### Panel’s Recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
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<tbody>
<tr>
<td>Artificial rupture of membranes (ROM) performed in the setting of antiretroviral therapy (ART) and virologic suppression is not associated with increased risk of perinatal transmission and can be performed for standard obstetric indications (BII)</td>
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<td>The following should generally be avoided because of a potential increased risk of transmission, unless there are clear obstetric indications:</td>
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<td>Artificial ROM in the setting of viremia (BIII)</td>
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<td>Routine use of fetal scalp electrodes for fetal monitoring (BIII)</td>
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<td>Operative delivery with forceps or a vacuum extractor (BIII)</td>
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<td>The ART regimen a woman is receiving should be considered when treating excessive postpartum bleeding resulting from uterine atony:</td>
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<td>In women who are receiving a cytochrome P450 (CYP) 3A4 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 in the lowest effective dose for the shortest possible duration (BIII).</td>
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<td>In women 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).</td>
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**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

Data on the association of duration of rupture of membranes (ROM) and perinatal transmission in the era of effective antiretroviral therapy (ART) are reassuring. A prospective cohort study of 707 pregnant women on ART included 493 women with delivery HIV-RNA <1,000 copies/mL with no cases of perinatal transmission with up to 25 hours of membrane rupture; logistic regression found that HIV viral load >10,000 copies/mL was the only independent risk factor for transmission. A large prospective, population-based surveillance study in the UK and Ireland included 2,116 pregnancies delivered at term vaginally or by emergency Cesarean delivery in women on ART from 2007 through 2012 with information on duration of ROM. The median duration of ROM was 3 hours 30 minutes (interquartile range, IQR 1–8 hours) and the overall perinatal transmission rate was not significantly different with longer duration of ROM (0.64% with duration of ROM ≥4 hours compared with 0.34% for ROM <4 hours, [OR 1.90, 95% CI, 0.45–7.97]). In those women with a viral load <50 copies/mL, there was no difference in perinatal transmission rates with duration of ROM ≥4 hours, compared with <4 hours (0.14% for ≥4 hours versus 0.12% for <4 hour; OR 1.14, 95% CI, 0.07–18.27). Among infants born preterm, there were no transmissions in 163 deliveries where the maternal viral load was <50 copies/mL. If spontaneous ROM occurs before or early during the course of labor, interventions to decrease the interval to delivery (e.g., administration of oxytocin) can be considered based on obstetric considerations in women with HIV with viral suppression. Women with detectable HIV viral loads should not undergo artificial ROM unless there is a clear obstetric indication.

Obstetric procedures that increase the risk of fetal exposure to maternal blood, such as invasive fetal monitoring, have been implicated in increasing vertical transmission rates by some, but not all, investigators, primarily in studies performed in the pre-ART era. Data are limited on use of fetal scalp electrodes in labor in women receiving suppressive ART who have undetectable viral loads; routine use of fetal scalp electrodes for fetal monitoring should generally be avoided in the setting of maternal HIV infection.

Similarly, data are limited regarding the potential risk of perinatal transmission of HIV associated with operative vaginal delivery with forceps or the vacuum extractor and/or use of episiotomy and are mostly from the pre-ART era. A prospective, population-based surveillance study in the UK and Ireland reported 251 operative deliveries (forceps or vacuum) from January 2008 through March 2016; 1 infant delivered...
operatively is known to have acquired HIV, although there were other significant risk factors that may have contributed to this transmission.\textsuperscript{7} Although information on HIV-RNA levels was not included in this report, during this time period 80\% to 90\% of pregnant women living with HIV in the UK achieved viral suppression by the time of delivery.\textsuperscript{7,8} These procedures should be performed only if there are clear obstetric indications. There are no data in the ART era regarding risk of perinatal HIV transmission with episiotomy or with vaginal or perineal tears, specifically in the absence of maternal viremia; indications for episiotomy should be the same as they are for women without HIV (e.g., need for expedited vaginal delivery, need for operative vaginal delivery, shoulder dystocia). 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 infection. The American College of Obstetricians and Gynecologists now recommends this practice in vigorous term and preterm infants, with clamping delayed for at least 30 to 60 seconds after birth.\textsuperscript{9-11} Even though HIV-specific data on the practice are lacking, there is no reason to modify it in mothers with HIV.

**Intrapartum Epidural Use and Pharmacologic Interactions with Antiretroviral Drugs**

Ritonavir inhibition of cytochrome P450 (CYP) 3A4 decreases the elimination of fentanyl by 67\%, raising concerns about possible increased risk of respiratory depression, particularly with patient-controlled analgesia during labor, in women receiving ritonavir-containing regimens. However, a pharmacokinetic simulation study suggests that even with maximal clinical dosing regimens of epidural fentanyl over 24 hours, ritonavir-induced CYP3A4 inhibition is unlikely to produce plasma fentanyl concentrations associated with a decrease in minute ventilation.\textsuperscript{12} This suggests that epidural anesthesia can be used safely regardless of ART regimen.

**Postpartum Hemorrhage, Antiretroviral Drugs, and Methergine Use**

Oral or parenteral methergine or other ergot alkaloids are often used as first-line treatment for postpartum hemorrhage resulting from 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 have been associated with exaggerated vasoconstrictive responses.\textsuperscript{13} When uterine atony results in excessive postpartum bleeding in women receiving PIs or cobicistat, 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 in as low a dose and for as short a period as possible. In contrast, additional uterotonic agents may be needed when other antiretroviral drugs that are CYP3A4 inducers (e.g., nevirapine, efavirenz, etravirine) are used because of the potential for decreased methergine levels and inadequate treatment effect.

**References**


