HIV: A Review of Diagnosis, Treatment, and Prevention

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Financial Disclosures

- None
Objectives

- Explain how to diagnose a patient with HIV
- List an example of a preferred antiretroviral regimen in a woman of childbearing age
- Describe mechanisms by which antiretroviral therapy (ART) reduces perinatal HIV transmission
- Describe the contraceptive options available to HIV-infected women
- State the reproductive options for safer conception among serodiscordant couples
Rates of HIV Diagnosis Among Adults and Adolescents in the US in 2015, by State

CDC HIV Surveillance Report 2016
HIV in Adult and Adolescent Females, by Race/Ethnicity 2014 USA

**Diagnoses of HIV Infection**
- N = 8,328
- 62% Black/African American
- 16% Asian
- 18% American Indian/Alaska Native
- 2% Hispanic/Latino
- 1% Native Hawaiian/other Pacific Islander
- <1% Multiple races

**Female Population, United States**
- N = 136,147,401
- 64% White
- 15% Hispanic/Latino
- 13% Asian
- 2% American Indian/Alaska Native
- 1% Native Hawaiian/other Pacific Islander
- <1% Multiple races

CDC 2014
HIV Prevalence and Incidence: 1980-2010

- People living with HIV
- New HIV infections using back-calculation methodology
- New HIV infections using original incidence surveillance methodology
- New HIV infections using updated incidence surveillance methodology

CDC 2012
Pregnant Women with HIV at Parkland

Diagnosed >1 year prior to presentation
Diagnosed ≤ 1 year prior to presentation

* Preliminary data
Babies exposed to HIV followed at CMC ARMS

Number of seroconversions:

- 2011: 2
- 2012: 2
- 2013: 0
- 2014: 2
- 2015: 1
- 2016: 1

HIV-exposed babies:
Goals of HIV Care in Pregnancy

- Minimize (eliminate) the risk of perinatal HIV transmission
- Optimize the health of the mother
- Establish (or re-establish) HIV care during and after delivery
- Minimize interruptions in therapy and risk of viral resistance
- Plan for - or prevent - future safe conception
REDUCTION OF MATERNAL–INFANT TRANSMISSION OF HUMAN IMMUNODEFICIENCY VIRUS TYPE 1 WITH ZIDOVUDINE TREATMENT

Edward M. Connor, M.D., Rhoda S. Sperling, M.D., Richard Gelber, Ph.D., Pavel Kiselev, Ph.D., Gwendolyn Scott, M.D., Mary Jo O’Sullivan, M.D., Russell VanDyke, M.D., Mohammed Bey, M.D., William Shearer, M.D., Ph.D., Robert L. Jacobson, M.D., Eleanor Jimenez, M.D., Edward O’Neill, M.D., Brigitte Bazin, M.D., Jean-François Delfraissy, M.D., Mary Culnane, M.S., Robert Coombs, M.D., Ph.D., Mary Elkins, M.S., Jack Moye, M.D., Pamela Stratton, M.D., and James Balsley, M.D., Ph.D., for the Pediatric AIDS Clinical Trials Group Protocol 076 Study Group*
Perinatal HIV Transmission Rate per 100

Cooper, Combination ART for pregnant women with HIV, JAID Human Retrovir, 2002
No Perinatal HIV-1 Transmission from Women with Effective ART Before Conception

<table>
<thead>
<tr>
<th></th>
<th>PT, % (95%CI)</th>
<th>aOR (95%CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall PT</td>
<td>0.7 (0.5-0.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal VL nearest delivery (copies/ml)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥400</td>
<td>2.8 (1.8-4.2)</td>
<td>6.2 (2.6-15.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>50-399</td>
<td>1.5 (0.9-2.4)</td>
<td>4.3 (1.8-9.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Undetectable</strong></td>
<td>0.2 (&lt;0.01-1.2)</td>
<td>1.1 (0.1-8.6)</td>
<td></td>
</tr>
<tr>
<td>Timing of ART</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 28 weeks gestation</td>
<td>2.2 (1.4-3.3)</td>
<td>7.8 (2.1-28.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>14-27 weeks gestation</td>
<td>0.9 (0.5-1.3)</td>
<td>6.0 (1.7-20.7)</td>
<td></td>
</tr>
<tr>
<td>&lt; 14 weeks gestation</td>
<td>0.4 (0.09-1.2)</td>
<td>2.9 (0.6-17.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Before conception</strong></td>
<td>0.2 (0.06-0.4)</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

0/2651 perinatal HIV transmissions

Mandelbrot, Clinical Infectious Diseases, 2015
Minimize (Eliminate) the Risk of Perinatal HIV Transmission

- Without ART during pregnancy, the risk of transmission from mother to infant is 1 in 4.

