The Optimal Age for Screening Adolescents and Young Adults Without Identified Risk Factors for HIV

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ABSTRACT

Purpose: To assess the optimal age at which a one-time HIV screen should begin for adolescents and young adults (AYA) in the U.S. without identified HIV risk factors, incorporating clinical impact, costs, and cost-effectiveness.

Methods: We simulated HIV-uninfected 12-year-olds in the U.S. without identified risk factors who faced age-specific risks of HIV infection (.6–71.3/100,000PY). We modeled a one-time screen ($36) at age 15, 18, 21, 25, or 30, each in addition to current U.S. screening practices (30% screened by age 24). Outcomes included retention in care, virologic suppression, life expectancy, lifetime costs, and incremental cost-effectiveness ratios in $/year-of-life saved (YLS) from the health-care system perspective. In sensitivity analyses, we varied HIV incidence, screening and linkage rates, and costs.

IMPLICATIONS AND CONTRIBUTION

This study found that for adolescents and young adults (AYA) without identified risk factors for HIV, a one-time routine HIV screen at age 25 would optimize clinical outcomes and be cost-effective. Focusing
The U.S. Centers for Disease Control and Prevention (CDC) estimate that 22% of new HIV diagnoses occur in adolescents and young adults (AYA) aged 13–24 years, and that nearly 61,000 AYA are now living with HIV in the U.S. [1,2]. In 2006, CDC recommended routine HIV screening at least once between the ages of 13 and 64, regardless of risk factors [3]. However, HIV screening rates among AYA remain low: 12% of U.S. high school students reported ever being screened in 2005, increasing only to 13% by 2012 [4]. Among older youth aged 18–24, the proportion who had ever been screened declined over a similar period, from 37% reported in 2000 to 30% in 2010.

Of all AYA aged 13–24 living with HIV, 51% are estimated to be unaware of their HIV status, substantially higher than the 13% of HIV-infected U.S. adults estimated to be unaware of their status [2]. People unaware of their HIV infection miss opportunities for treatment and improved individual health, as well as contribute disproportionately to HIV transmission [5]. CDC recommends that people at high risk for HIV infection, including people who have had sex with more than one partner since their last HIV screen, sexually active men who have sex with men, and injection drug users, be rescreened at least annually [3]. For youth without identified risk factors, however, uptake of CDC guidelines for routine screening may be limited by differing recommendations among national professional organizations, as well as lack of evidence that 13 is the optimal age at which to initiate HIV screening in AYA [6,7]. Although many youth with unknown risk factors may be at higher risk of HIV infection than either they or their healthcare providers perceive [8], we hypothesized that offering a one-time screen at a younger age may cause harm by missing infections that occur later. Additionally, offering an HIV test to a 13-year-old without identified risk factors might take the place of potentially higher priority health considerations such as catch-up immunizations or assessing safety and counseling on injury prevention [9]. Our objective was to identify the age at which the CDC recommendation for one-time HIV screening should begin. We thus assessed the clinical impact, cost, and cost-effectiveness of one-time HIV screening strategies for AYA aged 13–24 in the U.S. without identified HIV risk factors.

Methods

Analytic overview

We used the Cost-Effectiveness of Preventing AIDS Complications microsimulation model to evaluate the cost-effectiveness of alternative strategies for routine one-time HIV screening in youth aged 13–24, in addition to current HIV screening and testing practices in the U.S. (13% ever screened by age 18, and 30% by age 24) [4]. We simulated HIV-uninfected 12-year-olds without identified risk factors (Table 1). We modeled five screening strategies: a one-time screen at age 15, 18, 21, 25, or 30 years; each one-time screening strategy was performed in addition to current practice. Screens at age 25 and 30 were included to determine the value of screening after the AYA period. Model outcomes included CD4 cell count at diagnosis, life expectancy, and HIV-related lifetime costs from the health-care system perspective. In the base case, life expectancy was not quality-adjusted due to limited data among AYA [22]. To compare the marginal cost for an additional unit of health benefit when choosing between these different strategies, we report incremental cost-effectiveness ratios (ICERs) [23]. We calculated ICERs for each strategy compared with the next most costly alternative (Δ cost/Δ life expectancy), using outcomes for HIV-infected and HIV-uninfected people. Results were discounted at 3%/year to convert future costs and health outcomes [23]. We defined a strategy as “cost-effective” if its ICER fell below a willingness-to-pay threshold of $100,000/year-of-life saved (YLS) [24]; we examine a range of ICER thresholds in sensitivity analyses.

Model structure, population, and data parameters

The Cost-Effectiveness of Preventing AIDS Complications model is a patient-level simulation model of HIV infection, screening, disease progression, and treatment calibrated to clinical data with and without antiretroviral therapy (ART) in the U.S. [25]. Youth enter the model at age 12 without HIV infection, and are simulated through their lifetimes until death.

HIV incidence and diagnosis. Simulated patients face monthly risks of HIV infection, based on age-stratified incidence rates (Table 1 and online Appendix Table S1). For patients who become infected, diagnosis can occur via current practice of HIV detection (e.g., HIV screening and testing already occurring in health-care settings), or testing after presenting to care with an opportunistic infection (OI) or the one-time HIV screening program. The model includes age-stratified monthly probabilities of detection under current practice HIV screening. Current practice screening rates were derived from Youth Risk Behavior Survey data for 13- to 17-year-olds (% ever tested) and the National Health Interview Survey for people >18 years (% tested within 12 months).
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