#)). Those with a high level of HIV-1 RNA and a negative HIV-1/HIV-2 antibody differentiation test most likely have acute HIV infection. If both the HIV-1 RNA and the HIV-1/HIV-2 antibody differentiation test are negative, the initial HIV test result may have been a false positive.

Expedited HIV testing should be available on a 24-hour basis, **and results should be available within 1 hour** at all facilities with a maternity service and/or neonatal intensive care unit. Statutes and regulations regarding expedited testing vary from state to state (see [State Laws That Address High-Impact HIV Prevention Efforts](#)).

Intrapartum Continuation of Antenatal Antiretroviral Drugs

ART is recommended for the treatment of HIV and prevention of perinatal HIV transmission in all pregnant people with HIV, regardless of CD4 T lymphocyte cell count and HIV RNA (viral load). Pregnant people should continue their antepartum antiretroviral (ARV) regimen on schedule during the intrapartum period to maintain maximal virologic suppression and to minimize the chance of

developing drug resistance. When cesarean delivery is planned, oral medications can be administered preoperatively with sips of water. Medications that must be taken with food for absorption can be taken with liquid dietary supplements, contingent on consultation with the anesthesiologist during the preoperative period. If the maternal ARV drug regimen must be interrupted temporarily (i.e., for <24 hours) during the peripartum period, all drugs should be stopped and reinstated simultaneously to minimize the chance that resistance will develop.

Decisions Regarding the Use of Intrapartum Intravenous Zidovudine

Intrapartum administration of IV ZDV provides antiretroviral pre-exposure prophylaxis at a time when infants are at increased risk of exposure to maternal blood and body fluids. Although the PACTG 076 ZDV regimen included a continuous IV infusion of ZDV during labor for all women, decisions regarding the use of IV ZDV during labor are now based on maternal ART, HIV RNA level, and adherence considerations (see [Table 9](#) below). IV ZDV also is recommended for those with an initial diagnosis of HIV during labor and pregnant people with HIV whose HIV RNA level is unknown.

Current evidence indicates that intrapartum IV ZDV reduces perinatal HIV transmission for people with HIV RNA >1,000 copies/mL who are on ART, but the benefits for those with HIV RNA \leq 1,000 copies/mL are less clear. Using data from 1997 to 2010, the French Perinatal Cohort Study evaluated the association between IV ZDV and perinatal HIV transmission based on HIV RNA levels in >11,000 pregnant women with HIV who were on ART (72% of the women received triple-ARV regimens). The majority (95%) received IV intrapartum ZDV.⁶ Among women with HIV RNA \geq 1,000 copies/mL whose infants received only ZDV for prophylaxis, the risk of perinatal HIV transmission was significantly higher without maternal IV ZDV (10.2%) than with maternal IV ZDV (2.5%; $P < 0.01$), but this difference was not observed if the neonate received a combination prophylaxis of two or more ARV drugs (4.8% with IV ZDV vs. 4.1% without IV ZDV, $P = 0.83$). Among women with HIV RNA <1,000 copies/mL at delivery, transmission rates did not differ significantly between those who received IV ZDV (0.6%, 47 of 8,132 infants) and those who did not (0 of 369 infants, $P > 0.20$).

In a European cohort of infants who were considered to be at high risk of perinatal HIV transmission, lack of IV ZDV during labor was associated with transmission on univariate analysis, but not after the results were adjusted for maternal HIV RNA and other factors (adjusted odds ratio [OR] with IV ZDV was 0.79; 95% confidence interval, 0.55–1.15; $P = 0.23$).⁷ In a cohort of 717 women who delivered between 1996 and 2008 in Miami, not receiving IV ZDV during labor ($n = 67$) was not associated with an increased risk of perinatal HIV transmission.⁸ The majority of these women were receiving ART (89%) and had HIV RNA <1,000 copies/mL (75%) at delivery.

