Rapid HIV Testing in Labor & Delivery: A Safety Net to Prevent Perinatal Transmission

Margaret A. Lampe, RN, MPH
Centers for Disease Control & Prevention
Division of HIV/AIDS Prevention

July 2007
Rapid HIV Testing in Labor & Delivery: A Safety Net to Prevent Perinatal Transmission

At the end of this session, the participant will be able to

1. Explain the need for HIV testing in an emergent situation using “opt-out” consenting
2. Interpret test results, and understand the need for follow up of a positive test
3. Understand the importance of even late diagnosis in prevention of perinatal transmission
4. Understand the differences and issues associated with point of care vs. laboratory based testing
Estimated Number of Perinatally Acquired AIDS Cases, by Year of Diagnosis, 1985-2005 – United States

PACTG 076 & USPHS ZDV Recs

CDC HIV Testing Recs

~95% reduction

Number of cases:
- 0
- 200
- 400
- 600
- 800
- 1000

Year of diagnosis:
- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005

PACTG 076 & USPHS ZDV Recs:
- CDC HIV Testing Recs
- ~95% reduction
Estimated Number and Proportion of AIDS Cases among Female Adults and Adolescents 1985–2005—United States and Dependent Areas

Note. Data have been adjusted for reporting delays.
AIDS Rates for Female Adults and Adolescents Reported in 2005—United States and Dependent Areas

Rate (per 100,000 population)
- < 4
- 4 - 10
- > 10

American Samoa
Guam
Northern Mariana Islands
Puerto Rico
Virgin Islands, U.S.

* Rates were not calculated for areas reporting fewer than 5 AIDS cases in females in 2005.
Reported AIDS Cases among Female Adults and Adolescents, by Region and Race/Ethnicity, 2005
50 States and DC

Region

<table>
<thead>
<tr>
<th>Region</th>
<th>White, not Hispanic</th>
<th>Black, not Hispanic</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>419</td>
<td>1,923</td>
<td>821</td>
</tr>
<tr>
<td>Midwest</td>
<td>255</td>
<td>723</td>
<td>88</td>
</tr>
<tr>
<td>South</td>
<td>827</td>
<td>4,005</td>
<td>482</td>
</tr>
<tr>
<td>West</td>
<td>284</td>
<td>287</td>
<td>251</td>
</tr>
</tbody>
</table>

* Region totals include females of unknown race or multiple races.
Female Adults and Adolescents 15 to 44 Years of Age Reported to be Living with AIDS, 2005—United States and Dependent Areas

N=53,281*

Note: Data based on person's age as of December 31, 2005.
* Includes 77 persons whose residence is unknown or missing.
Diagnosis Rates of HIV/AIDS for Female Adults and Adolescents, 2005—33 States

Note: Data include persons with a diagnosis of HIV infection regardless of AIDS status at diagnosis. Data from 33 states with confidential named-based HIV infection reporting since at least 2001. Data have been adjusted for reporting delays.
Timing of Antiretroviral (ARV) Prophylaxis and Risk of Perinatal HIV Transmission

- **No ARV + BF**: 40%
- **No ARV**: ~25%
- **In Labor**: 9-13%
- **Pregnancy**: <2%

**Estimated Transmission Rate**

Wade, et al. 1998 NEJM 339;1409-14
Guay, et al. 1999 Lancet 354;795-802
Fiscus, et al. 2002 Ped Inf Dis J 21;664-668
Moodley, et al. 2003 JID 167;725-735
Rationale for Rapid HIV Testing for Women in Labor

- 6,000-7,000 HIV infected women gave birth in 2000
- 280-370 HIV infected infants
- 40% of infected infants born to women with unknown HIV status prior to delivery
  (Office of Inspector General, July 2003)
- In 2002, only 69% of post-partum women reported HIV testing during prenatal care
  (Anderson & Sansom, MCH Journal, June 2006)
### Estimated Number of Perinatally-Acquired HIV Infections, United States

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimate</th>
<th>(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>1,650</td>
<td>--</td>
</tr>
<tr>
<td>2000</td>
<td>284-367</td>
<td>--</td>
</tr>
<tr>
<td>2001</td>
<td>277</td>
<td>(244-295)</td>
</tr>
<tr>
<td>2002</td>
<td>204</td>
<td>(161-276)</td>
</tr>
<tr>
<td>2003</td>
<td>167</td>
<td>(127-224)</td>
</tr>
<tr>
<td>2004</td>
<td>138</td>
<td>(96-186)</td>
</tr>
</tbody>
</table>

