



Electronic Decision Support at the Point of Care: Integrating Content for a Low Resource Setting

American Public Health Association Meeting

Denver, CO

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Executive Director, POC-IT Center

Division of Infectious Diseases

Johns Hopkins School of Medicine

Disclosures

- **No Financial disclosures**
- **No off-label discussion of medications**

Objectives

- **Background, electronic medical information**
- **Use of technology in low-resource settings**
- **Adoption**
- **Challenges**

Can Technology Help?

- **Information overload**
 - 10,000 diseases
 - 3,000 medications
 - 1,100 laboratory tests
 - >400,000 articles annually
- **Medical Errors**
- **Clinical Evidence vs anecdotal medicine**

Assessing Impact: Access to Appropriate Tools

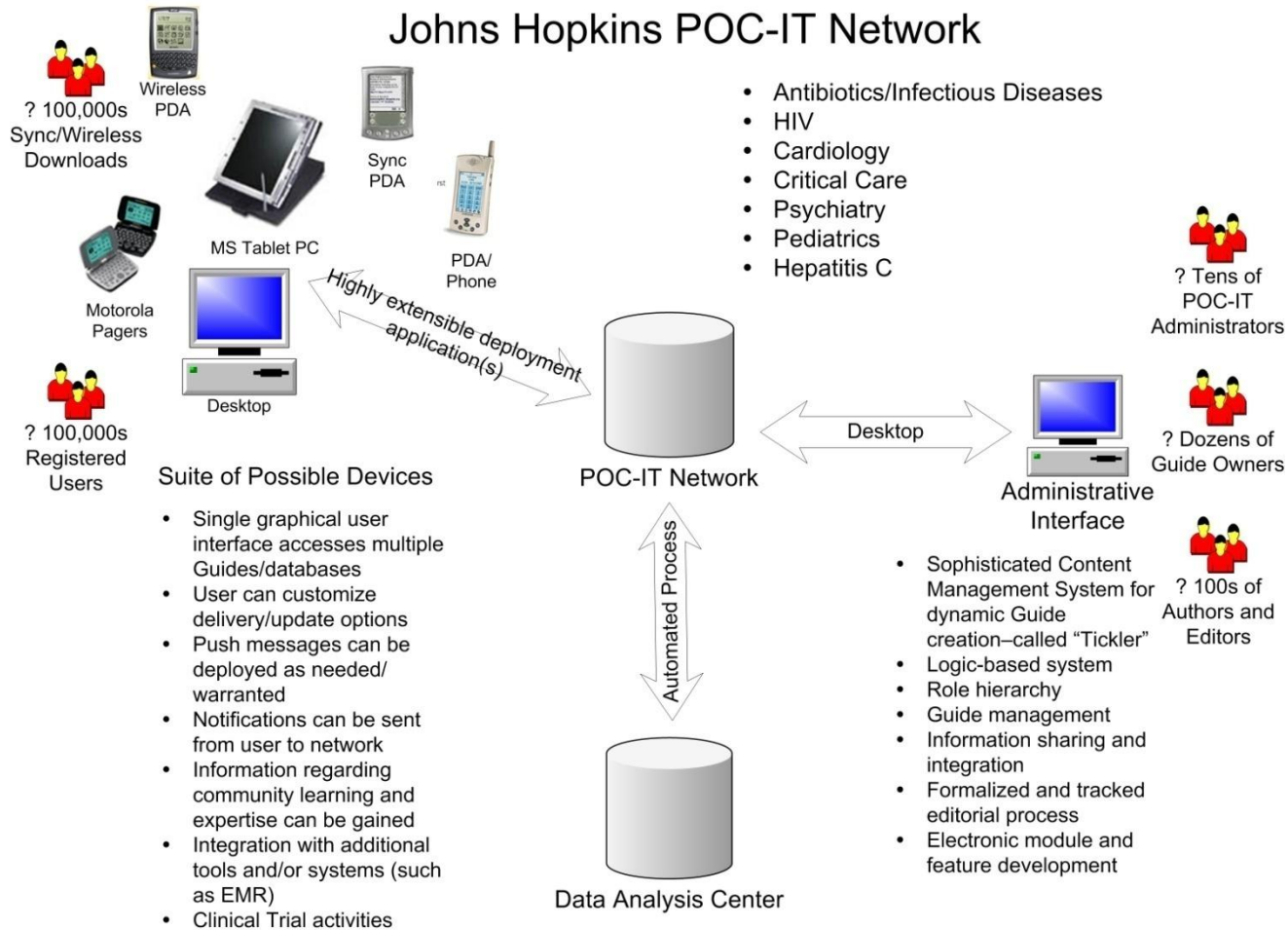
- **Critical features of clinical decision support**
 1. Decision support as part of clinician workflow ($p < 0.00001$),
 2. Recommendations, not just assessments ($p = 0.0187$),
 3. Decision support at the time and location of decision making ($p = 0.0263$)
 4. Computer based decision support ($p = 0.0294$).
- **Summary**
 - “Of 32 systems possessing all four features, 30 (94%) significantly improved clinical practice.”