- The risk of perinatal transmission can now be <1% with:
  - Intrapartum AZT
  - Highly active ART therapy (HAART) for mom (prior to conception ideally)
  - Elective Cesarean section as appropriate
  - Formula feeding
  - Infant prophylaxis
Factors Influencing Perinatal Transmission

- **Maternal Factors**
  - High viral load
  - Low CD4+ lymphocyte count
  - Maternal systemic co-infections
  - STDs: ulcerative diseases
  - Maternal IV drug use
  - No ART or prophylaxis
Factors Influencing Perinatal Transmission

- **Obstetric Factors**
  - Length of ruptured membranes (>4h)
  - Chorioamnionitis
  - Vaginal delivery (if VL > 1000)
  - Invasive procedures

- **Infant Factors**
  - Prematurity
  - Breastfeeding
Timing of Perinatal HIV Transmission: Non-Breastfeeding Women

- **Intrauterine** (before 36 weeks) ~20% of cases
  - Virologic detection of HIV in newborn at 1–2 days of life *(HIV DNA PCR)*

- **Peripartum** ~80% of cases
  - Onset of placental separation
  - Mother-to-fetus microtransfusions
  - Labor and rupture of membranes
  - Virologic detection of HIV in newborn at weeks to months of life *(HIV DNA PCR)*

www.aidsinfo.nih.gov
Preferred ARV regimens in Pregnancy: Jan 26, 2017 (Not on meds)

- Preferred 2-NRTI Backbones:
  - Epzicom (ABC/3TC) (*HLA-B*5701 testing!*)
  - Truvada (TDF/FTC)
  - 3TC+TDF

- PI-based
  - Reyataz (atazanavir)/Norvir (ritonavir) + 2-NRTI backbone
  - Prezcobix (darunavir/ritonavir) + 2-NRTI backbone

- Integrase Inhibitor Regimen
  - Isentress (raltegravir) + 2-NRTI backbone
**Alternative ARV regimens in Pregnancy: January 26, 2017**

- **Combivir** = Alternative 2-NRTI backbone
- **Kaletra** + 2-NRTI backbone
- **Efavirenz** + 2-NRTI backbone
- **Complera** (RPV/TDF/FTC)
- Dolutegravir
- Tenofovir alafenamide
- Stribild (EVG/COBI/TDF/FTC) – *PK studies underway*
- Fosamprenavir
- Miravirroc
- Cobicistat
HIV regimen for pregnant women at Parkland (Not on meds)

- Truvada (TDF/FTC) – one pill daily
- Atazanavir (Reyataz) – 400 mg daily (200 x 2 pills)
- Ritonavir (Norvir) – one pill (100mg) once daily

4 pills per day, taken with food

Atazanavir 300 mg daily postpartum (3 pills/day)
Truvada

- Tenofovir disoproxil fumarate + emtricitabine
  - NRTI - structurally similar to DNA base, incorporates into viral DNA -> premature strand termination
  - Well tolerated; few drug interactions; low pill burden
  - Renally excreted (avoid if significant CKD)
  - Decreases bone density over time
  - Can be used for Hep B/HIV coinfection
Atazanavir

- Protease inhibitor
  - Inhibits HIV-1 protease – results in the production of immature, noninfectious virus
- Requires gastric acid for absorption: dose adjustment with H2 blockers, contraindicated with PPI
- Unconjugated hyperbilirubinemia - not harmful
  - Monitor infant bilirubin but no clinically significant hyperbilirubinemia or kernicterus reported
- Prolongs PR interval – drug interactions
- May cause limited rash, resolves within 2 weeks
Ritonavir

- Protease inhibitor / “booster” for other PIs
  - Has some antiretroviral activity at high doses
  - At lower doses (100mg), used to shut down CYP34A and other liver enzymes to “boost” serum concentrations of other PIs.

