Cost-effectiveness of HIV monitoring for long-acting cabotegravir pre-exposure prophylaxis in the US

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PLAIN LANGUAGE SUMMARY

We used a mathematical model to find that using Ag/Ab testing alone to monitor for HIV infection among people using injectable, bi-monthly cabotegravir-based HIV PrEP would save costs with similar clinical outcomes compared to CDC-recommended combined Ag/Ab+RNA testing.

BACKGROUND

- HIV detection is challenging among people acquiring HIV while on long-acting, injectable cabotegravir (CAB-LA) pre-exposure prophylaxis (PrEP) due to low/undetectable viral loads, delayed antibody production, and the absence of acute retroviral syndrome.
- US CDC recommends simultaneous antigen/antibody (Ag/Ab) and RNA testing at each CAB-LA injection visits.
- **Objective:** To determine the optimal HIV monitoring strategy among US men (MSM) and transgender women (TGW) who have sex with men receiving CAB-LA.

METHODS

- Design: CEPAC microsimulation model of HIV.
- Population: US men and transgender women who have sex with men, representing HPTN083OLE participants.
- Outcomes: misdiagnoses, quality-adjusted life-years, HIV-related costs, and incremental cost-effectiveness ratios.
- Strategies: simultaneous Ag/Ab and RNA testing (current CDC guideline, (*Ag/Ab+RNA*), Ag/Ab alone (*Ag/Ab-only*), *and* RNA alone (*RNA-only*) at each CAB-LA injection.
- Time horizon: 10 years.

Table 1. Select model input parameters

Parameter	Value	Ref
HIV incidence, per 100 person-years		
Off-PrEP	5.32	1,2
On CAB-LA	0.26	
During PrEP interruption	5.32	
Without ARV exposure		
Ag/Ab sensitivity (acute/chronic), %	81.88/99.94	3,4,5
RNA sensitivity (acute/chronic), %	99.03/100	6,7
Ag/Ab specificity, %	99.77	8,9
RNA specificity, %	99.95	10,11
With ARV exposure		
Ag/Ab sensitivity, %	50.00	12, 13
RNA sensitivity, %	75.00	
Ag/Ab specificity, %	99.77	8,9
RNA specificity, %	99.91	13
CAB-LA administration frequency, months	2	14
Delay to restart PrEP after interruption, mean (SD), months	2.1 (0.7)	12,13

[1] Landovitz *NEJM* 2021
[2] Neilan *Ann Intern Med* 2022
[3] Peters *JAMA* 2016
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[10] Aptima HIV-1 Quantitative Package Insert
[11] Alinity HIV-1 AMP Package Insert
[12] Landovitz IAS 2024
[13] Landovitz CROI 2024
[14] CDC 2021 PrEP guidelines

At current test costs, *Ag/Ab-only* for HIV monitoring during CAB-LA PrEP use would achieve similar outcomes at lower cost compared with current CDC-recommended *Ag/Ab+RNA* testing

RESULTS

Table 2. Model-projected performance of on-PrEP monitoring strategies over 10 years

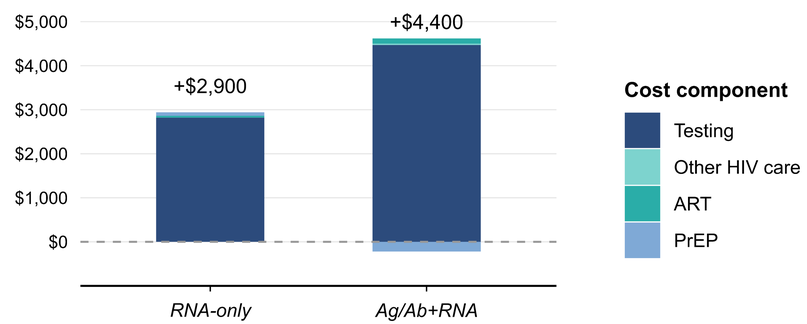
	Misdiagnosis, n per 10,000		Discordant results, n per 10,000	PrEP interruption frequency, n, per person	HIV cases, n per 10,000	Time from HIV acquisition to diagnosis, months, per person	QALYs, undisc	Total cost, million USD per 10,000
Strategies	FP	FN						
Ag/Ab-only	15.70	3.50	-	1,075	220	6.0	9.80	2,143.6
RNA-only	8.84	1.20	-	697	219	4.9	9.80	2,173.2
Ag/Ab+RNA	0.01	0.52	26.62	1,488	221	3.7	9.80	2,187.8

Costs are reported in 2024 USD, rounded to the nearest 100, and 3%/year discount rate is applied. Results are calculated from unrounded numbers. QALYs are rounded to two decimal places.

Base case

- *Ag/Ab-only* would be preferred: lower per-person cost ($214,400) than *Ag/Ab+RNA* ($218,800) or *RNA-only* ($217,300; ICER=$52.1M/QALY vs. *Ag/Ab-only*).
- *Ag/Ab+RNA* would lead to fewest misdiagnosis and earlier HIV diagnoses but more PrEP interruptions due to discordant results, potentially increasing HIV infections.
- QALYs were equivalent across all strategies (9.80).

Figure 1. Additional cost per person vs. *Ag/Ab-only* ($2024 USD, discounted)

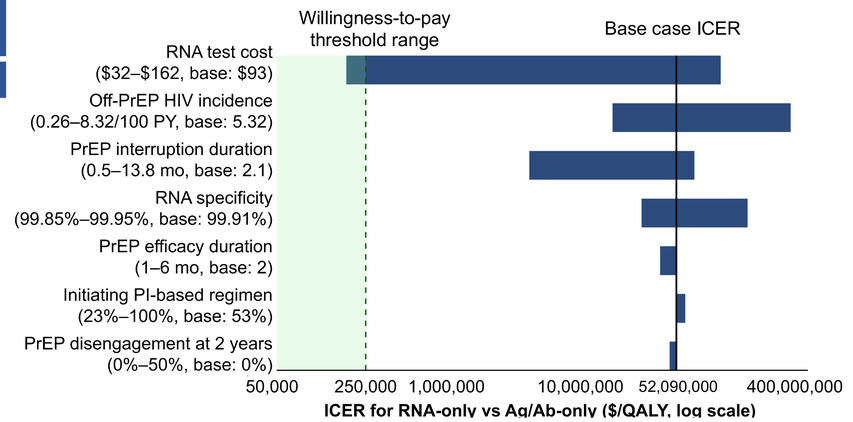


RESULTS (CONTINUED)

Sensitivity analyses

- Ag/Ab-only remained preferred across all deterministic and probabilistic sensitivity analyses.
- RNA-only would be preferred only if RNA test cost decreased below $32 (66% reduction).
- Results were robust to extended dosing intervals and PrEP disengagement rates.

Figure 2. One-way sensitivity analysis: ICER for *RNA-only* vs. *Ag/Ab-only* ($/QALY, log scale)



LIMITATIONS

- Assumed constant HIV risk behavior during PrEP interruptions.
- Longitudinal psychological/behavioral consequences of false-positive diagnoses may not have been fully captured
- HIV transmission (sexual/parenteral) not explicitly modeled; however, low viral loads among those on CAB-LA suggest low sexual transmission risk

CONCLUSIONS & ONGOING WORK

- *Ag/Ab-only* monitoring at CAB-LA injection visits would save costs with similar clinical outcomes compared to CDC-recommended simultaneous *Ag/Ab+RNA* testing.
- Ongoing analyses include evaluating pre-PrEP initiation screening strategies and alternative testing approaches

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