POC-IT Center

- **POC-IT Center**
 - **Develops electronic evidence-based clinical decision support guides**
 - **Guides are accessible through**
 - The Web
 - Mobile technologies (Palm, Pocket-PC, Symbian O/S, RIM, Android, Windows SmartPhone and iPhone)
 - CD-ROM
 - Print
 - **Designed for use in both primary and specialty care clinical settings**
 - **ABX (Antibiotic) Guide and HIV Guide distill complex material into need-to-know information**
 - easily accessible
 - quickly viewed
 - regularly updated

Tickler Network

Johns Hopkins POC-IT Network

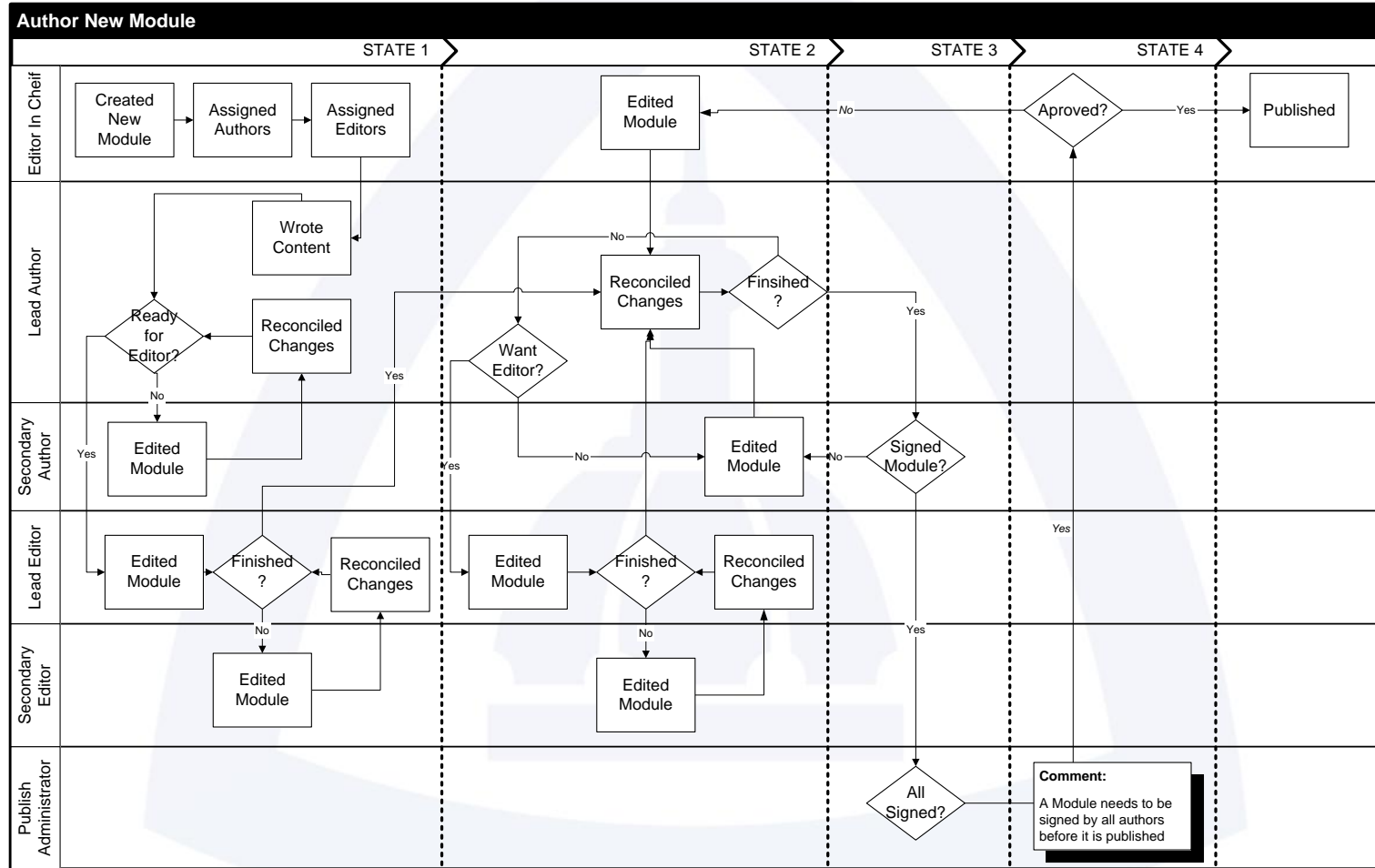


Tickler--Authoring Modules

Diagnosis Module

Title	Tuberculosis, Active			
Keyword List				
	Book Keyword	Text	Type	ID
1	Yes	Tuberculosis	SNOMED	R-F6B50
2		Tuberculosis screening	SNOMED	R-F73A6
3		AIDS with tuberculosis	SNOMED	DE-36338
4	Yes	MTB - Mycobacterium tuberculosis	SNOMED	L-21801
5		Pulmonary tuberculosis	SNOMED	DE-14810
6	Yes	Mycobacterium bovis	SNOMED	L-21803
Author	Timothy Sterling, M.D.			
Heading				
Name	PATHOGENS			
Bulleted List				
	Text			
1	<i>Mycobacterium tuberculosis</i>			
2	<i>Mycobacterium bovis</i>			
3				
Heading				
Name	CLINICAL			
Bulleted List				
	Text			
1	Hx: pulmonary TB = cough > 2 wks, fever, night sweats, weight loss, hemoptysis, SOB, chest pain			
2	Disseminated TB = fevers, weight loss, organ involvement. Also see TB meningitis module for C			
3	CXR: upper lobe infiltrate classic (may be cavitory); atypical presentations especially in children			
4	Sputum AFB smear--50% sensitive.			