Based on available data, the Panel recommends that IV ZDV should continue to be administered to pregnant people with HIV RNA >1,000 copies/mL within 4 weeks of delivery (or to people with HIV who have unknown HIV RNA levels within 4 weeks of delivery), regardless of their antepartum ARV regimen. Although not required, administration of intrapartum IV ZDV may be considered for individuals with HIV RNA levels \geq 50 copies/mL and \leq 1,000 copies/mL or in people for whom there are concerns about adherence to or tolerance of their ARV regimens in late pregnancy. Specifically, patients who have not maintained an undetectable viral load consistently throughout the third trimester, patients who have had challenges consistently participating in prenatal care, and patients with ongoing psychosocial factors that raise additional concerns about adherence should be considered potential candidates for intrapartum IV ZDV despite a viral load <1,000 copies/mL. Many

experts think the data are insufficient to determine whether administration of intrapartum IV ZDV to pregnant people with HIV RNA between 50 copies/mL and 1,000 copies/mL provides any additional protection against perinatal transmission. However, the transmission risk is slightly higher (approximately 1% to 2%) when HIV RNA is in the range of 50 copies/mL to 999 copies/mL than when it is <50 copies/mL (transmission risk is $\leq 1\%$).^{1,6,9}

IV ZDV is **not** required for individuals who meet **ALL** of the following three criteria: (1) are receiving ART, (2) have HIV RNA <50 copies/mL within 4 weeks of delivery, and (3) are adherent to their ARV regimen. However, a study showing that 6% of women with suppressed HIV RNA levels during pregnancy had viral load rebound near delivery¹⁰ highlights the importance of using clinical judgement when making the decision to use intrapartum IV ZDV, regardless of the patient's viral load. The additional benefit of IV ZDV in pregnant individuals who are receiving ART and are virally suppressed (HIV RNA <50 copies/mL) has not been evaluated in randomized clinical trials.

If a patient has known or suspected ZDV resistance, intrapartum use of IV ZDV still is recommended in patients with HIV RNA >1,000 copies/mL near delivery unless a documented history of hypersensitivity exists. This intrapartum use of **IV ZDV** is recommended because of its proven record in reducing the risk of perinatal HIV transmission, even in the presence of maternal resistance to the drug (see [Antiretroviral Drug Resistance and Resistance Testing in Pregnancy](#)).

Administration of Intrapartum IV ZDV

Intrapartum IV ZDV is recommended for individuals with HIV RNA >1,000 copies/mL or unknown HIV RNA near the time of delivery or when they present in labor. In those with HIV RNA >1,000 copies/mL who are undergoing a scheduled cesarean delivery for prevention of perinatal HIV transmission, IV ZDV administration should begin at least 3 hours before the scheduled cesarean delivery; pregnant people **should receive a 1-hour loading dose of ZDV at 2 mg/kg followed by a continuous IV ZDV infusion of 1 mg/kg for 2 hours (minimum of 3 hours total)**. This recommendation is based on a pharmacokinetic (PK) study in which ZDV was administered orally during pregnancy and as a continuous infusion during labor. Maternal ZDV levels were measured at baseline, after the initial IV loading dose, and then every 3 to 4 hours until delivery. ZDV levels were also measured in cord blood.¹¹ Systemic and intracellular ZDV levels increased from baseline but appeared to stabilize after 3 hours of infusion; cord blood ZDV levels were associated with maternal levels and maternal infusion duration. If cesarean delivery is being performed for other indications and maternal viral load is $\leq 1,000$ copies/mL near the time of delivery, administering IV ZDV is not required.

When an **urgent** unscheduled cesarean delivery is indicated in a patient who has a viral load >1,000 copies/mL, consideration can be given to shortening the interval between initiation of IV ZDV administration and delivery. For example, some experts recommend administering the 1-hour loading dose of IV ZDV and not waiting to complete additional administration before proceeding with delivery when an expedited delivery is indicated.

When IV ZDV is not available, substitution of single-agent oral ZDV for IV ZDV is not recommended. In some international studies, oral (rather than IV) ZDV has been administered during labor. Data are limited on the PKs of oral versus IV ZDV during labor. In studies of oral dosing in labor, ZDV levels were lower than they were with IV dosing, and PK parameters suggested erratic absorption during labor.^{12,13} Therefore, IV administration is recommended over oral administration in the United States for individuals with HIV RNA >1,000 copies/mL near delivery. **Prompt**

administration of combination ART to the pregnant patient is preferred to single therapy with oral ZDV. Consultation with a person experienced in HIV management during labor and delivery is recommended and is available through the [National Perinatal HIV/AIDS Clinical Consultation Center](#) at 1-888-448-8765.

