CAN ADHERENCE INTERVENTIONS AMONG YOUTH WITH HIV IN THE UNITED STATES BE COST-EFFECTIVE?

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INTRODUCTION

- Youth with HIV (YWH) in the United States are at high risk for poor clinical outcomes and for transmission of HIV to others.
- Estimates of virologic suppression among YWH range from only 12-53%.
- The Adolescent Medicine Trials Network for HIV/AIDS Interventions (ATN) is evaluating interventions to improve ART adherence among YWH.

OBJECTIVE

- To project the clinical and economic impact of hypothetical adherence interventions, such as electronic reminders, and to identify combinations of effectiveness, duration, and cost at which an adherence intervention would provide the best value for YWH.

METHODS

- We used the Cost-effectiveness of Preventing AIDS Complications (CEPAC)-Adolescent model to simulate a cohort of YWH aged 13-24 years. We compared two strategies:
  1. **SOC:** standard-of-care
  2. **AI:** adherence intervention
- In the AI strategy, a hypothetical 12-month AI was assumed to improve absolute cohort-level virologic suppression (efficacy) by 10% compared to SOC, at a cost of $100/person/month.
- Modeled outcomes included opportunistic infections, life expectancy, primary HIV transmissions averted during the intervention, HIV-related costs, and incremental cost-effectiveness ratios (ICERs, $/year-of-life saved (YLS); cost effectiveness threshold ≤$100,000/YLS; discounted 3%/year).

Table 1. Select base case model input parameters

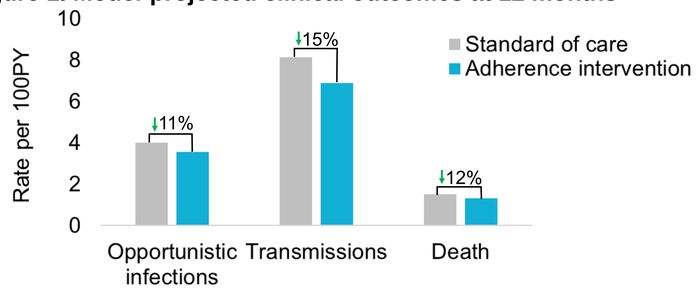
Parameter	Base case	Source
Cohort characteristics		
Age in years, mean (SD)	19.5 (3.6)	[1]
Male / Female sex, %	57 / 43	[2]
CD4 at model start, cells/μL, mean (SD)	545 (228)	[1]
VL at model start, $\log_{10}$ copies/mL, mean (SD)	5.22 (5.34)	[3]
Adherence, % of pills taken, mean	55%	[4,5]
ART efficacy with >95% adherence (VL <50 copies/mL at 48 weeks, %)	96.4%	[6]
Costs (USD 2019)		Modeled intervention
Adherence intervention (total cost)	$1,200	
Routine HIV care, range by CD4 (monthly)	$260-$2,850	[7-9]
ART (monthly)	$2,670	[10]

[1] Ellen *AIDS* 2014 [2] Lally *JAIDS* 2018 [3] Daar *Ann Intern Med* 2011 [4] Becker *MedGenMed* 2002 [5] Sax PLoS One 2012. [6] Walmsley *N Engl J Med* 2013 [7] Gebo *Hopkins HIV Rep* 2003 [8] Bozzette *N Engl J Med* 1998 [9] Bamezai *Ann Emerg Med* 2005 [10] IBM Micromedex® *RedBook*®

Adherence interventions that improve virologic suppression among a cohort of youth with HIV can have a meaningful impact across a lifetime and be cost-effective.

RESULTS

Figure 1. Model-projected clinical outcomes at 12 months



- Compared to SOC, AI led to lower rates of opportunistic infections (-11%), transmissions (-15%), and deaths (-12%) at 12 months (**Figure 1**).

