Comparison of Multiple Laboratory-Performed Rapid HIV Tests with Standard Confirmatory Assays for the Assessment of Multi-Rapid Test Algorithms

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Thanks to NYSDOH ACT Staff, Dr. Freddy Molano, APHL

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Study Objectives

- Retrospectively evaluate concordance of laboratory-performed rapid HIV tests with standard confirmatory assays
  - Used rapid-reactive plasma samples submitted for confirmatory testing from POC sites with high and low prevalence
  - Tested in lab with 3 rapid tests - determine false positive and false negative rates
- Compare lab rapid test results with POC rapid test results

Key Data Needs

- Data for sequences of 2 or 3 different rapid tests performed prospectively in high and low prevalence settings
- False-negative result rates for different rapid tests used as initial screening test in POC setting

Methods

- Rapid referral plasma specimens submitted between Jan 2008 and Feb 2010 from two POC testing programs
- Tested by lab confirmatory assays

- Tested by 3 HIV rapid tests in lab

Uni-Gold™ Recombigen® HIV

Clearview COMPLETE HIV 1/2

Advance Awareness™ OraQuick ADVANCE® Rapid Antibody Test HIV-1/2

Specimens from Two Testing Programs: High & Low Prevalence

	NYSDOH ACT: Low Prevalence	Community Health Care Network : High Prevalence
Testing sites	Multiple sites in NY excluding NYC	Eight testing sites and mobile unit in NYC
Number of tests/yr	~18,000	15,000-18,000
HIV Prev	<0.5%	1.8-1.9%
Testing algorithm	Two rapid tests (May 2008) UG then CV or OQ	Single rapid test Jan 2008 – UG, OQ, or CV Feb 2009 – OQ

Objective 1:

Determine concordance of confirmatory assays with rapid tests performed in lab

HIV-1 Confirmatory Assays vs Lab Rapid Tests

NYSDOH Anonymous Counseling and Testing (ACT) -148 specimens

Lab HIV Result	All Lab Rapid Tests Positive	Discordant Lab Rapid Tests	All Lab Rapid Tests Negative	Total
HIV-1 WB Positive (EIA =Pos, MS=1P2N)	118	0	0	118 (79.7%)
HIV-1 WB Indeterminate (EIA =Pos, MS=1P2N, TMA=D)	2	3	0	5 (3.4%)
HIV-1 WB Negative (EIA =Neg, MS=1N2N)	0	9	16	25 (16.9%)

Community Health Care Network (CHCN) – 463 specimens

Lab HIV Result	All Lab Rapid Tests Positive	Discordant Lab Rapid Tests	All Lab Rapid Tests Negative	Total
HIV-1 WB Positive (EIA =Pos, MS=1P2N)	433	2	0	435 (94%)
HIV-1 WB Indeterminate (EIA =Pos, MS=1P2N, TMA=D or not done)	2	1	0	3 (0.6%)
HIV-1 WB Negative (EIA =Neg, MS=1N2N)	0	2	23	25 (5.4%)

HIV-1 Confirmatory Assays vs Lab Rapid Tests

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Number of lab confirmed positives = 123/148 (83%)

Positive confirmation rate lower for ACT than CHCN – due to less specific 1st test (Uni-Gold) and/or lower prev?

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Number of lab confirmed positives = 437/463 (94%) (1 WB Ind – no TMA)

HIV-1 Confirmatory Assays vs Lab Rapid Tests

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Higher percentage of early HIV infections detected in ACT program – due to use of more sensitive 1st test (Uni-Gold)?

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Lab rapid tests match confirmatory assays in 136/148 (92%) of ACT specimens and 458/463 (99%) of CHCN specimens

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17 specimens had one or more lab rapid test results that were discordant with the lab confirmatory assays

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HIV-1 WB Indeterminate (EIA =Pos, MS=1P2N, TMA=D or not done)	2	1	0	3 (0.6%)
HIV-1 WB Negative (EIA =Neg, MS=1N2N)	0	2	23	25 (5.4%)