Transmission and Mode of Delivery

Current Recommendations on Mode of Delivery

Scheduled cesarean delivery, defined as cesarean delivery performed before the onset of labor and before rupture of membranes (ROM), is recommended at 38 weeks gestation for prevention of perinatal HIV transmission in individuals with HIV RNA levels >1,000 copies/mL near delivery and for those with unknown HIV RNA levels. Although most studies do not specify the exact time that the HIV RNA levels closest to delivery were measured, the Panel recommends viral load testing at approximately 36 weeks gestation or within 4 weeks of anticipated delivery to inform decisions about mode of delivery and optimal treatment of the newborn. The American College of Obstetricians and Gynecologists (ACOG) recommends that pregnant people with HIV RNA >1,000 copies/mL be counseled regarding the potential benefits of scheduled cesarean delivery.¹⁴

Recommendations for cesarean delivery to prevent perinatal HIV transmission were based initially on findings from a multicenter, randomized clinical trial¹⁵ and a large individual patient data meta-analysis¹⁶ that were conducted before the availability of viral load information, when most pregnant people with HIV received either no ARV drugs or ZDV as a single drug. The HIV RNA threshold of 1,000 copies/mL for decisions about mode of delivery was based largely on data from a 1999 report of the Women and Infants Transmission Study, a large prospective cohort study that reported no cases of perinatal HIV transmission among 57 women with HIV RNA levels <1,000 copies/mL.¹⁷ Results of studies conducted since then have been extrapolated to make current recommendations about the mode of delivery in an era when ART is recommended for all pregnant people and viral load information is readily available.

In a report on births to women with HIV in the United Kingdom and Ireland between 2000 and 2011, perinatal transmission rates in women on ART with HIV RNA <1,000 copies/mL who had a planned cesarean delivery (13 of 3,544 women; 0.3%) were not significantly different from those who had a planned vaginal delivery (6 of 2,238 women; 0.3%).⁹ Similarly, data from the French Perinatal Cohort showed no difference in transmission rates between vaginal delivery and planned cesarean delivery among women with suppressed viral loads on ART (0.3% in both groups of women).¹⁸ Among 290 deliveries in women with HIV in Finland from 1993 to 2013, 75.4% of women delivered vaginally, 12.5% delivered by elective cesarean, and 12.5% delivered by emergency cesarean; 80% had HIV RNA <50 copies/mL. No perinatal HIV transmissions occurred across the delivery methods.¹⁹ For preterm deliveries in women with HIV RNA <1,000 copies/mL, an analysis of data from the French Perinatal Cohort found that transmission rates were slightly higher among planned vaginal deliveries than among planned cesarean deliveries, but the number of women with viral loads <400 copies/mL was low, and the differences across viral load levels were not statistically significant.¹⁸

Given the low perinatal HIV transmission rates achievable with the use of maternal ART, the benefit of scheduled cesarean delivery is difficult to evaluate for people who are virally suppressed. It is unclear whether scheduled cesarean delivery confers any additional benefit in reducing transmission, and there are harms associated with unindicated cesarean delivery. No evidence to date suggests any

benefit from scheduled cesarean delivery in people who have been receiving ART for several weeks and who are virally suppressed at or near delivery. Furthermore, evidence exists that complication rates for cesarean deliveries are higher in women with HIV than in women without HIV.²⁰ Therefore, decisions about mode of delivery for pregnant people receiving ART with HIV RNA levels $\leq 1,000$ copies/mL should be individualized based on discussion between an obstetrician and a pregnant person. Pregnant people should be informed that no evidence indicates that a scheduled cesarean delivery performed solely for prevention of perinatal HIV transmission is of any benefit in people receiving ART with HIV RNA $\leq 1,000$ copies/mL and, therefore, **is not routinely recommended** for these people.