Patients must take atazanavir + ritonavir at the same time every day
Single Pill Regimens Available

- **Triumeq®**
  - abacavir 600 mg/dolutegravir 50 mg/
  - lamivudine 300 mg tablets

- **ATRIPLA®**
  - efavirenz 600 mg/entecavir 100 mg/

- **COMPLERA®**
  - emtricitabine 200mg/ribavirin 25mg/
  - tenofovir disoproxil fumarate 300mg tablets

- **STRIKING®**
  - elvitegravir 150mg/cobicistat 150mg/entecavir
  - 200mg/tenofovir disoproxil fumarate 300mg tablets
ART-experienced Women

- If on ART at presentation – continue
  - Resistance testing if detectable viremia (>500 copies/ml)

- If ART-experienced, but not currently on meds
  - Get history of meds, select regimen based on history and prior resistance testing
  - Don’t wait to start meds
Avoid interruption of therapy, if possible

- Interruption is likely to increase risk of ARV resistance

- If discontinuation required, stop and reinitiate all drugs at the same time
Failure of Viral Suppression

- Assess resistance, adherence, dosing and problems with absorption [chelators, gastric acid reducers]
- Consider modification of ARV regimen vs directly observed therapy
- Consult with an HIV expert
- Delivery planning
● Cesarean section recommended:

● For women with HIV RNA levels >1,000 near time of delivery

● Schedule at 38 weeks if for viral load; 39 weeks otherwise

● Benefits of Cesarean unclear after ROM or onset of labor, or for women with HIV RNA levels <1,000 on combination ARVs
Intrapartum Management for Women on ARV in Pregnancy

- IV ZDV not required if woman is receiving combination ARV regimens and HIV RNA < 1000 copies/mL consistently during late pregnancy and no concerns regarding adherence to the regimen

- *Current practice at PHHS is to administer IV ZDV to all HIV-positive women regardless of viral load*

- Continue oral ART regimen during labor

- **Avoid** invasive procedures

- **Caution:** Methergine with PI-based regimen - HYPERTENSION
Follow-Up Care for the Mother

- Maternal Child Health postpartum visit (MFM clinic)
- Refer mother for continued HIV care
- Confirm ART dosage changes if needed postpartum (atazanavir)
- Monitor for adherence and postpartum depression
- HIV testing and follow-up of neonate and other children
- Follow-up of sexual/needle-sharing partners
Follow-Up Care for the Mother

- Primary, gynecologic/obstetric, and family planning services
- Mental health services
- Substance abuse treatment
- Coordination of care through case management for the woman, her children, and other family members
HIV-infected women can use all available contraceptive methods

- For those on boosted PI regimen (atazanavir/ritonavir):
  - Implant, progestin-only pill, combined hormonal contraceptives = 2
  - DMPA = 1
  - IUD: Initiation = 1/2, Continuation = 1

- Emergency contraception should be offered

CDC, Medical Eligibility Criteria for Contraception 2016
## Importance of postpartum retention

<table>
<thead>
<tr>
<th>Variable</th>
<th>Maintained viral load suppression (n = 57)</th>
<th>Did not maintain viral load suppression (n = 46)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral load at subsequent presentation, copies/mL</td>
<td>0 [0, 0]</td>
<td>10,160 [3157, 45,200]</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>CD4 cell count at subsequent presentation, cells/μL</td>
<td>596 [397, 783]</td>
<td>342 [197, 566]</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>ART at subsequent presentation</td>
<td>43 (75)</td>
<td>27 (59)</td>
<td>.01</td>
</tr>
<tr>
<td>Viral load at subsequent delivery, copies/mL</td>
<td>0 [0, 0]</td>
<td>0 [0, 978]</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>CD4 cell count at subsequent delivery, cells/μL</td>
<td>562 [435, 807]</td>
<td>427 [234, 625]</td>
<td>.004</td>
</tr>
<tr>
<td>ART at subsequent delivery</td>
<td>56 (98)</td>
<td>43 (93)</td>
<td>.40</td>
</tr>
<tr>
<td>Vertical transmission</td>
<td>0</td>
<td>4 (9)</td>
<td>.02</td>
</tr>
</tbody>
</table>

Data are reported as mean ± SD, n (percentage), median [Q1, Q3].