Specimens with Discordant Confirmatory-Lab Rapid Tests and/or WB Indeterminate

#	Type	EIA	WB	TMA	MS	Lab Interp.	OQ	UG	CV
1	CHCN	N	N		1N2N	N	R	NR	R
2	CHCN	N	N		1N2N	N	R	NR	R
3	ACT	N	N		1N2N	N	NR	R	NR
4	ACT	N	N		1N2N	N	NR	R	NR
5	ACT	N	N		1N2N	N	NR	R	NR
6	ACT	N	N		1N2N	N	NR	R	R
7	ACT	N	N		1N2N	N	NR	R	NR
8	ACT	N	N		1N2N	N	NR	R	NR
9	ACT	N	N		1N2N	N	NR	R	NR
10	ACT	N	N		1N2N	N	NR	R	NR
11	ACT	N	N		1N2N	N	NR	R	NR
12	CHCN	P	P		1P2N	P	NR	R	R
13	CHCN	P	P		1P2N	P	R	R	NR
14	ACT	P	I	D	1P2N	P	NR	R	NR
15	ACT	P	I	D	1P2N	P	NR	R	NR
16	ACT	P	I	D	1P2N	P	R	R	NR
17	CHCN	P	I		1P2N	I	R	R	NR
18	ACT	P	I	D	1P2N	P	R	R	R
19	ACT	P	I	D	1P2N	P	R	R	R
20	CHCN	P	I	D	1P2N	P	R	R	R
21	CHCN	P	I	D	1P2N	P	R	R	R

Specimens with Discordant Confirmatory-Lab Rapid Tests and/or WB Indeterminate

#	Type	EIA	WB	TMA	MS	Lab Interp.	OQ	UG	CV
1	CHCN	N	N		1N2N	N	R	NR	R
2	CHCN	N	N		1N2N	N	R	NR	R
3	ACT	N	N		1N2N	N	NR	R	NR
4	ACT	N	N		1N2N	N	NR	R	NR
5	ACT	N	N		1N2N	N	NR	R	NR
6	ACT	N	N		1N2N	N	NR	R	R
7	ACT	N	N		1N2N	N	NR	R	NR
8	ACT	N	N		1N2N	N	NR	R	NR
9	ACT	N	N		1N2N	N	NR	R	NR
10	ACT	N	N		1N2N	N	NR	R	NR
11	ACT	N	N		1N2N	N	NR	R	NR
12	CHCN	P	P		1P2N	P	NR	R	R
13	CHCN	P	P		1P2N	P	R	R	NR
14	ACT	P	I	D	1P2N	P	NR	R	NR
15	ACT	P	I	D	1P2N	P	NR	R	NR
16	ACT	P	I	D	1P2N	P	R	R	NR
17	CHCN	P	I		1P2N	I	R	R	NR

False positive:
OQ = 2/611 (0.3%)
CV = 3/611 (0.5%)
UG = 9/611 (1.5%)

False negative:
OQ = 3/611 (0.5%)
CV = 5/611 (0.8%)
UG = 0/611 (0.0%)

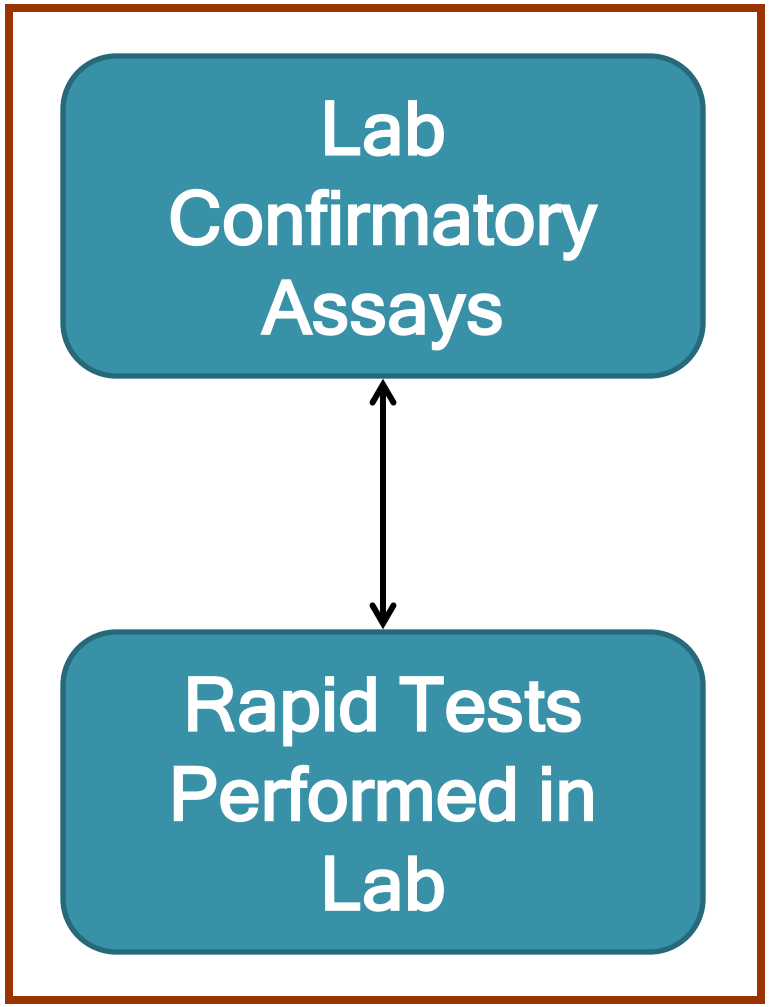
Conclude: Uni-Gold is most sensitive and least specific test