5	AFB culture--80% sensitive.			
6	PCR: best for sputum with positive AFB smear. expensive.			

Editorial Workflow



Tickler--Editing/Updating Modules

Isoniazid - Content Editor

e Edit Table List Tools

General History Editor Preview Source Roles

Antibiotic Module

Title Isoniazid

Author Paul A. Pham Pharm.D. and John G. Bartlett M.D.

Zambia Zambia Specific Information

Heading INDICATIONS

Heading FORMS

Heading

Name USUAL ADULT DOSING

Text

Bulleted List

	Text
1	Treatment of latent TB (prophylaxis): INH 5mg/kg (max300mg) PO qd x 9 mos or DOT: 15mg/kg (max 900mg) 2x/wk x 9 mc
2	Active TB treatment (with other anti- TB agents): 5mg/kg (max300mg) PO qd x 6-9 mos or directly observed therapy (DOT):
3	Active TB treatment continuation phase (with other anti- TB agents): 3x/wk for CD4 <100
4	Active TB treatment duration: 6 mos for most forms except severe cavitary pulmonary (9 mos), bone/joint (9 mos), miliary (9
5	Coadminister with pyridoxine 50mg/d or 100mg 2x/wk to prevent neuropathy.
6	DOT preferred for active TB in all pts
7	Obtain CBC and LFTs at baseline and periodically throughout course of therapy. Monitor monthly for hepatitis sx; consider r
8	Administer 1 hr before or 2 hrs after meals;
9	

Heading RENAL DOSING

Heading ADVERSE DRUG INTERACTIONS

Heading

Name

Text

Bulleted List

1	Increase phenytoin levels. Monitor closely.
2	Carbamazepine: may increase carbamazepine levels. Monitor closely.
3	Enflurane: in rapid acetylators of INH, high output renal failure may occur. Monitor closely.