Timing of Delivery

For the general obstetric population, ACOG recommends that a scheduled cesarean delivery not be performed before 39 weeks gestation because of the risk of iatrogenic prematurity.^{21,22} However, when cesarean delivery is indicated to prevent transmission of HIV, ACOG recommends scheduling cesarean delivery at 38 weeks gestation to decrease the likelihood of onset of labor or ROM before delivery.¹⁴ Gestational age should be determined by best obstetrical dating criteria, including last menstrual period and early ultrasound for dating purposes. Consistent with ACOG guidelines for management of individuals with suboptimal pregnancy dating, amniocentesis to document lung maturity should be avoided in pregnant people with HIV.

Among 1,194 infants born to mothers with HIV, 9 (1.6%) born vaginally and 18 (4.4%) delivered by scheduled cesarean had respiratory distress syndrome (RDS) ($P < 0.001$). No statistically significant association existed between mode of delivery and infant RDS in an adjusted model that included infant gestational age and birth weight.²³ Although newborn complications may be increased with planned cesarean delivery at < 39 weeks gestation, the benefits of planned cesarean delivery at 38 weeks generally are thought to outweigh the risks if the procedure is performed to prevent HIV transmission.

In pregnant people with HIV RNA $\leq 1,000$ copies/mL, cesarean delivery is not recommended to prevent perinatal HIV transmission. The Panel recommends that pregnant people should be delivered according to standard obstetric indications; **labor should not be induced at 38 weeks for prevention of perinatal HIV transmission.** When scheduled cesarean delivery is performed in pregnant people with HIV RNA $\leq 1,000$ copies/mL for an indication other than preventing HIV transmission, cesarean delivery should be scheduled based on ACOG guidelines for pregnant people without HIV. A comparison of 613 women (with HIV RNA levels $< 1,000$ copies/mL) who delivered vaginally at 38 to 40 weeks gestation and 303 women who delivered vaginally at ≥ 40 weeks gestation demonstrated no difference (0.3% vs. 0.5%) in perinatal HIV transmission by estimated gestational age at delivery, which suggests that individuals without an indication for scheduled cesarean delivery for prevention of perinatal HIV transmission should be delivered according to standard obstetric indications.²⁴

Cesarean Delivery for People Presenting Late in Pregnancy

People with HIV who present late in pregnancy and are not receiving ARV drugs may not have HIV RNA results available before delivery. Without current therapy, HIV RNA levels are unlikely to be $\leq 1,000$ copies/mL at baseline. Even when ART is initiated immediately, reduction in plasma HIV RNA to undetectable levels may take several weeks, depending on the baseline viral load and kinetics of viral decay for a particular drug regimen (see [Recommendations for the Use of](#)

[Antiretroviral Drugs During Pregnancy: overview](#) and [Pregnant People Who Have Not Achieved Viral Suppression on Antiretroviral Therapy](#)).²⁵⁻²⁹ In this instance, scheduled cesarean delivery is likely to provide additional benefit in reducing the risk of perinatal transmission of HIV, unless viral suppression can be documented before 38 weeks gestation. Although some experts would recommend a cesarean delivery in a person who has virologic suppression for a brief period (e.g., <2 weeks), given this scenario, many others would support a vaginal delivery as long as the person's plasma HIV RNA level was <1,000 copies/mL by the day of delivery. In these situations, patient-centered counseling and shared decision making should be used in making a plan for delivery. Regardless of mode of delivery, presumptive HIV therapy should be considered for the neonate in these circumstances (see [Antiretroviral Management of Newborns with Perinatal HIV Exposure or HIV Infection](#)). No data are available to address the management of an elite controller (i.e., someone who has previously maintained an undetectable HIV RNA level without ART) who presents in labor and is not receiving ART; however, in this setting, it would appear reasonable to administer IV ZDV and support vaginal delivery (CIII).

Risk of Maternal Complications With Cesarean Delivery

Administration of perioperative antimicrobial prophylaxis is recommended for all pregnant people to decrease maternal infectious morbidity associated with cesarean delivery. Most studies performed in the era before routine ART was recommended demonstrated that women with HIV have higher rates of postoperative complications (mostly infectious) than those without HIV and that their risk of complications is related to degree of immunosuppression and the receipt of suppressive ART.³⁰⁻³⁵ A Cochrane review of six studies in women with HIV concluded that urgent cesarean delivery was associated with the highest risk of postpartum morbidity, scheduled cesarean delivery was intermediate in risk, and vaginal delivery had the lowest risk of morbidity.^{36,37} Complication rates in women with HIV in most studies^{15,38-42} were within the range reported in populations of women without HIV with similar risk factors and not of sufficient frequency or severity to outweigh the potential benefit of reduced perinatal HIV transmission.

