Economic Value of Early Antiretroviral Treatment As HIV Infection Prevention in the United States

Timothy Juday, PhD, John A Romley, PhD, Daniel Seelkins, MD, Tony Hedben, PhD and Dana Goldman, PhD

*Leonard D. Schaeffer Center for Health Policy and Economics, University of Southern California, +U.S. Medical, Bristol-Myers Squibb

BACKGROUND

Until 2009, HIV treatment guidelines recommended initiation of combination antiretroviral therapy (cART) when a patient’s CD4 cell count dropped below the threshold of 350 cells/mm², but not at higher CD4 counts. In 2009, the NA-ACCORD study found that patients who initiated cART within six months of reaching a CD4 cell count of 351-500 cells/mm² had significantly lower mortality than those who deferred therapy until their CD4 cell count fell below 350 cells/mm². In response, treatment guidelines were updated in December 2009 to recommend initiation of cART when a patient’s CD4 cell count dropped below the threshold of 500 cells/mm².

While the clinical benefits of early cART initiation (initiation of cART between 350 and 500 cells/mm²) to HIV positive individuals are well documented, early cART initiation also helps prevent the spread of new infections. The HPTN 052 study found that early cART initiation reduced sexual transmission of HIV infection by 96%. However, the economic value of this reduction has yet to be assessed.

METHODS (continued)

To quantify the life years saved through treatment as prevention, we calculated the difference between life expectancy with HIV and life expectancy without HIV. Life expectancy with HIV was specified in the disease model. Life expectancy without HIV was taken from life tables. We adjusted for average age at infection based on Annual Surveillance Reports and discounted future life years at a 3% rate.

To value the life years saved, we relied on studies of willingness to pay for safety. Based on prominent reviews of the evidence, we used the plausible but relatively conservative range of $50,000 to $300,000 for the value of a life year.

RESULTS

The relationship between the timing of cART initiation and annual HIV incidence is shown in Figure 1. If there had been no early cART initiation, the disease model predicts that incidence would have been stable at approximately 60,000 cases per year through 2009. Given the actual timing of initiation, predicted incidence declined through the early 2000s, and stabilized at an incidence of nearly 47,500 cases in 2009. The model indicates that early cART prevented a total of 100,800 HIV cases in the U.S. through 2009.

Individuals who were infected with HIV in 1997 and did not receive early cART lost 11.16 years of life. Hence, cases prevented through early treatment saved 11.16 life years. In discounted terms, the life expectancy benefit was 3.63 years. These figures were stable over the analysis period.

The benefits of treatment as prevention are shown in Table 1. At a value of life year of $200,000 per year, early treatment generated $85 billion in benefits in the form of reduced incidence in the U.S. through 2009.

CONCLUSION

Early cART initiation prevented a substantial number of HIV infections in the U.S. through 2009, thereby averting $85 billion in economic loss to society.

LEARNING OBJECTIVE

Given the benefits associated with reduced HIV transmission resulting from early treatment of HIV positive individuals, stakeholders should encourage early initiation of cART consistent with current treatment guidelines.

REFERENCES


LIMITATIONS

This study only assessed the value of early cART initiation in terms of HIV prevention; it did not assess the value of extended survival in HIV positive individuals.

CONCLUSIONS (continued)

To model HIV prevention resulting from early cART initiation, we adapted an existing model of HIV disease transmission and progression. The model includes 4 disease stages, defined by mean CD4 counts (774, 553, 332 and 111 cells/mm²). Disease progression and life expectancy were based on U.S. evidence. Treatment was assumed to reduce the infectivity of sexual encounters by 90%. However, we allowed sexual activity to increase with treatment. The model was calibrated to actual HIV incidence. We used the model to predict HIV incidence based on actual initiation rates by disease stage, and then under a scenario with no early treatment, i.e., no initiation prior to the worst disease stage.

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