Specimens with Discordant Confirmatory-Lab Rapid Tests and/or WB Indeterminate

#	Type	EIA	WB	TMA	MS	Lab Interp.	OQ	UG	CV
14	ACT	P	I	D	1P2N	P	NR	R	NR
15	ACT	P	I	D	1P2N	P	NR	R	NR
16	ACT	P	I	D	1P2N	P	R	R	NR
17	CHCN	P	I	-	1P2N	I	R	R	NR
18	ACT	P	I	D	1P2N	P	R	R	R
19	ACT	P	I	D	1P2N	P	R	R	R
20	CHCN	P	I	D	1P2N	P	R	R	R
21	CHCN	P	I	D	1P2N	P	R	R	R

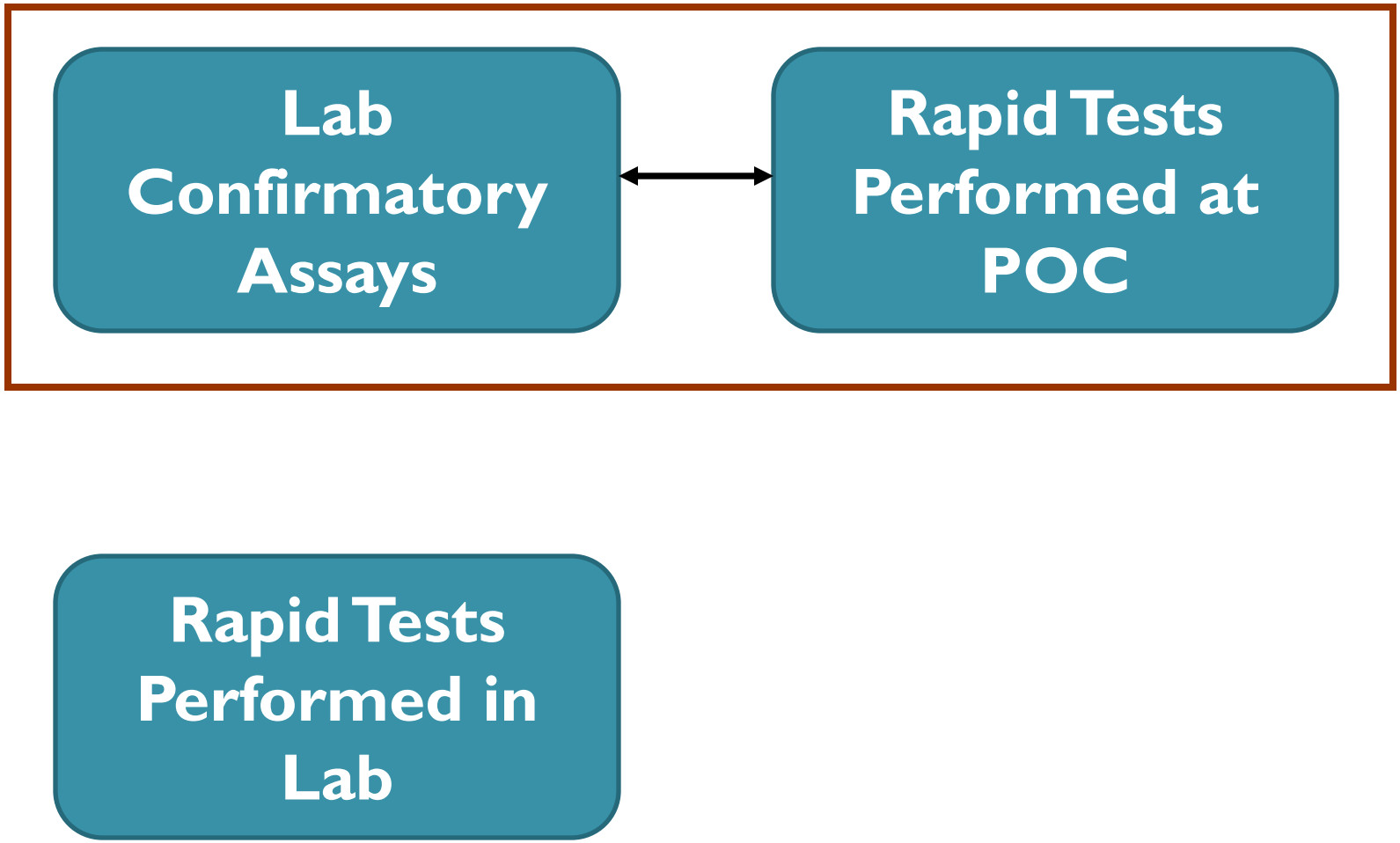
Conclude: Uni-Gold is most sensitive because detects all WB indeterminate specimens. OraQuick detects 6/8, and Clearview detects 4/8