A U.S. study of nationally representative data from a large administrative database demonstrated that—even in the era of ART—infected complications, surgical trauma, prolonged hospitalization, and in-hospital deaths remain higher among women with HIV than among those without HIV.²⁰ The rate of any complication associated with cesarean delivery was 117 per 1,000 deliveries among women with HIV and 67 per 1,000 deliveries among women without HIV. A meta-analysis of primarily observational studies in women with HIV also reported higher morbidity with elective cesarean delivery than with vaginal delivery (OR: 3.12) and no reduction in perinatal HIV transmission among the mothers on ART.⁴³ Therefore, pregnant people with HIV should be counseled regarding the specific risks associated with undergoing cesarean delivery in the setting of HIV infection.

In addition, caution should be exercised in proceeding with a cesarean delivery in circumstances without clear evidence of benefit, especially in younger people who are likely to have additional pregnancies and perhaps multiple cesarean deliveries. The risks of abnormal placentation (e.g., placenta previa, placenta accreta spectrum), bowel and bladder injury, and intrapartum hemorrhage increase as the number of cesarean deliveries a person has had increases. These risks should be considered and discussed with the pregnant person before proceeding with a cesarean delivery.^{44,45}

Managing Individuals Who Present in Early Labor or With Ruptured Membranes

Most studies have shown a similar risk of perinatal HIV transmission for cesarean delivery performed for obstetric indications after labor and membrane rupture as for vaginal delivery. In one study, the HIV transmission rate was similar in women undergoing emergency cesarean delivery and those delivering vaginally (1.6% vs. 1.9%, respectively).² Although a 2001 meta-analysis found that a longer duration of ruptured membranes was associated with an increased risk of perinatal HIV transmission,⁴⁶ it is not clear how soon after the onset of labor or the ROM that the benefit of cesarean delivery is lost for women with HIV RNA >1,000 copies/mL.⁴⁷ Later data on the association between the duration of ROM and perinatal HIV transmission in the era of ART and viral load measurement are reassuring. A prospective cohort study of 707 pregnant women in Ireland showed that among 493 women on ART with HIV RNA levels <1,000 copies/mL, no cases of perinatal transmission occurred among those with membranes ruptured for up to 25 hours. Only a viral load of >10,000 copies/mL was an independent risk factor for perinatal transmission.⁸

In a large, prospective, population-based surveillance study in the United Kingdom and Ireland that evaluated data on 2,116 pregnancies between 2007 to 2012, no difference was observed in perinatal HIV transmission between women with a ROM duration of ≥ 4 hours (0.64%) and those with a ROM duration of <4 hours (0.34%). Among women with HIV RNA <50 copies/mL, the transmission rate for a ROM duration ≥ 4 hours was 0.14% and did not differ from the rate for a ROM duration of <4 hours (0.12%). The median duration of ROM was 3 hours 30 minutes (interquartile range: 1–8 hours). The infants in this study were delivered at term—vaginally or by emergency cesarean delivery—to women with HIV who were on ART; the majority of women (89%) had HIV RNA <50 copies/mL and only 1% had HIV RNA $\geq 1,000$ copies/mL. Among preterm infants, no transmissions occurred during 163 deliveries where the maternal viral load was <50 copies/mL.⁴⁸

Because it is not clear whether cesarean delivery after onset of labor reduces the risk of perinatal HIV transmission in individuals with HIV RNA >1,000 copies/mL, management of patients originally scheduled for cesarean delivery who present in labor or with ruptured membranes must be individualized at the time of presentation.

If spontaneous ROM occurs at >34 weeks gestation before labor or early in labor in individuals whose HIV RNA level is $\leq 1,000$ copies/mL, interventions to decrease the interval to delivery (e.g., administration of oxytocin) should be considered based on obstetric considerations. When membrane rupture occurs before 34 weeks gestation, decisions about timing of delivery should be based on best obstetric practices, considering risks to the infant of prematurity and of HIV transmission. Antibiotics to prolong the time from membrane rupture to onset of labor (the latency period), magnesium sulfate for fetal neuroprotection, and antenatal corticosteroids to accelerate fetal lung maturity should be given in accordance with usual obstetric guidelines because no data exist to suggest that these recommendations need to be altered for pregnant people with HIV.

