Use of Genotypic Resistance Testing To Guide HIV Therapy: Clinical Impact and Cost-Effectiveness

Abstract

Background: Genotypic sequencing for drug-resistant strains of HIV can guide the choice of antiretroviral therapy.

Objective: To assess the cost-effectiveness of genotypic resistance testing for patients acquiring drug resistance through failed treatment (secondary resistance) and those infected with resistant virus (primary resistance).

Design: Cost-effectiveness analysis with an HIV simulation model incorporating CD4 cell count and HIV RNA level as predictors of disease progression.

Data Sources: Published randomized trials and data from the Multicenter AIDS Cohort Study, the national AIDS Cost and Services Utilization Survey, the Red Book, and an institutional cost-accounting system.

Target Population: HIV-infected patients in the United States with baseline CD4 counts of $0.250 \times 10^9$ cells/L.

Time Horizon: Lifetime.

Perspective: Societal.

Interventions: Genotypic resistance testing and clinical judgment, compared with clinical judgment alone, in two contexts: after initial treatment failure (secondary resistance testing) and before initiation of antiretroviral therapy (primary resistance testing).

Outcome Measures: Life expectancy, quality-adjusted life expectancy, and cost-effectiveness in dollars per quality-adjusted life-year (QALY) gained.

Results of Base-Case Analysis: Secondary resistance testing increased life expectancy by 3 months, at a cost of $17,900 per QALY gained. The cost-effectiveness of primary resistance testing was $22,300 per QALY gained with a 20% prevalence of primary resistance but increased to $69,000 per QALY gained with 4% prevalence.

Results of Sensitivity Analysis: The cost-effectiveness ratio for secondary resistance testing remained under $25,000 per QALY gained, even when effectiveness and cost of testing and antiretroviral therapy, quality-of-life weights, and discount rate were varied.

Conclusions: Genotypic antiretroviral resistance testing following antiretroviral failure is cost-effective. Primary resistance
HIV Resistance Testing in Clinical Practice: A QALY-fied Success

The Cost-Effectiveness of Testing HIV for Genetic Signs of Drug Resistance as a Guide to the Choice of Therapy

The Association of HIV Susceptibility Testing With Survival Among HIV-Infected Patients Receiving Antiretroviral Therapy: A Cohort Study

Annals of Internal Medicine; 151 (2): 73-84

Hepatic Decompensation in Antiretroviral-Treated Patients Co-Infected With HIV and Hepatitis C Virus Compared With Hepatitis C Virus–Monoinfected Patients: A Cohort Study

Annals of Internal Medicine; 160 (6): 369-379

Isoniazid prevented active tuberculosis in patients with HIV treated with antiretroviral therapy

Annals of Internal Medicine; 161 (6): JC12

A clinical decision-support system with interactive alerts improved CD4 cell count in HIV

Annals of Internal Medicine; 158 (8): JC11

Hepatitis C Virus

Annals of Internal Medicine; 165 (5): ITC33-ITC48

Management of Newly Diagnosed HIV Infection

Annals of Internal Medicine; 167 (1): ITC1-ITC16

testing also seems to be reasonably cost-effective and will become more so as the prevalence of primary resistance increases.
Impact of antiretroviral therapy containing tenofovir disoproxil fumarate on the survival of patients with HBV and HIV coinfection. Liver Int 2019.


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Genotypic testing is preferred over phenotypic resistance testing to guide therapy in persons with suboptimal virologic response or virologic failure while on first- or second-line regimens and in individuals in whom resistance mutation patterns are known or not expected to be complex (AII). The addition of phenotypic to genotypic resistance testing is recommended for persons with known or suspected complex drug-resistance mutation patterns (BIII). A next-generation sequencing genotypic resistance assay that analyzes HIV-1 proviral DNA in host cells is now commercially available. This test aims to detect archived resistance mutations in patients with HIV RNA below the limit of detection or with low-level viremia. Use of Resistance Assays in Determining Initial Treatment. BACKGROUND Genotypic antiretroviral resistance testing (GRT) in HIV infection with drug resistant virus is recommended to optimize antiretroviral therapy, in particular in patients with virological failure. We estimated the clinical effect, cost and cost-effectiveness of using GRT as compared to expert opinion in patients with antiretroviral treatment failure. METHODS We developed a mathematical model of HIV disease to describe disease progression in HIV-infected patients with treatment failure and compared the incremental impact of GRT versus expert opinion to guide antiretroviral therapy.