Undo
Cut
Copy
Paste
Create New Bullet
Move Up
Move Down
Delete Bullet

ABX Guide

The screenshot shows the Johns Hopkins POC-IT Center ABX Guide website. At the top left is the Johns Hopkins logo and the text "JOHNS HOPKINS POC-IT CENTER". To the right is a search bar with a "GO" button. Below the header is a navigation menu with links for "Handheld ABX", "CME Center", "Q&A Forum", "Literature Review", "Site Info", and "FAQ".

The main content area is divided into several sections:

- Other POC-IT Resources:** POC-IT Center, HIV Guide, Diabetes Guide.
- Related Sites:** JH Infection Control, Center for Clinical Global Health, JH Viral Hepatitis Center, JH Center for Global Health, JH Division of Infectious Diseases, Infectious Diseases Grand Rounds, Zambia HIV Guide.
- Other Q&A Forums:** HIV Guide Q&A, Hepatitis Q&A.
- Guide Editors:** Editor In Chief (John G. Bartlett, MD), Managing Editor (Paul G. Auwaerter, MD, MBA), Pharmacology Editor (Paul Pham, PharmD, BCPS).

On the right side, there is a "Question of the Month" section featuring a question about ciprofloxacin for CoNS IE, dated 2010-09-07. Below it is a "Literature Review" section with an archive by John G. Bartlett, M.D.

At the bottom right, there is a circular badge for "2008 TOP 10" award from Medical Economics, with the text "Mobile Medical Software Resource".

At the bottom left, there is a green banner for "ABX GUIDE CME CENTER" with the text "EARN CREDITS WHEN YOU SEE THE FOLLOWING ICON".

In the center, there is a circular callout box that says: "To use the Guide, please select from the options Diagnosis, Drugs, Pathogens, Management, Vaccines to the left." Below this callout is a list of categories: Diagnosis, Drugs, Pathogens, Management, and Vaccines.

At the bottom center, there is an "Announcements" section stating "ABX Guide 2010 print edition now available." with a small image of the print edition cover.

> 680,000 individual registered users since 2000

POC-IT Antibiotics (ABX) Guide

620 information modules

- **Content Features**
 - Diagnostic Criteria
 - Treatment Regimens & Algorithms
 - Therapeutic Indications
 - Drug manufacturer formulations
 - Dosing Guidelines
 - Drug Interactions
- **More than 270 diagnoses, 120 pathogens, 230 of the most commonly prescribed drugs**



Other POC-IT Resources

POC-IT Center
HIV Guide

Related Sites

JH Infection Control
Center for Clinical Global Health
JH Viral Hepatitis Center
JH Center for Global Health
JH Division of Infectious Diseases
Infectious Diseases Grand Rounds
Zambia HIV Guide

Other Q&A Forums

HIV Guide Q&A

Guide Editors

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Managing Editor
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ABX GUIDE
CME CENTER

EARN CREDITS WHEN YOU SEE
THE FOLLOWING TWO ICONS

POC-IT CME (0.25hr)

Links to quick, 0.25 hr CME programs
within the context of your search

CME Dialogues (1hr)

Diagnosis >



Diagnosis

Respiratory

- Bronchiectasis
- Bronchitis, Acute Uncomplicated
- Chronic Bronchitis, Acute Exacerbations
- Common Cold
- Empyema
- Influenza
- Influenza, Avian
- Legionnaires' Disease
- Lung Abscess
- Pneumonia, Aspiration
- Pneumonia, Community-Acquired
- Pneumonia, Hospital-Acquired
- SARS [Severe Acute Respiratory Syndrome] *Coming Soon...*
- Tuberculosis, Active
- Tuberculosis, Latent
- Upper Respiratory Infections

Sepsis Syndromes

- Sepsis - Unknown Source
- Staphylococcal Toxic Shock Syndrome
- Streptococcal Toxic Shock Syndrome
- Vascular Catheter Associated Sepsis

Antibiotics

- Antibacterial
- Antifungal
- Antimycobacterial
- Antiparasitic
- Antiviral
- Biological

Diagnosis

- Biodefense
- Bone/Joint
- Cardiac
- Dermatologic
- Eyes/Orbits
- Fever
- Generalized Infx
- Genitourinary
- GI
- Gynecologic
- HEENT
- HIV/AIDS
- Neurologic
- Respiratory
- Sepsis Syndromes
- Soft Tissue
- STD
- Surgical Infections
- Travel/Tropical
- Vaccine Adverse Reactions