In these circumstances, where there is a paucity of data, consultation with an expert in perinatal HIV may be helpful. Because the delivery plan in the setting of labor must be made quickly, telephone consultation via a 24-hour, 7-day-a-week hotline (e.g., the [National Perinatal HIV/AIDS Clinical Consultation Center](#) at 1-888-448-8765) may provide assistance in rapidly developing an individualized plan.

Other Intrapartum Management

Obstetric Procedures

Obstetric procedures that increase the risk of fetal exposure to maternal blood—such as invasive fetal monitoring—have been associated with an increased risk of perinatal transmission in some studies, primarily those performed in the pre-ART era.⁴⁹⁻⁵² Data are limited on the use of fetal scalp electrodes during labor in women who are receiving suppressive ART and who have an undetectable viral load. The use of fetal scalp electrodes for fetal monitoring is an additional **potential** source of perinatal HIV exposure for the infant and should be avoided in the setting of maternal HIV infection when possible. If a fetal scalp electrode is used, some Panel members would manage the infant as being at high risk of perinatal HIV transmission even when the mother is virally suppressed (HIV RNA <50 copies/mL). See [Antiretroviral Management of Newborns with Perinatal HIV Exposure or HIV Infection](#).

Based on data discussed in the previous section (see Managing Individuals Who Present in Early Labor or with Ruptured Membranes, **above**), artificial ROM can be performed for standard obstetric indications in people with HIV RNA <50 copies/mL who are on ART and are virally suppressed. Artificial ROM should be avoided in people with HIV RNA \geq 50 copies/mL, unless there is a clear obstetric indication. Although no data exist about the risks of perinatal HIV transmission with intrauterine pressure catheters, clinicians may use them with caution when indicated.

Delayed cord clamping has been associated with improved iron stores in both term and preterm infants, as well as a lower incidence of necrotizing enterocolitis and intraventricular hemorrhage in preterm infants born to mothers without HIV. ACOG now recommends delaying cord clamping for 30 to 60 seconds after birth in vigorous term and preterm infants.⁵³⁻⁵⁵ In the setting of HIV infection, a recent study of 64 mother–infant pairs in which 32 infants had early cord clamping (performed <30 seconds after birth) and 32 infants had delayed cord clamping (performed 120 seconds after birth) found that mean hemoglobin levels at 24 hours of life were significantly higher in the delayed cord clamping group ($P = 0.05$). This difference persisted at 1 month of age ($P < 0.05$), despite differential prescribing of iron supplementation to infants with anemia. All mothers were on stable ARV regimens. During 18 months of follow-up, no HIV transmissions were reported and the risk of jaundice or polycythemia in infants with delayed cord clamping did not increase.⁵⁶

Intrapartum Epidural Use and Pharmacologic Interactions With ARV Drugs

Ritonavir (RTV) inhibition of cytochrome P450 (CYP) 3A4 decreases the elimination of fentanyl by 67%. This raises concerns about a possible increased risk of respiratory depression, particularly with patient-controlled analgesia during labor, in patients who are receiving regimens that contain RTV. However, a pharmacokinetic simulation study suggested that even with maximal clinical dosing regimens of epidural fentanyl over 24 hours, RTV-induced CYP3A4 inhibition is unlikely to produce the plasma fentanyl concentrations that are associated with a decrease in minute ventilation.⁵⁷ This suggests that epidural anesthesia can be used safely regardless of a patient's ARV regimen.