Table 2. Model-projected clinical and cost-effectiveness outcomes

	Life expectancy (months)	Lifetime per-person cost (USD)	Life expectancy (months)	Lifetime per-person cost (USD)	ICER ($/YLS)
Strategy	Undiscounted		Discounted		
SOC	313	778,900	178	453,500	-
AI	327	802,900	187	458,800	7,400

ICER: incremental cost-effectiveness ratio; YLS: year-of-life-saved; USD: 2018 US dollars. Results are rounded.

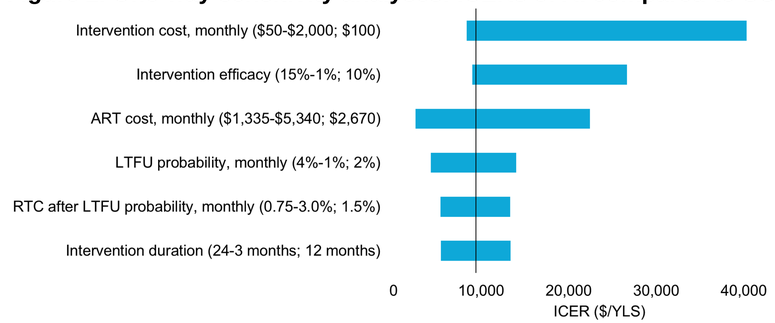
- The modeled AI improved discounted life expectancy by 9 months at an added discounted lifetime cost of $5,400/person (**Table 2**).
- The ICER of AI compared to SOC was $7,400/YLS, which falls below the cost-effectiveness threshold of $100,000/YLS (**Table 2**).

Table 3. Detailed per-person cost outcomes of AI compared to SOC

Costs added	Costs averted
ART (↑$9,500)	Transmissions (↓$5,700)
Intervention (↑$1,200)	Opportunistic infections (↓$400)
HIV care (↑$1,200)	Death (↓$400)

RESULTS (CONTINUED)

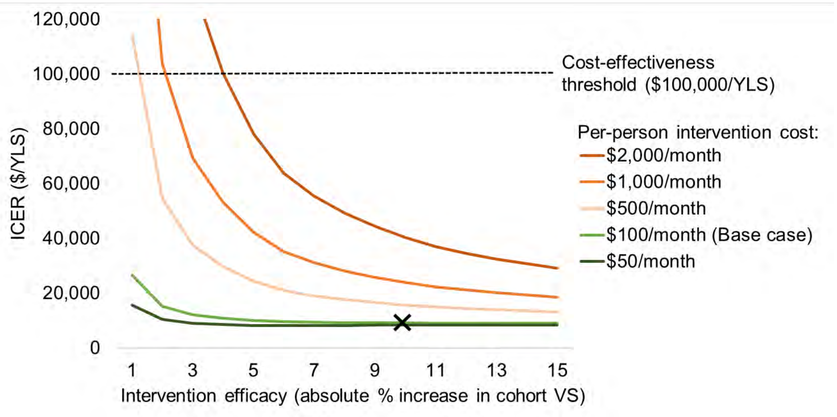
Figure 2. One-way sensitivity analyses: ICERs of AI compared to SOC



Each parameter is varied through the range shown in parentheses, followed by a semicolon and the base case input value. Abbreviations: LTFU: loss to follow-up; RTC: return to care; ICER: incremental cost-effectiveness ratio.

- The ICER of AI compared to SOC was most sensitive to intervention cost, ART cost, and intervention efficacy.

Figure 3. Two-way sensitivity analyses: varying AI costs and efficacy



- When the AI increased cohort-level virologic suppression by 5% at the end of 12 months, AI remained <$100,000/YLS among a wide range of intervention costs.

LIMITATIONS

- We assumed adherence reverted to baseline after intervention end and that adherence improved in all YWH in both strategies after age 25.
- We did not account for different clinical characteristics or resource utilization between youth with perinatally and non-perinatally acquired HIV.

CONCLUSIONS

- Adherence interventions targeted to youth with HIV, if modestly effective, could improve life expectancy, prevent onward transmission of HIV, and provide excellent value for money.