Lindegren, JAMA 1999  
Fleming, IAS 2002  
McKenna, AJOG in press
The Case for Rapid HIV Testing During Labor

Zidovudine administration during pregnancy and the neonatal period reduces the rate of mother-to-child transmission of human immunodeficiency virus (HIV) type 1 by approximately two-thirds. Analysis of data from the AIDS Clinical Trial Group (ACTG) 076 cohort and subsequent reports has revealed perinatal transmission rates in the 3% to 5% range in zidovudine-treated groups compared with previously reported rates of 20% or greater in untreated groups. In late 1994, the Public Health Service developed recommendations for the use of zidovudine during the antepartum, intrapartum, and neonatal period, establishing the national standard of care for identified HIV-infected pregnant women.

The success of ACTG 076, while impressive, is not absolute; 2 challenges remain to optimize the prevention of mother-to-child transmission of HIV. First, steps must be taken to further lower the rate of transmission before the 3% level reported among the treated mothers in the ACTG 076 trial. Trials of multiple antiretroviral agents are now being undertaken toward that end. However, even the development of improved therapeutic and diagnostic tools will not signal the death knell of perinatal infections. The continued existence of congenital syphilis, despite the availability of a clinically effective prevention protocol, is a case in point. In New York, the de facto standard of prenatal care is for all women to be tested for syphilis during pregnancy and for all infected women to be treated. Despite these stringent preventive measures, congenital syphilis rates as high as 2% have been reported from some hospitals in New York State within the last decade. As with HIV, women at highest risk for delivering a child with a prenatal care than if transmission rates were reduced from 5% to 2% among cohorts already receiving zidovudine (as is the current goal of the pediatric ACTG).

In the United States, 2% of pregnant women receive little or no prenatal care. However, some groups, such as African Americans and Hispanics, have rates closer to 10%. Often their first and only opportunity to have counseling and testing for HIV occurs when they are admitted during labor. Women who have inadequate care are often at particular risk for HIV infection because of drug use. For example, a study conducted at a municipal hospital in New York in 1989 found that 50% of the deliveries to HIV-infected women occurred among the 15% of women with minimal or no prenatal care. These percentages will vary widely by region (17.5% of African Americans in the District of Columbia had intrapartum care) and temporally with the ebb and flow of drug epidemics, resulting in differences in the relative contribution that intrapartum HIV counseling and testing and, where indicated, zidovudine prophylaxis could potentially make to reductions in mother-to-child transmission rates.

In situations such as the one cited above (where 50% of HIV-infected women have no antenatal testing), if intrapartum therapy reduced transmission by one-third (as opposed to the two-thirds associated with the full ACTG 076 regimen), more children would be spared HIV disease than would be spared by the development of more advanced therapeutics that could reduce rates of transmission from 5% to 2%. Clearly, if the effectiveness of intrapartum and neonatal zidovudine more closely approximated that of full prenatal, intrapar
Prenatal and Perinatal Human Immunodeficiency Virus Testing: Expanded Recommendations

ABSTRACT: Early identification and treatment of all pregnant women with human immunodeficiency virus (HIV) is the best way to prevent neonatal disease. Pregnant women universally should be tested for HIV infection with patient notification as part of the routine battery of prenatal blood tests unless they decline the test (ie, opt-out approach). Repeat testing in the third trimester and rapid HIV testing at labor and delivery are additional strategies to further reduce the rate of perinatal HIV transmission. The Committee on Obstetric Practice makes the following recommendations: follow an opt-out prenatal HIV testing approach where legally possible; repeat offers of HIV testing in the third trimester to women in areas with high HIV prevalence; women known to be at high risk for HIV infection, and women who declined testing earlier in pregnancy, as allowed by state laws and regulations; use conventional HIV testing for women who are candidates for third-trimester testing; use rapid HIV testing in labor for women with undocumented HIV status; and if a rapid HIV test result is positive, initiate antiretroviral prophylaxis (with consent) without waiting for the results of the confirmatory test.
CDC Recommendations for HIV Testing of Adults, Adolescents & Pregnant Women, September, 2006

Revised Recommendations for HIV Testing of Adults, Adolescents, and Pregnant Women in Health-Care Settings
### Current ACOG & CDC Recommendations: General Similarities & Differences