ART, antiretroviral therapy; HIV, human immunodeficiency virus; Q, quartile.
HIV care engagement during pregnancy and 2 years postpartum, Philadelphia, 2005 - 2011

Adams, Clinical Infectious Diseases, 2015
# Factors associated with Postpartum disengagement from HIV care at Parkland

## Deliveries at Parkland between Jan 1, 2005 – June 30, 2015

<table>
<thead>
<tr>
<th>Event</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Followed up to MFM clinic postpartum</td>
<td>465 (80%)</td>
</tr>
<tr>
<td>Followed up to HIV clinic within 1 year postpartum</td>
<td>390 (67%)</td>
</tr>
<tr>
<td>Median time to HIV clinic visit (days)</td>
<td>50 [29-103]</td>
</tr>
</tbody>
</table>

Data presented as n (%) or median [Q1, Q3] as appropriate

Unpublished data
# Factors Associated with Postpartum Disengagement from HIV care at Parkland

<table>
<thead>
<tr>
<th></th>
<th>Follow up (n = 390)</th>
<th>No Follow up (n = 189)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>27.9 ± 5.8</td>
<td>26.4 ± 5.8</td>
<td>0.004</td>
</tr>
<tr>
<td>Nulliparity</td>
<td>99 (25)</td>
<td>50 (26)</td>
<td>0.78</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td>0.04</td>
</tr>
<tr>
<td>Black</td>
<td>276 (71)</td>
<td>144 (76)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>31 (8)</td>
<td>22 (12)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>79 (20)</td>
<td>21 (11)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4 (1)</td>
<td>2 (1)</td>
<td></td>
</tr>
<tr>
<td>Entered prenatal care (PNC)</td>
<td>386 (99)</td>
<td>181 (96)</td>
<td>0.01</td>
</tr>
<tr>
<td>Number of PNC visits</td>
<td>11 [8, 14]</td>
<td>8 [5, 11]</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data presented as n (%), mean ±SD, or median [Q1, Q3] as appropriate.
<table>
<thead>
<tr>
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<th>Follow up (n = 390)</th>
<th>No Follow up (n = 189)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIV diagnosis duration (years)</strong></td>
<td>2.3 [0.5, 5.2]</td>
<td>2.0 [0.4, 4.9]</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Viral load &lt;1000 copies/ml</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At presentation to PNC</td>
<td>181 (46)</td>
<td>56 (30)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>At delivery</td>
<td>302 (77)</td>
<td>129 (68)</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Viral load undetectable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At presentation to PNC</td>
<td>104 (27)</td>
<td>31 (16)</td>
<td>0.006</td>
</tr>
<tr>
<td>At delivery</td>
<td>244 (63)</td>
<td>78 (41)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Antiretroviral therapy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At presentation to PNC</td>
<td>191/382 (49)</td>
<td>55/177 (29)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>At delivery</td>
<td>371/382 (95)</td>
<td>161/177 (85)</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Data presented as n (%), mean ±SD, or median [Q1, Q3] as appropriate.
Conclusion

Women at risk for disengagement from postpartum HIV care at Parkland:

- Younger
- Non-Hispanic ethnicity
- Less likely to be on ART or virologically suppressed at initiation of prenatal care
- Less likely to achieve complete viral suppression by delivery

Unpublished data
Impact of pill burden on retention to care postpartum at Parkland

Deliveries at Parkland between Jan 1, 2011 – June 30, 2015

<table>
<thead>
<tr>
<th>Prescribed an ART regimen of &lt; 6 pills/day</th>
<th>n = 284 deliveries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>91 (32%)</td>
</tr>
<tr>
<td>Prescribed an ART regimen of ≥ 6 pills/day</td>
<td>193 (68%)</td>
</tr>
</tbody>
</table>

Data presented as n (%) as appropriate

Unpublished data
## Impact of pill burden on retention to care postpartum at Parkland

<table>
<thead>
<tr>
<th></th>
<th>&lt; 6 pills/day</th>
<th>≥ 6 pills/day</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow up with OB postpartum</td>
<td>76 (84)</td>
<td>146 (76)</td>
<td>0.134</td>
</tr>
<tr>
<td>Follow up with HIV clinic within 1 year postpartum</td>
<td>70 (77)</td>
<td>116 (60)</td>
<td>0.018</td>
</tr>
<tr>
<td>Viral load undetectable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At presentation to PNC</td>
<td>42 (46)</td>
<td>27 (14)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>At delivery</td>
<td>57 (63)</td>
<td>93 (48)</td>
<td>0.056</td>
</tr>
<tr>
<td>At first postpartum visit</td>
<td>43 (47)</td>
<td>51 (26)</td>
<td>0.001</td>
</tr>
<tr>
<td>Postpartum ART change by HIV provider</td>
<td>7 (8)</td>
<td>88 (46)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data presented as n (%) as appropriate