ABX-Guide Success

- **Navigation**
- **Ability for flexible and quick responses**
- **Information updated, published daily to web/handhelds**
 - **Urgent Public Health/Medical Information**
 - Biodefense – Anthrax October 2001
 - SARS 2003
 - Influenza, pandemic influenza 2009
 - Foodborne outbreaks
 - **Drug shortages**
 - **New drugs, vaccines**
 - **Guideline recommendations**

Electronic Guide Effectiveness

- **Interventional Study Using ABX Guide:**
Antibiotic decision accuracy, cross-over
 - Traditional Care: 66% initial 3-month period
 - Care w/ Guide: 86.6% second 3-month period
($p = 0.005$)

J Am Coll Surg. 2006 Mar;202(3):459-67.

POC-IT HIV/AIDS Guide

- **HIV Guide** (launched 2004)
 - **>28,000 registered users**
 - **225 information modules**
 - Diagnosis
 - Drugs
 - Pathogens
 - Management
 - **Chronic Illness, Management Guide + acute infections**



HIV Guide

[Handheld HIV](#) | [CME Center](#) | [Q&A Forum](#) | [Publications](#) | [Resources](#) | [Site Info](#) | [FAQ](#)

Other POC-IT Resources

[ABX Guide](#)
[POC-IT Center](#)
[Diabetes Guide](#)

Related Sites

[Infection Control](#)
[CCGHE](#)
[Viral Hepatitis Center](#)
[Center for Global Health](#)
[JH Division of Infectious Diseases](#)
[Zambia HIV Guide](#)

Other Q&A Forums

[ABX Guide Q&A](#)
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HIV GUIDE CME CENTER

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THE FOLLOWING ICON



Links to 0.25, 0.50 hr multimedia

Browse Guide By:

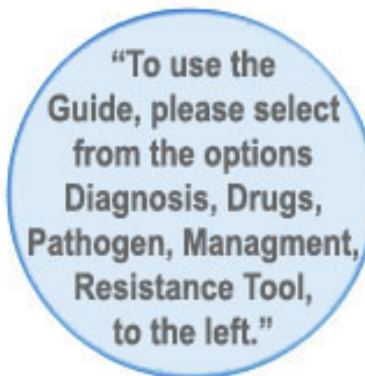
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[Drugs](#)

[Pathogen](#)

[Management](#)

[Resistance Tool](#)



Features

The HIV GUIDE is now available for download through SKYSCAPE

All handheld, mobile devices are supported including Palm, PocketPC, BlackBerry® and iPhone.

To download the HIV Guide from Skyscape, please visit this site.
2008-02-26

New Developments

FDA approval of RTV tablets
Paul A. Pham, Pharm.D.
02-22-2010

Announcements

100 Questions and Answers About HIV and AIDS



Question of the Month

Re: Re: Re: Starting HAART during Acute HIV Infection
My Situation: I developed a very high fever, malaise and eye pain that came out of nowhere starting Aug.8th that lasted for 6 days. My HIV antibody test came back negative....
2010-09-29

Literature Review

[Archives](#)
By John G. Bartlett, M.D.

Zambia HIV



an affiliate of Johns Hopkins University

HOME

ABOUT US

WHAT

Hon



People waiting for male circumcision services outside University Teaching Hospital in Lusaka, Zambia

- 1 out of 7 adults HIV infected
- Av life expectancy: 37 yrs
- U.S. President's Emergency Plan for AIDS Relief (PEPFAR)
- WHO Guidelines for HIV Treatment

POC-IT Zambia HIV Guide

- **Zambia's Access Problem**

- **How to provide a version of the National Guidelines that is:**

- Easily accessible and understandable to range of medical providers [MD, RN, lay-educated]
 - Functional in remote areas and away from desktop computing resources
 - Supported by authoritative, evidence-based resource
 - Available on a durable device

- **Zambian National Guidelines goals:**

- to standardize the quality of HIV care in all health-related sectors
 - equip health care workers with the basic information that will help them provide high-quality care and treatment for patients with HIV

POC-IT Zambia HIV Guide

- **The POC-IT Solution**

- **Guidelines Developed in Zambia by the National HIV/STI/TB Council (NAC) and numerous cooperating partners and institutions**
- **The POC-IT Center created an electronic version of the **Zambian National Guidelines on Management and Care for People Living with HIV/AIDS Guidelines with PEPFAR funding through CDC****
- **Integration with core HIV Guide Content**





Zambia HIV National Guidelines

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- [HIV Counseling and Testing](#) >>
- [Sexually Transmitted Infections \(STIs\)](#) >>
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Browse Guide By:

- Diagnosis
- Drugs
- Pathogen
- Management
- Guidelines

"To use the Guide, please select from the options Diagnosis, Drugs, Pathogen, Management, Guidelines Tool to the left."