<table>
<thead>
<tr>
<th>Recommendation*</th>
<th>CDC</th>
<th>ACOG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opt-out HIV screening early in PNC</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Repeat HIV testing in 3rd trimester for women:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- in jurisdictions/states with elevated HIV incidence among women ages 15-45</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>- in elevated prevalence health care facilities</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>- known to be at high risk for HIV-infection</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>- who declined earlier HIV testing</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

*Some differences in specific terms used*
22 Jurisdictions with elevated HIV or AIDS Case Rates Among Women aged 15-45, 2004*

≥ 17 HIV cases or ≥ 9 AIDS cases per 100,000 women
includes Puerto Rico (not shown)
## Current ACOG & CDC Recommendations: General Similarities & Differences

<table>
<thead>
<tr>
<th>Recommendation*</th>
<th>CDC</th>
<th>ACOG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opt-out rapid HIV testing for women in labor with undocumented HIV test during this pregnancy</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>- initiate ARV prophylaxis on basis of rapid test result</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Rapid HIV testing of newborn if mother’s HIV status unknown.</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

*Some differences in specific terms used
MIRIAD
Mother-Infant Rapid Intervention at Delivery
Objectives of MIRIAD
Mother Infant Rapid Intervention At Delivery

- To determine the feasibility and performance of rapid HIV testing for women in labor with undocumented HIV status
- To provide timely antiretroviral drug prophylaxis to reduce perinatal transmission
- To facilitate follow-up care for HIV-infected women and their infants
THE BENEFITS OF TAKING AN HIV TEST

- All pregnant women should know if they have HIV.
- You can pass HIV to your baby during pregnancy, childbirth and breastfeeding.
- If you have HIV and are pregnant, you have about a 1 in 4 (25%) chance of passing HIV to your baby.
- If you have HIV, you can take medicine to keep you healthy and to lower the chances of passing HIV to your baby. You can also choose not to breastfeed since babies can get HIV from their mother’s milk.
MIRIAD Eligibility & Acceptance
2001-2005

- **153,014** visits evaluated at 17 hospital L&D units
- **12,481 (8.2%)** women were eligible to participate
  - 38% had no prenatal care
- **9,233 (74%)** offered MIRIAD (rapid HIV testing)
- **7,898 (86%)** consented for participation/testing

Acceptance rates varied:
- 87.2% using residual from other labs vs.
- 73.9% when additional finger stick required.
  (p<0.0001)

MIRIAD Participants, 2001-2005

Women with BOTH rapid test & EIA results available
N=7753

HIV+ women
52 (0.7%)

HIV- women
7701 (99.3%)

2 women without delivery information

50 deliveries;
51 babies

HIV+ infants
5/43 (12%)

HIV - infants
38/43 (88%)

Infant HIV status unknown: 8

25/52 (48%) did not disclose known HIV infection
L&D Point-of-Care Testing Station

- The rapid test is done on this counter, extra supplies are stored below.

- OB physicians, midwives and nurses share testing
# Turnaround Times for Rapid Test Results, Point-of-Care vs. Lab Testing: MIRIAD 2001-2005

<table>
<thead>
<tr>
<th>Activity</th>
<th>Point of Care</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival on L&amp;D to result to woman</td>
<td>242 min (4hrs, 2min)</td>
<td>295 min (4hrs, 45min)</td>
</tr>
<tr>
<td>Blood Drawn to result to provider</td>
<td>30 min</td>
<td>68 min</td>
</tr>
</tbody>
</table>

## Odds of < 60 minute turn-around time (blood draw to provider receiving results)
**MIRIAD, 2001-2005; N=6719**

<table>
<thead>
<tr>
<th>Testing Location</th>
<th>AOR*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td>1.0</td>
<td>Ref</td>
</tr>
<tr>
<td>Point of Care</td>
<td>14.3</td>
<td>(12.3, 16.6)</td>
</tr>
<tr>
<td>Hours arrived prior to delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>1.0</td>
<td>Ref</td>
</tr>
<tr>
<td>3-6</td>
<td>1.19</td>
<td>(1.02-1.38)</td>
</tr>
<tr>
<td>7-12</td>
<td>1.21</td>
<td>(1.04-1.42)</td>
</tr>
<tr>
<td>&gt;12</td>
<td>1.26</td>
<td>(1.09-1.46)</td>
</tr>
</tbody>
</table>

* Adjusted by study site

# OraQuick Performance, MIRIAD, 2001-2005
## 7753 women tested

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td># False positives</td>
<td>6</td>
</tr>
<tr>
<td>[EIA: 18 false positives]</td>
<td></td>
</tr>
<tr>
<td># False negatives</td>
<td>0</td>
</tr>
<tr>
<td>Sensitivity (95% CI)</td>
<td>100%</td>
</tr>
<tr>
<td>Specificity (95% CI)</td>
<td>99.9% [EIA: 99.77%]</td>
</tr>
<tr>
<td>Positive Predictive Value</td>
<td>52/58 (90%) [EIA: 52/70 (74%)]</td>
</tr>
</tbody>
</table>

Intrapartum rapid HIV testing of women with unknown status is feasible, acceptable, and accurate.

