CD4 cell count and viral load monitoring in patients undergoing antiretroviral therapy in Uganda: cost effectiveness study


Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
The objective was to assess the cost-effectiveness of adding cluster of differentiation (CD) 4 cell count and viral load monitoring to the usual clinical monitoring for patients with HIV who were receiving antiretroviral therapy (ART) in Uganda. Adding routine CD4 cell count monitoring was more cost-effective than adding viral load and CD4 cell count monitoring. It was also more cost-effective than starting ART. Despite some limitations, the methods seem appropriate, and so do the authors’ conclusions.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of adding cluster of differentiation (CD) 4 cell count and viral load monitoring to the usual clinical monitoring for patients with HIV who were receiving antiretroviral therapy (ART) in Uganda.

Interventions
The interventions were quarterly CD4 cell counts, and quarterly viral load tests plus CD4 cell counts. The two interventions were added to clinical monitoring and were compared with clinical monitoring alone. Clinical monitoring was conducted at weekly household visits.

Location/setting
Uganda/primary care.

Methods
Analytical approach:
The authors modelled the data from one randomised controlled trial (RCT) to estimate the long-term impact of the three monitoring strategies, for an adult population with HIV. The time horizon was 15 years from the start of treatment. The authors did not state the perspective.

Effectiveness data:
Most of the effectiveness evidence came from a clinical study by Mermin, et al. (2011, see ‘Other Publications of Related Interest’ below for bibliographic details). The remaining estimates were from relevant studies and expert opinion (trial clinicians). The clinical study was a randomised controlled trial (RCT) of home-based ART, in rural Uganda, with a median follow-up of three years. The main clinical effectiveness estimates were the numbers of deaths and severe morbid events (14 different diagnoses). The event rates reflected the trial's intention-to-treat analyses. Other clinical parameters included the annual percentage change in ART regimens. The ongoing arm-specific annual mortality observed in the trial was used for the long-term estimates.

Monetary benefit and utility valuations:
The disability weights came from the Disease Control Priorities Project.

Measure of benefit:
The disability-adjusted life-years (DALYs) averted was the measure of benefit.
Cost data:
The cost categories included the antiretroviral drugs, monitoring, out-patient and in-patient care, and the capital costs for staff and monitoring equipment. The resource quantities and prices for treatment, and the monitoring costs came from the RCT. The in-patient costs were from the World Health Organization (WHO) Choosing Interventions that are Cost Effective (WHO-CHOICE) database, for sub-Saharan Africa. The long-term costs were based on mortality and changes of ART regimen. All costs were presented in US dollars ($).

Analysis of uncertainty:
The authors conducted one-way and multivariate sensitivity analyses to assess the impact of uncertainty in the key parameters. A probabilistic analysis was performed by varying all the uncertain inputs, in 50,000 Monte Carlo simulations. The results of the sensitivity analyses were presented in tables.

Results
Over 15 years, for every 100 people starting ART, the estimated cost of clinical monitoring was $606,260. The incremental cost of CD4 cell count monitoring was $20,458 and the additional cost of viral load monitoring was $142,458. Clinical monitoring produced 466.4 DALYs. The DALYs averted with the addition of CD4 cell count monitoring were 117.3 and those averted with the addition of viral load monitoring were 27.5.

The incremental cost-effectiveness ratio (ICER) of adding CD4 cell count monitoring to clinical monitoring was $174 per DALY averted. The ICER of adding viral load monitoring to clinical monitoring and CD4 cell count monitoring was $5,181 per DALY averted. At a cost-effectiveness threshold of $485, which was the Ugandan gross domestic product per capita in 2008, the addition of CD4 cell count monitoring was very cost-effective, but the further addition of viral load monitoring was not cost-effective.

The probabilistic sensitivity analysis showed that clinical plus CD4 cell count monitoring was dominant, as it was more effective and less costly, compared with clinical, viral load, and CD4 cell count monitoring, in 27.7% of simulations, and dominant over clinical monitoring in 24.2% of simulations.

Authors’ conclusions
The authors concluded that adding routine CD4 cell count monitoring to clinical monitoring was more cost-effective than adding viral load monitoring and CD4 cell count monitoring. It was also more cost-effective than starting ART.

CRD commentary
Interventions:
The interventions were well described and realistic treatment options. It was unclear if weekly household visits were the usual care in the study setting, and it was unclear if all relevant options were considered. These options might be relevant in other similar settings.

Effectiveness/benefits:
The sources for the clinical parameters were reported, and the data appear to have been appropriate and relevant to the study setting. The main effectiveness data came from a study with a strong design, and so they should be of high quality, but the details of this study, such as the numbers of participants, were not provided. The original trial publication should be consulted to assess the quality of this evidence. DALYs were an appropriate measure of benefit; they capture the burden of disease and allow cross-disease comparisons to be made. A time horizon of 15 years might have been sufficient to capture all the differences in costs and effectiveness, as the mean life expectancy was about seven years. The authors reported that future benefits were discounted, but did not state the discount rate.

Costs:
The authors did not explicitly state the perspective, but the costs appear to be consistent with a health care payer perspective, as only the direct medical costs were considered. The price year was not stated and currency conversions were not reported. Future costs appear to have been discounted, but the rate was not reported. These factors reduce the transparency of the analysis and might hinder its replication for other settings. The key data sources were given, and appear to have been appropriate for the study setting, but the costs were generally presented as category totals, with no breakdown of individual items.
Analysis and results:
An incremental analysis was appropriate for exploring the relative cost-effectiveness of the monitoring options. The authors did not describe their model in detail, making it difficult to assess the its quality. The ranges of values, distributions, and sources were reported. The authors compared their results with those of other economic evaluations and explained the reasons for similar or different findings. They highlighted some limitations of their analysis, such as the lack of long-term data on mortality. The results should be transferable to settings with similar epidemiology, cost structures, adherence to ART, and ART regimen switching.

Concluding remarks:
Despite some limitations in the reporting, the methods appear to have been appropriate and the results were reported sufficiently. Given the scope of the analysis, the authors' conclusions appear to be appropriate.

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