Operative Vaginal Delivery

In the past, before data from the era of ART were available, HIV was considered a relative contraindication to operative vaginal delivery with forceps or vacuum device. Peters et al. reviewed the deliveries of 9,072 women with HIV in the United Kingdom between 2008 and 2016. The

percentage of women with viral suppression was 80% for the deliveries from 2007 through 2011 and 90% for those from 2012 through 2014. Among the 3,023 of 3,663 vaginal deliveries with data as to whether forceps or vacuum device were used, 249 (8.2%) involved operative delivery (5.6% using forceps, 2.4% using vacuum device, 0.1% using both forceps and vacuum device, and 0.2% device type unknown). Among the 222 infants with known HIV status at 18 months of age, one case of HIV transmission with multiple possible causes was reported and not enough evidence existed to confirm intrapartum transmission. The study authors concluded that operative delivery is a safe option for women who are virally suppressed.⁵⁸ Based on these data, the Panel recommends that operative delivery with forceps or a vacuum extractor should follow standard obstetric indications but should be avoided, if possible, when HIV RNA is ≥ 50 copies/mL. No data from the ART era address the risk of perinatal HIV transmission associated with episiotomy or with vaginal or perineal tears in the absence of maternal viremia; indications for episiotomy should be the same as they are for pregnant people without HIV (e.g., a need for expedited vaginal delivery, a need for operative vaginal delivery, shoulder dystocia).

Postpartum Hemorrhage, ARV Drugs, and Methergine Use

Oral or parenteral methergine or other ergot alkaloids often are used as first-line treatment for postpartum hemorrhage caused by uterine atony. However, methergine should not be coadministered with drugs that are potent CYP3A4 enzyme inhibitors, including protease inhibitors (PIs). Concomitant use of ergotamines with PIs and/or cobicistat (COBI) has been associated with exaggerated vasoconstrictive responses, including acute ischemia of the lower extremities.^{59,60} When uterine atony results in excessive postpartum bleeding in people who are receiving PIs or COBI, methergine should be used only if alternative treatments—such as prostaglandin F₂-alpha, misoprostol, or oxytocin—are unavailable or are contraindicated. If no alternative medications are available and the need for pharmacologic treatment outweighs the risks, methergine should be used at the lowest effective dose for the shortest possible duration. In contrast, additional uterotonic agents may be needed when using other ARV drugs that are CYP3A4 inducers (e.g., nevirapine, efavirenz, etravirine) because of the potential for decreased methergine levels and inadequate treatment effect. No known drug–drug interactions limit the adjunctive use of tranexamic acid in this setting.

Table 9. Intrapartum Care and Recommended Interventions to Prevent Perinatal HIV Transmission for Pregnant People with HIV Based on HIV RNA Levels at the Time of Delivery

All individuals with HIV should be receiving antiretroviral therapy (ART) or initiate ART in pregnancy as early as possible to suppress HIV RNA to undetectable levels (<50 copies/mL).

HIV RNA at Time of Delivery Assessed at 36 Weeks Gestation or Within 4 Weeks of Delivery with No Concerns Regarding ART Adherence ^a				
	<50 copies/mL and on ART with No Concerns About Adherence	≥50 to ≤1,000 copies/mL	>1,000 copies/mL	Unknown HIV RNA ART Adherence Concerns Not Receiving ART HIV Diagnosis in Labor
Intrapartum ART	Pregnant people should take their prescribed ART on schedule during labor and before scheduled cesarean delivery (CIII). In general, ARV regimens are initiated postpartum for people diagnosed with HIV during labor.			
Intrapartum IV ZDV	Not required (BII).	Not required but may be considered (CII); many experts recommend.	Yes, recommended (AI). ^b IV ZDV: 1-hour loading dose at 2 mg/kg followed by a continuous ZDV infusion of 1 mg/kg for 2 hours (at least 3 hours total) (AII).	
Mode of delivery	Normal vaginal delivery ^c (AII).	Normal vaginal delivery ^c (AII).	Scheduled cesarean delivery at 38 weeks ^d (AII).	Individualized care, see footnote. ^d
Artificial rupture of membranes^e	Per standard obstetric indications (BII).	Avoid if possible (BIII).	Not applicable, cesarean delivery recommended.	Avoid if possible in people with detectable or unknown viral load who are not receiving a cesarean delivery (BII).
Induction of labor	Per standard obstetric indications, including use of oxytocin . Pregnant people with HIV RNA ≤1,000 copies/mL should NOT be routinely induced at 38 weeks.		Not applicable, scheduled cesarean delivery recommended.	Avoid if possible (BIII).
IUPC	Data not available for pregnant people with HIV; use IUPC with caution and only if clear obstetric indications exist.			
Fetal scalp electrodes for fetal monitoring	Avoid, particularly when maternal viral load is not suppressed (≥50 copies/mL) or is unknown, because of the potential risk of HIV transmission (BIII). See Antiretroviral Management of Newborns with Perinatal HIV Exposure or HIV Infection .			
Operative delivery with forceps or a vacuum extractor	Per standard obstetric indications (BIII).	Avoid for pregnant people in the setting of viremia if possible (BIII).		