Announcements

This HIV Guide is an electronic version of the Zambian National Guidelines on Management and Care for People Living with HIV/AIDS developed in Zambia by the National HIV/STI/TB Council (NAC) and numerous cooperating partners and institutions. The National Guidelines were developed with a goal of standardizing the quality of HIV care in all health-related sectors, and aim to equip health care workers with the basic information that would help them to provide high-quality care and treatment for patients with HIV.

The HIV Guide presents the Zambian National Guidelines in easily accessible electronic format, while benefits the reader with wealth of additional technical information and references on topics related to HIV/AIDS care and treatment.

Technical assistance for developing the electronic guide was provided by Jhpiego, Point of Care-Information Technology (POC-IT) Center, and Johns Hopkins University School of Medicine (JHU SOM), with funding from the U. S. President's Emergency Plan for AIDS Relief (PEPFAR) through the Centers for Disease Control and Prevention.

The HIV Guide is also available on a CD ROM and in a version for PALM handheld devices. Contact information for inquiries: Jhpiego Zambia, 8 Ngumbo Road, Long Acres, PO Box 36873, Lusaka, Zambia, or by phone +260 (1) 256255 / 6 / 7.

Diagnosis

- Complications of Therapy
- Malignancies
- Miscellaneous
- Opportunistic Infections
- Organ System

Drugs

- Antimicrobial Agents
- Antiretrovirals
- Miscellaneous

Guidelines

- Zambia HIV National Guidelines

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Management >



Management

Antiretroviral Therapy

- Adherence
- Post-exposure prophylaxis
- Pregnancy and perinatal transmission (Zambia specific)
- Toxicity & side effects: switching therapy (Zambia specific)
- Treatment interruption

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- Baseline & routine testing
- CD4 cell count
- HIV Diagnosis

Miscellaneous

- Initial Evaluation (Zambia specific)

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Management > Laboratory Testing >



CD4 Cell Count

Joel E. Gallant, MD, MPH and Christopher Hoffmann, MD, MPH
04-07-2008

- HIV Subtype C predominates in Zambia.
- There may be some subtype differences in CD4 decline, with more rapid decline with subtype D than subtype A. However, there is currently no evidence of more rapid decline among individuals with subtype C HIV than individuals in industrialized countries with subtype B.
- Average time to CD4 <200 is likely 4 to 14 years, although it has not been studied in Zambia specifically.
- Zambia National Guidelines recommend baseline CD4 testing and repeat CD4 testing every 6 months while on HAART.
- Before starting HAART, CD4 should be tested every 3-6 months as rate of decline can be highly variable from person to person and even over time for an individual patient (however, National Guidelines do not specify a specific pre-HAART testing interval).
- CD4 testing availability is expanding in Zambia and testing cost is subsidized and should be part of a comprehensive HIV care programme and not charged to patients. However, where commercially available or available for a fee, cost per test is approximately \$15-30.

REFERENCES

Zambia Information Author: Christopher Hoffmann, MD, MPH

DEFINITION

- Number of CD4 cells (T-helper lymphocytes with CD4 cell surface marker). CD4 count used to assess immune status, susceptibility to opportunistic infections, need for HAART and OI prophylaxis, and for defining AIDS (CD4 <200).

INDICATIONS

Facts about CD4

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POC-IT Support



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Management > Antiretroviral Therapy >



Pregnancy and perinatal transmission (Zambia specific)

Christopher Hoffmann, MD, MPH
04-12-2008

DEFINITION

- HIV transmission risk to infant is 15-30% during labor & delivery and 15% during breast feeding. Rate of transmission during normal gestation is very low.