*Unpublished data*
ART regimens with lower pill burden (<6 pills/day) during pregnancy are associated with:

- Retention to HIV primary care in the year postpartum
- Continued virologic suppression at postpartum HIV clinic visit
- Fewer ART changes at the HIV clinic postpartum

Unpublished data
Safe Conception for Serodiscordant Couples: January 2017 Updates

- ART for the infected partner until VL undetectable
  - Consider pre-exposure prophylaxis (PrEP)
  - Discordance between plasma and genital viral loads reported
  - ARV drugs vary in ability to penetrate the genital tract

**HIV-infected female:** artificial insemination (partner’s sperm)

**HIV-infected male:** donor sperm with artificial insemination

- Sperm preparation techniques
- Semen analysis recommended to HIV-infected males before conception is attempted
Safe Conception for Serodiscordant Couples at Parkland

- Referral to Thursday morning MFM clinic for preconception counseling visit (with partner)

Section 1 Patient/Provider Checklist

Organization/Clinic Name

CHECKLIST FOR INITIATING PREEXPOSURE PROPHYLAXIS (PrEP)

Print name of provider

Print name of patient

Today’s date (month/day/year)

https://www.cdc.gov/hiv/risk/prep/
Pre-exposure Prophylaxis (PrEP) and Safe Conception

Once daily Truvada:

- Start 1 month prior to attempting to conceive; continue for 1 month after conception
- Timed, periovulatory unprotected intercourse only (AFTER partner is fully suppressed)
  - HIV, STDs, and pregnancy tests q3months (Cr q6 months)
  - Check Hep B status, vaccinate
  - Adherence is critical
- Anyone at ongoing risk of HIV acquisition is a candidate
- If new HIV infection documented during PrEP: stop PrEP and stop attempting to conceive. Refer to HIV specialist.
PrEP in Pregnancy

- Pregnancy and breastfeeding are NOT contraindications
  - Abstinence recommended during pregnancy
  - Discuss symptoms, risk of acute HIV infection during pregnancy (and risk of vertical transmission).

- PrEP when the HIV-infected partner is receiving cART and suppressed has not been studied, but risk is low
PrEP for African American Women

#PrEPForHer DOMINATE your sex life

PrEP is a safe, daily pill that helps prevent HIV.

https://dctakesonhiv.com/prep/african_american_women
Why is early diagnosis important?

Increased Risk of Sexual Transmission of HIV

HIV RNA in Semen (Log_{10} copies/ml)

- 5
- 4
- 3
- 2

Acute Infection

- 6 wks

Asymptomatic Infection

- 1/1000 - 1/10,000

HIV Progression

- 1/500 - 1/2000

AIDS

- 1/100 - 1/1000

Virus 75-750 times more infectious

Cohen & Pilcher, J Infect Dis. 2005
Why is early diagnosis important?

- Early detection allows for early introduction of antiretroviral therapy, which:
  - Decreases the risk of viral transmission (to both sexual partners and fetuses)
  - May decrease severity of acute disease
  - Preserves immune function
  - Lowers viral set point
  - May limit the size of the reservoir of latent virus established early after infection
How is the diagnosis of HIV infection made in 2017?
Referrals to Thursday clinic during Pregnancy

Reactive HIV Ag/Ab Screening Tests Among Pregnant Women: Parkland, 2016*

- False positive
- True positive

* Estimates
Acute HIV Infection


HIV RNA (plasma)
HIV p24 Antigen
HIV Antibody

Days

0 10 20 30 40 50 60 70 80 90 100

HIV Infection

0 11 17 22

Eclipse

AHI

Viral Detection with NAAT

Antibody Detection with 3rd generation IA

4th generation Ab/Ag

2nd generation IA

1st generation IA

Early HIV Infection

Western blot positive


Infection
HIV RNA (plasma)