Implementation Considerations
Implementation Considerations

Who to test?
- No PNC
- Undocumented HIV status – access to prenatal record
- Repeat testing in 3rd trimester - continued risk

Confidentiality
- Informed consent
- Opt-Out Approach

Test
- Point of Care vs Lab
- CLIA Waiver
- Training and QA

Inform*
- Preliminary
- Confirmatory

Refer
- ARV Prophylaxis

Results

Information
- Mother & baby follow-up
- Community-based services

USPHS Guidelines
aidsinfo.nih.org/guidelines
Opt-Out HIV Testing in Labor

- Woman needs to be told:
  - No record of an HIV test result is on her chart
  - HIV testing is part of routine prenatal tests
  - She can decline the test
  - Experts recommend HIV testing because, if a woman is positive, she can lower her baby’s risk of getting HIV and can help her get treatment for herself
## FDA-approved Rapid HIV Tests

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Sensitivity (95% C.I.)</th>
<th>Specificity (95% C.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OraQuick Advance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- whole blood</td>
<td>99.6 (98.5 - 99.9)</td>
<td>100 (99.7-100)</td>
</tr>
<tr>
<td>- oral fluid</td>
<td>99.3 (98.4 - 99.7)</td>
<td>99.8 (99.6 – 99.9)</td>
</tr>
<tr>
<td>- plasma</td>
<td>99.6 (98.5 - 99.9)</td>
<td>99.9 (99.6 – 99.9)</td>
</tr>
<tr>
<td><strong>UniGold Recombigen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- whole blood</td>
<td>100 (99.5 – 100)</td>
<td>99.7 (99.0 – 100)</td>
</tr>
<tr>
<td>- serum/plasma</td>
<td>100 (99.5 – 100)</td>
<td>99.8 (99.3 – 100)</td>
</tr>
<tr>
<td>Test</td>
<td>HIV-1 Sensitivity</td>
<td>HIV-1 Specificity</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Clearview Stat-Pak</td>
<td>99.7 (98.9 – 100)</td>
<td>99.9 (98.6 – 100)</td>
</tr>
<tr>
<td>Clearview Complete</td>
<td>99.7 (98.9 – 100)</td>
<td>99.9 (98.6 – 100)</td>
</tr>
<tr>
<td>Test Type</td>
<td>Sensitivity</td>
<td>Specificity</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>(95% C.I.)</td>
<td>(95% C.I.)</td>
</tr>
<tr>
<td><strong>Reveal G3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- serum</td>
<td>99.8 (99.2 – 100)</td>
<td>99.1 (98.8 – 99.4)</td>
</tr>
<tr>
<td>- plasma</td>
<td>99.8 (99.0 – 100)</td>
<td>98.6 (98.4 – 98.8)</td>
</tr>
<tr>
<td><strong>Multispot</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- serum/plasma</td>
<td>100 (99.9 – 100)</td>
<td>99.9 (99.8 – 100)</td>
</tr>
<tr>
<td>- HIV-2</td>
<td>100 (99.7 – 100)</td>
<td></td>
</tr>
</tbody>
</table>
Remember the tradeoffs...

- Good News: More HIV-positive people receive their test results and there is an opportunity to immediately intervene to reduce the risk of transmission to the infant.