CLINICAL RECOMMENDATION

Impact of HIV on Fertility and Pregnancy Outcomes

- Uncontrolled HIV decreases fertility (by approx. 30%); correlates with viral load and disease state
- Uncontrolled HIV worsens pregnancy outcomes (increased still birth, low birth weight, intrauterine growth retardation, chorioamnionitis) and increases maternal mortality (5-fold increase).
- Control of HIV restores fertility (unexpected pregnancy occurs on average of 1 year after HAART initiation)
- HIV transmission from mother to child occurs in 15-30% of live births and 15% of breast-fed infants. Risk of HIV during pregnancy, delivery, and breastfeeding is approximately 40% without any interventions for prevention of mother to child transmission (PMTCT).
- Predictors of transmission: acute HIV infection during pregnancy, higher viral load, genital ulcer disease, active HSV

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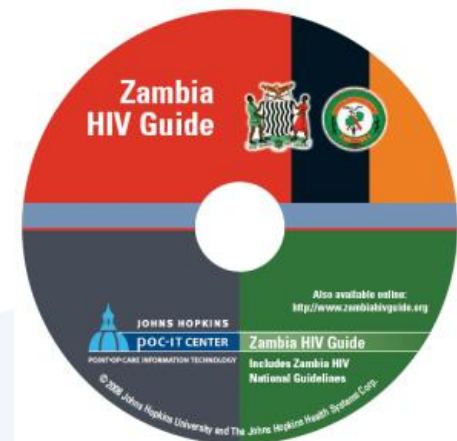
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POC-IT Zambia HIV Guide

- **The POC-IT Center Solution, (continued)**
 - **Integrated Guidelines with POC-IT HIV Guide**
 - Enhanced the Guidelines with a wealth of additional clinical information and references on topics related to HIV/AIDS care and treatment
 - The integrated content is easily accessible both on the web and when downloaded from a CD-ROM onto a PDA



Rollout--adoption

- **Urban—Lusaka**
 - Smartphone (Palm)
- **Rural—Copper Belt**
 - CD-ROM
 - Palm handheld



Technology Training with Angela Chembe, Makeni Clinic, Zambia – November 2008



Table 1: Basic Usage by Device*

Device	Searches During Clinic Hours **			Searches During Evenings, Weekends, and Holidays		
	Number of Searches ***	Average # of "Taps" per Search	Average Time in Guide (minutes)	Number of Searches	Average # of "Taps" per Search	Average Time in Guide (minutes)
2	27	5.5	4.0	4	5.3	2.2
3	66	3.9	2.3	28	4.8	4.2
5	60	6.3	5.9	21	5.9	5.8
6	8	5.6	2.6	13	7.8	4.3
7	52	4.1	3.0	7	7.9	6.9
<i>Combined (Average)</i>	<i>213 (42.6)</i>	<i>4.9</i>	<i>3.7</i>	<i>73 (14.6)</i>	<i>6.0</i>	<i>4.8</i>

* Because users do not log-on to use the Zambia Guide, and because the devices can be shared, the log files can only detail how a *device* was used and not how a particular individual used a device: devices could have been shared with and used by co-workers or others; assigned participants may have conducted demonstrations of the device.

** Clinic Hours were determined to be 8AM to 5PM, Monday through Friday, excluding public holidays.

*** Searches involved the access of actual content or related information within the Zambia HIV/AIDS Guide. For example, simply turning the device on did *not* constitute a search, however navigating to the "Abbreviations" page *did* constitute a search.

Table 2: Point-Of-Care Usage * by Device

Device	Number of Searches	Average # of "Taps" per Search	Average Time in Guide (minutes)
2	21	3.5	1.1
3	45	3.8	1.1
5	42	3.7	1.4
6	2	5.5	3.2
7	40	3.6	1.5
<i>Combined</i>	<i>150</i>	<i>3.7</i>	<i>1.3</i>

* Point-Of-Care Usage is a sub-set of searches of "Searches During Clinic Hours." A Point-Of-Care Search had to meet the following strict criteria: 1) had to be during normal clinic hours (8AM to 5PM on non-holiday, weekdays); 2) had to have occurred after a 2 day training "wash-out" period; 3) had to be under 5 minutes in duration; and 4) had to constitute less than 15 "taps." The criteria were chose to specifically assess the usage of the guide during what might be considered "normal" or "typical" patient encounter conditions.