What we compared…

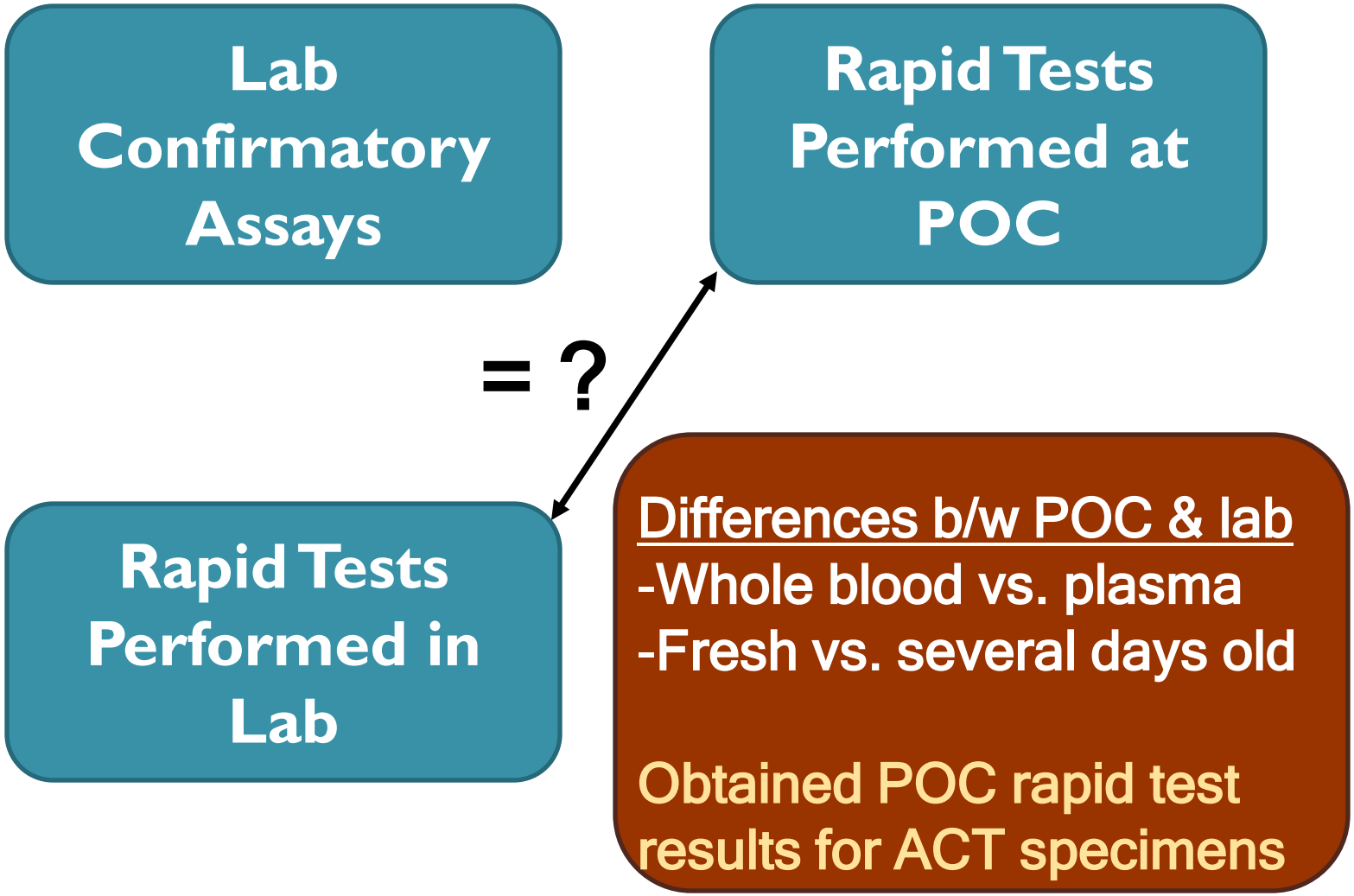


Conclude:
Uni-Gold is the most sensitive test, however…

What we want to compare…



Objective 2: Are rapid test results the same in lab & POC?



POC Rapid Results for Discordant and/or WB Indeterminate Specimens

						Lab			POC	
Type	EIA	WB	TMA	MS	Lab Interp.	OQ	UG	CV	UG	CV
ACT	P	I	D	1P2N	P	R	R	R	R	R
ACT	P	I	D	1P2N	P	R	R	R	R	R
ACT	P	I	D	1P2N	P	NR	R	NR	R	**R**
ACT	P	I	D	1P2N	P	NR	R	NR	R	**R**
ACT	P	I	D	1P2N	P	R	R	NR	R	nd
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	R	R	**NR**
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR

POC Rapid Results for Discordant and/or WB Indeterminate Specimens

						Lab			POC	
Type	EIA	WB	TMA	MS	Lab Interp.	OQ	UG	CV	UG	CV
ACT	P	I	D	1P2N	P	R	R	R	R	R
ACT	P	I	D	1P2N	P	R	R	R	R	R
ACT	P	I	D	1P2N	P	NR	R	NR	R	**R**
ACT	P	I	D	1P2N	P	NR	R	NR	R	**R**
ACT	P	I	D	1P2N	P	R	R	NR	R	nd
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	R	R	**NR**
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR
ACT	N	N		1N2N	N	NR	R	NR	R	NR

Conclude: Uni-Gold and Clearview have equal sensitivity at POC site. Uni-Gold is least specific test in both places