- Challenging News: Some people will receive a false-positive result before confirmatory testing.
Interpreting Rapid Test Results

For a laboratory test:

**Sensitivity**: Probability test=positive if patient=positive

**Specificity**: Probability test=negative if patient=negative

**Predictive value**:

Probability patient=positive if test=positive
Probability patient=negative if test=negative
Example: Test 1,000 persons
Test Specificity = 99.6% (4/1000)

HIV prevalence = 10%

| True positive: | 100 |
| False positive: | 4 |

Positive predictive value: $\frac{100}{104} = 96\%$
Example: Test 1,000 persons

Test Specificity = 99.6% \((4/1000)\)

HIV prevalence = 10%
True positive: 100  False positive: 4
Positive predictive value: 100/104 = 96%

HIV prevalence = 0.4%
True positive: 4  False positive: 4
Positive predictive value: 4/8 = 50%
Positive Predictive Value of a Single Test Depends on Specificity & Varies with Prevalence

<table>
<thead>
<tr>
<th>HIV Prevalence</th>
<th>OraQuick</th>
<th>Reveal</th>
<th>Uni-Gold</th>
<th>Single EIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>99%</td>
<td>92%</td>
<td>97%</td>
<td>98%</td>
</tr>
<tr>
<td>5%</td>
<td>98%</td>
<td>85%</td>
<td>95%</td>
<td>96%</td>
</tr>
<tr>
<td>2%</td>
<td>95%</td>
<td>69%</td>
<td>87%</td>
<td>91%</td>
</tr>
<tr>
<td>1%</td>
<td>91%</td>
<td>53%</td>
<td>77%</td>
<td>83%</td>
</tr>
<tr>
<td>0.5%</td>
<td>83%</td>
<td>36%</td>
<td>63%</td>
<td>71%</td>
</tr>
<tr>
<td>0.3%</td>
<td>75%</td>
<td>25%</td>
<td>50%</td>
<td>60%</td>
</tr>
<tr>
<td>0.1%</td>
<td>50%</td>
<td>10%</td>
<td>25%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Test Specificity  99.9%    99.1%    99.7%    99.8%
Newborn screening

- 3.7 million infants screened

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cases</th>
<th>Incidence</th>
<th>PPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKU</td>
<td>289</td>
<td>1:13,050</td>
<td>2.65%</td>
</tr>
<tr>
<td>Galactosemia</td>
<td>54</td>
<td>1:62,800</td>
<td>0.57%</td>
</tr>
<tr>
<td>Hypothyroidism</td>
<td>1203</td>
<td>1:3,300</td>
<td>1.77%</td>
</tr>
<tr>
<td>Adrenal Hyperplasia</td>
<td>51</td>
<td>1:25,100</td>
<td>0.53%</td>
</tr>
</tbody>
</table>

- Arch Pediatr Adolesc Med, 2000
Negative Predictive Value of a Single Test Depends on Sensitivity & Varies with Prevalence

<table>
<thead>
<tr>
<th>HIV Prevalence</th>
<th>OraQuick</th>
<th>Reveal</th>
<th>Uni-Gold</th>
<th>Single EIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>99.96%</td>
<td>99.98%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>5%</td>
<td>99.98%</td>
<td>99.99%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>2%</td>
<td>99.99%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>1%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>0.5%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>0.3%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>0.1%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Predictive Value, Negative Test

Test Sensitivity | 99.6% | 99.8% | 100% | 100%
Elements of a QA Program

1. Organization of the QA Program
2. Testing Personnel
3. Process Control:
   1. Before testing
   2. During testing
   3. After testing
4. Documents and Records
5. Troubleshooting
The Rapid Test is Positive
The Rapid Test is Positive

- Disclosure
  - gently, privately - probably HIV infected
- Final results await confirmatory testing
  - Local issues
    - EIA not necessary
    - How long will it take?
- Review medications in labor and for the baby
HIV Prophylaxis to Prevent Perinatal Transmission in Labor/Newborn Positive Rapid Test

Four options USPHS guidelines
1. AZT
2. AZT+3TC
3. Nevirapine
4. AZT+nevirapine
The Rapid Test is Positive

- Mode of delivery-vaginal but?
- No invasive uterine procedures
- Avoid amniotomy
- Follow-up care
  - Mother and baby
Conclusion

- Until all pregnant women with HIV access screening prenatally, the promise of ACTG 076 and other clinical trials cannot be realized.

- Rapid testing provides a last opportunity to reduce the impact of missed prevention opportunities.
Clinical Consultation

National Perinatal HIV Consultation and Referral Service (Perinatal Hotline)

*University of California San Francisco*

(888) 488-8765

24 hours/day

7 days/week
Resources

- National Model Protocol
  www.cdc.gov/hiv/projects/perinatal/

- CDC HIV Testing in Health Care Settings
  http://www.cdc.gov/hiv/topics/testing/healthcare/

- USPHS Treatment Guidelines
  www.aidsinfo.nih.gov

- FXBC at UMDNJ www.WomenChildrenHIV.org