Table 3: Unique Modules Accessed by Device

Device	Number of <u>Unique</u> Modules Accessed (out of 210)	Number of <u>Unique Zambia-Specific</u> Modules Accessed (out of 73)
2	43	15
3	71	21
5	110	31
6	35	9
7	70	20
<i>Combined Overall</i>	<i>144</i>	<i>35</i>

Quotes from Zambia providers

- *“The patients can be seen much quicker.”*
- *“It has made my work easier.”*
- *“Easier to use than [printed] reference manuals.”*
- *“Information [in the POC-IT guide was] well-summarized”*

Adoption

- **Urban--Gizmo factor**
 - **Smartphone**
 - **Frequent use**
 - Phone calls
 - Music
- **Rural—availability**
 - **Single computer/clinic**
 - **Electricity**
 - **Handhelds—solar charging**

Lessons from the Zambia Model

- **Zambia HIV Guide experience model for developing region or country-specific guides**
 - **Navigate the political system and collaborate with Ministries of Health**
 - **Assess the capacities of government and health delivery systems**
 - **Adapt to country requirements**
 - **Integrate cultural specifics**
 - **Integrate country/region-specific guidelines**
 - **Strengthen national healthcare systems**
 - **Benefit of US experts reviewing country/region-specific guidelines for accuracy and currency**

Adoption within existing culture

JOHNS HOPKINS
POC-IT CENTER
POINT-OF-CARE INFORMATION TECHNOLOGY

Search: **GO**

Diabetes Guide - Trinidad and Tobago

Other POC-IT Resources
POC-IT Center
ABX Guide
HIV Guide

Related Sites
[PAHO](#)
[Medical Association of Trinidad](#)
[CHRC guidelines](#)
[Trinidad and Tobago Ministry of Health](#)
[CDAP - The Chronic Disease Assistance Programme](#)

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Browse Guide By:

- Overview
- Management
- Complications and Comorbidities**
"Describes diabetes associated complications and comorbidities, with diagnostic and treatment recommendations."
- Medications
- Clinical Tests

View All Modules

Announcements
The Diabetes Outreach Program is one initiative of the TT Health Sciences Initiative, designed to improve the capacity of healthcare professionals to provide quality care for the people of Trinidad and Tobago. This Diabetes Guide presents information in easily accessible electronic formats, benefiting users on topics related to diabetes care and treatment. It includes information about diabetes that is of general (international) use as well as topics that are of specific use in Trinidad and Tobago.

Adoption within existing culture

Trinidad and Tobago Specific
Modules>Trinidad and Tobago Specific
Modules>



Complementary and Alternative Medicine: Herbals

Todd T. Brown, M.D., Ph.D. and Paul A. Pham, Pharm.D.
04-02-2010

Trinidad and Tobago Specific Information

Trinidad and Tobago Information Author: Compton Seaforth, Ph.D.

- Estimated prevalence of herbal use for diabetes in Trinidad ranked fifth -- after herbal use for colds, cooling, hypertension and fevers based on ethnopharmacological survey from 2007-2008.
- The following plants are commonly used to treat diabetes, based on survey of 30 adults in Trinidad from 1996-2006: *Antigonon leptopus*, *Bidens alba*, *Bidens pilosa*, *Bixa orellana*, *Bontia daphnoides*, *Carica papaya*, *Catharanthus roseus*, *Cocos nucifera*, *Gomphrena globosa*, *Laportea aestuans*, *Momordica charantia*, *Morus alba*, *Phyllanthus urinaria* and *Spiranthes acaulis* (*Lans*).
- **Caraili (*Momordica charantia* L.):** common names include bitter melon, karela, Carylá, Karaile, maiden's blush, Popololo, Balsam pear, Sorrow seed.
- The fruit and leaf parts are taken for diabetes and hypertension.
- Effect on blood glucose: doses of 100mL juice expressed from the unripe fruit reported to be antidiabetic in adults (Raman). Bitter-tasting glycosides have been isolated from the plant (Okabe).
- **Zebapeek (*Neurolaena lobata* R. Br.)** : leaf teas are taken under other names such as "Zeb-a -pique" for diabetes.

- Local experts, thought leaders to write topics & recommendations
- Video teachings

Zambia HIV Guide Collaborators



ZAMBIANS AND AMERICANS
IN PARTNERSHIP TO FIGHT HIV/AIDS

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