HIV p24 Antigen

HIV Antibody

Days

0 10 20 30 40 50 60 70 80 90 100


Infection

4th gen

Acute HIV Infection

Eclipse

AHI

Viral Detection with NAAT

3rd generation IA

2nd generation IA

1st generation IA

Western blot positive

4th generation Ab/Ag
3rd generation HIV algorithm

HIV-1/HIV-2 EIA

Repeatedly Reactive

HIV-1 Western Blot

Positive  Negative  Indeterminate

HIV-2 EIA

Repeatedly Reactive

HIV-2 Supplemental Test

Positive  Negative  Indeterminate
4th generation HIV algorithm (July 2015, PHHS)

HIV Diagnostic Testing Algorithm

- **HIV-1/2 Antigen/Antibody Combination Immunoassay**
- Reactive upon repeated testing in the lab: Multispot HIV-1/HIV-2 Differentiation Test
- Nonreactive: HIV-1 antigen and HIV-1/HIV-2 antibodies were not detected.
- If recent HIV exposure is suspected, redraw and repeat testing or consider testing for HIV-RNA QN RT-PCR.

**HIV-1 Positive**
- If suspecting acute infection in patients at risk for HIV-2 infection, consider HIV-2 DNA/RNA QL RT-PCR. Needs miscellaneous test order in EPIC

**HIV-2 Positive: Send out HIV-2 Antibody Confirmation**
- Negative

**HIV-1 (-) or indeterminate HIV-2 (-)**
- HIV-1 RNA, Qualitative TMA
- Positive: Acute HIV-1 infection
- Negative

**HIV-1 (+) or HIV-2 (+)**
- HIV Positive (Undifferentiated)
- May consider additional testing for HIV-1 RNA QN RT-PCR and HIV-2 DNA/RNA QL RT-PCR to verify or rule out HIV-1/HIV-2 dual infection.

**HIV-1 (-) or HIV-2 (-)**
- Direction in orange boxes: Require an additional order in Epic by ordering provider.
- Direction in blue boxes: Done reflexly in the lab. No additional order required.

(PHHS algorithm 2015)
4th generation HIV algorithm (Feb 2017, PHHS)

HIV Diagnostic Testing Algorithm

HIV-1/2 Antigen/Antibody Combination Immunoassay

If recent HIV exposure is suspected, redraw and repeat testing or consider testing for HIV-1 RNA Qualitative TMA.

Reactivity:
- HIV-1 Neg/2 Ind:
  - Recommend HIV-1 RNA Qualitative TMA

- HIV-1 Ind/HIV-2 Pos:
  - Recommend HIV-1 RNA Qualitative TMA AND HIV-2 DNA/RNA Qualitative RT-PCR to assess for possible HIV-1/HIV-2 dual infection.

- HIV-1 Pos/HIV-2 Ind:
  - Recommend HIV-2 DNA/RNA Qualitative RT-PCR.

- HIV-2 Pos:
  - HIV-2 POSITIVE
  - HIV-2 POSITIVE WITH HIV-1 CROSS-REACTIVITY
  - HIV POSITIVE UNTYPABLE (Undifferentiated)

Nonreactive:
- HIV-1 antigen and HIV-1/HIV-2 antibodies were not detected.

Repeat:
- Repeatedly Reactive:
  - Geenius HIV-1/HIV-2 Differentiation Test

Direction in orange boxes: Requires separate order(s) in Epic by ordering provider.
Nucleic Acid Tests for HIV

1) HIV-1 RNA, Quantitative, Real-time PCR
   - Viral Load
   - Not FDA-approved as a confirmation test
   - Hours for results

2) HIV-1 RNA Qualitative TMA
   - FDA-approved as a confirmation test
   - 3-5 days for results
HIV-1 True Positive

<table>
<thead>
<tr>
<th>HIV TESTS</th>
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<tbody>
<tr>
<td>HIV Ag/Ab Interp</td>
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<td>HIV-1 Positive</td>
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Geenius HIV 1/2 Ab