POC Rapid Test Results vs Lab Rapid Test Results - ACT specimens

Uni-Gold

POC Result	Lab Result: R	Lab Result: NR	Lab Result: not done
R	128	**15**	0
NR	0	1	0

All false positives POC

Clearview

POC Result	Lab Result: R	Lab Result: NR	Lab Result: not done
R	81	**3**	1
NR	1	19	0

1 false pos POC, 2 false neg lab

Conclude: Lower reactivity in rapid tests performed in lab compared to POC. Rapid test results in lab ≠ rapid test results at POC site

Conclusions

- ACT detected more early infections than CHCN, lower confirmation rate
  - Due to use of Uni-Gold as 1st assay?
- Uni-Gold most sensitive in lab, Uni-Gold & Clearview equally sensitive at POC
  - Rapid test results in lab ≠ results at POC
- Fewer reactives in lab than at POC
  - Does specimen handling/processing in lab affect rapid test performance?
  - Differences in what is considered ‘positive’ by operators?

Questions?

Summary of ACT Specimens

POC Rapid Test Results	Lab P	Lab I TMA D	Lab N	Total
Test 1 - R Test 2 - R	81	4	1	86
Test 1 - R Test 2 - NR	0	0	22	22
Test 1 - R Test 2 - nd	35	1	2	38