Table 9. Intrapartum Care and Recommended Interventions to Prevent Perinatal HIV Transmission for Pregnant People with HIV Based on HIV RNA Levels at the Time of Delivery

HIV RNA at Time of Delivery Assessed at 36 Weeks Gestation or Within 4 Weeks of Delivery with No Concerns Regarding ART Adherence ^a				
	<50 copies/mL and on ART with No Concerns About Adherence	≥50 to ≤1,000 copies/mL	>1,000 copies/mL	Unknown HIV RNA ART Adherence Concerns Not Receiving ART HIV Diagnosis in Labor
Delayed cord clamping	Per standard obstetric indications and care.			
Use of methergine for postpartum hemorrhage	Due to potential drug interactions with some ARV drugs, consider a patient's ARV regimen when treating postpartum bleeding caused by uterine atony (BIII). ^f			
Infant ARVs and infant feeding	See Antiretroviral Management of Newborns with Perinatal HIV Exposure or HIV Infection, Table 10, Table 11, Postpartum Follow-Up of People with HIV, and Infant Feeding for Individuals with HIV in the United States.			

Key: ART = antiretroviral therapy; ARV = antiretroviral; CYP = cytochrome P450; IUPC = intrauterine pressure catheter; IV = intravenous; ZDV = zidovudine

^a Assess ART adherence at every visit and upon presentation for delivery.

^b Begin IV ZDV when patients present in labor or at least 3 hours before a cesarean delivery using a 1-hour loading dose of ZDV at 2 mg/kg followed by a continuous ZDV infusion of 1 mg/kg for at least 2 hours (AII).

^c Scheduled cesarean delivery performed solely for prevention of perinatal HIV transmission in people receiving ART with HIV RNA ≤1,000 copies/mL is **not recommended** given the low rate of perinatal transmission in this group (AII). In people with HIV RNA levels ≤1,000 copies/mL, if scheduled cesarean delivery or induction is indicated, it should be performed at the standard time for obstetric indications (AII).

^d Provide individualized care. If HIV RNA is >1,000 copies/mL or unknown, evidence is insufficient to determine whether cesarean delivery reduces the risk of perinatal HIV transmission for people who present in spontaneous labor or with ruptured membranes. Management of people originally scheduled for cesarean delivery because of HIV who present in labor must be individualized at the time of presentation (BII). In these circumstances, consultation with an expert in perinatal HIV (e.g., telephone consultation with the [National Perinatal HIV/AIDS Clinical Consultation Center](#) at 1-888-448-8765) may be helpful in rapidly developing an individualized plan.

^e In pregnant people on ART with suppressed viral load (HIV RNA <50 copies/mL), duration of ruptured membranes is not associated with an increased risk of perinatal transmission and is not an indication for cesarean delivery to prevent HIV transmission (BII).

^f Consider drug interactions with ART when treating postpartum bleeding caused by uterine atony. In people who are receiving a CYP3A4 enzyme inhibitor (e.g., a protease inhibitor, cobicistat), methergine should be used only if no alternative treatments for postpartum hemorrhage are available and the need for pharmacologic treatment outweighs the risks. If methergine is used, it should be administered at the lowest effective dose for the shortest possible duration (BIII). In people who are receiving a CYP3A4 enzyme inducer—such as nevirapine, efavirenz, or etravirine—additional uterotonic agents may be needed because of the potential for decreased methergine levels and inadequate treatment effect (BIII).

Rating of Recommendations: A = Strong; B = Moderate; C = Optional

Rating of Evidence: I = One or more randomized trials with clinical outcomes and/or validated laboratory endpoints; II = One or more well-designed, nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

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