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<tbody>
<tr>
<td>Collected:</td>
<td>01/20/17 1501</td>
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<tr>
<td>Resulting lab:</td>
<td>PARKLAND LAB</td>
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<tr>
<td>Reference range:</td>
<td>HIV Negative</td>
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</tr>
<tr>
<td>Value:</td>
<td>HIV-1 Positive (Abnormal)</td>
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</tr>
<tr>
<td>Comment:</td>
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<td>HIV TESTS</td>
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<tr>
<td>HIV Ag/Ab Interp</td>
<td>Reactive *</td>
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<tr>
<td>Geenius HIV 1/2 Ab</td>
<td>Indeterminate</td>
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Geenius HIV 1/2 Ab

| Collected:     | 01/20/17 1503   |
| Resulting lab: | PARKLAND LAB    |
| Reference range: | HIV Negative    |
| Value:         | HIV Indeterminate (Abnormal) |
| Comment:       | THIS IS NOT A CONFIRMATORY TEST |
HIV Positive, Untypable (Undifferentiated)

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<tbody>
<tr>
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<td>Reactive</td>
</tr>
<tr>
<td>Geenius HIV 1/2 Ab</td>
<td>HIV Pos Untypable</td>
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</tbody>
</table>

**Geenius HIV 1/2 Ab**

- **Collected:** 01/20/17 1506
- **Resulting lab:** PARKLAND LAB
- **Reference range:** HIV Negative
- **Value:** HIV Pos Untypable (Abnormal)
- **Comment:** THIS IS NOT A CONFIRMATORY TEST
HIV Ag/Ab Screen Positive: Refer

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</thead>
<tbody>
<tr>
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<td>Reactive</td>
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<tr>
<td>Geenius HIV 1/2 Ab</td>
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Referral to Thursday AM MFM clinic
In a Parkland Prenatal Clinic...

1. Refer the patient to the next Thursday morning ID clinic for further testing
## False Positive HIV test in Pregnancy

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<tbody>
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</table>
On Labor and Delivery:

1. History and physical
2. Assess risk factors for HIV infection
3. Review labs - *false positive HIV test earlier in pregnancy?*
4. Order Nucleic Acid tests:
   - HIV-1 RNA, Quantitative, real-time PCR (viral load)
   - HIV RNA Qualitative TMA
5. Manage based on available labs and *clinical risk assessment*
Back to Basics: History Taking

**The 5 Ps:**
- Partners – gender, number (lifetime, past 3 months)
- Protection against STDs
- Practices of sex – anal, oral, vaginal
- Prior history of STDs
- Pregnancy prevention
Summary

- Women with HIV are living longer
- Elimination of perinatal transmission is possible
- Simplified ART regimens are recommended over Combivir/Kaletra
- Postpartum follow up is key
- Providers should inquire about patient and partner HIV status and offer safe conception counseling
- PrEP is recommended for women at high risk of HIV acquisition
- While diagnosis of HIV is possible as early as 2 weeks after infection, the algorithm requires multiple steps with interpretation by experienced clinicians
Thank You

- Barbara McElwee, WHNP
- Scott Roberts, MD
- Vanessa Rogers, MD
- Thursday clinic staff
- Linda Andoseh, NP
- Arti Barnes, MD
- Jeanne Sheffield, MD
- Casey Senter, MD
- Cece Cheng, MD
- Mary Ann Kelly, RN
- Don McIntire, PhD
- Catherine Eppes, MD
Primary Care for Patients with HIV

- Disease-specific history:
  - HIV Diagnosis – when, mode of transmission
  - HIV-related conditions: malignancies, opportunistic infections
  - HIV medication history
  - Comorbidities (dyslipidemia, DM, CKD, …)
  - Psychiatric history
  - Immunizations
  - OB and GYN histories
  - STD history

*Primary Care Guidelines for the Management of Persons Infected with HIV: 2013 Update, IDSA. CID, 2014*
Primary Care for Patients with HIV

- HIV labs, G6PD, HLA B5701
- Screen for Hep B/C, Herpes viruses (CMV, VZV, HSV), Syphilis, Trichomonas, Gonorrhea, Chlamydia
- Toxoplasma, TB screening, CXR
- Metabolic profile, CBC, lipids
- Pap smears: initial visit, then at 6 months, then annually. Colposcopy for any abnormality.

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Primary Care for Patients with HIV

- Vaccines: Pneumococcal, influenza, varicella, hepatitis A, B, HPV, Polio, Tetanus, VZV
- All women of childbearing age: asked about plans and desires regarding pregnancy – at initiation and regularly thereafter...

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