Code EE402

Economic model of Alzheimer's Disease that incorporates the uncertainty associated with measuring efficacy in clinical trials

Mar J, Arrospide A, Handels R, Soto-Gordoa M

Biogipuzkoa Health Research Institute, Donostia-San Sebastián, Spain, Basque Government Health Department, Vitoria-Gasteiz, Spain; Maastricht University, Maastricht, Netherlands

Contact: javier.marmedina@gmail.com

BACKGROUND

Attention has recently focused on proposals for new approaches to reproduce changes in Alzheimer's Disease (AD) patient trajectories in the medium term based on the results of ongoing clinical trials and taking into account uncertainty about their efficacy.

OBJECTIVE

To propose a new methodological approach based on discrete event simulation for the economic evaluation of new Alzheimer's disease (AD) treatments, by incorporating probabilistic sensitivity analysis (PSA) and scenario analysis

METHODS

Target population

Cohort of individuals of both sexes aged around 70 years old (mean 72.72 [standard deviation (SD) 6.58]) who were diagnosed with amyloid-confirmed mild cognitive impairment (MCI) compatible with Alzheimer's disease.

Intervention

Hypothetical disease modifying treatment, with the efficacy included in the synthetic dataset.

Model

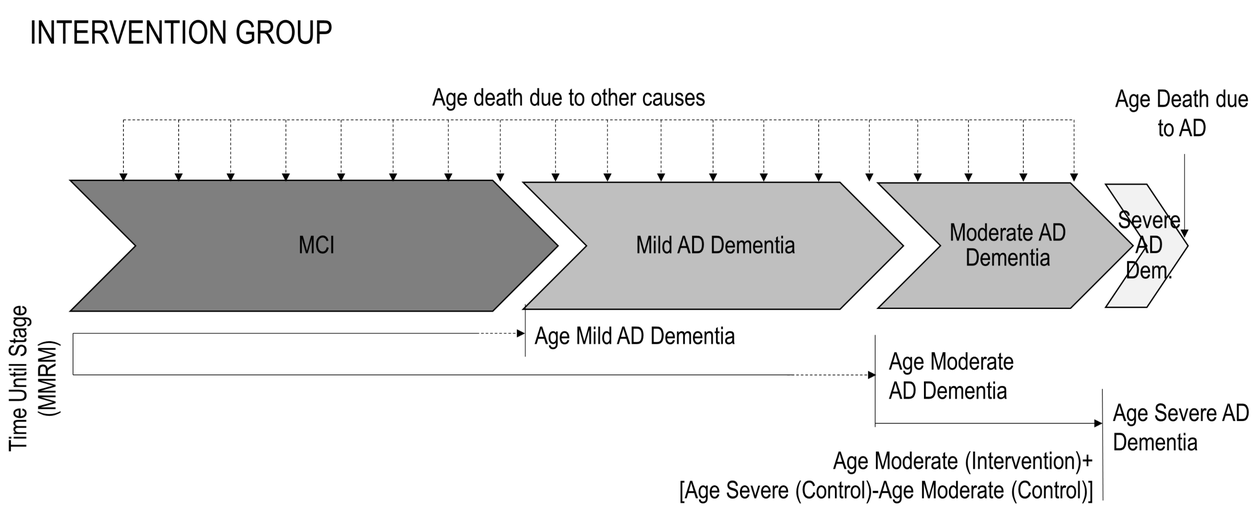
A discrete event simulation model, using Python's SimPy package, was built using data from a synthetic clinical trial dataset to model typical patient-level natural history trajectories of Clinical Dementia Rating – Sum of Boxes scores from mild cognitive impairment to severe dementia using mixed regression models for repeated measures (MMRM). We converted the standard function with CDR-SB progression as the dependent variable into a time-to-event function based on dementia stage cut-offs for use in our discrete event simulation model. With this function, we assigned times to mild, moderate and severe dementia in both arms (intervention and control) for each individual. Costs and utilities were obtained from the literature

PSA & Scenario analysis

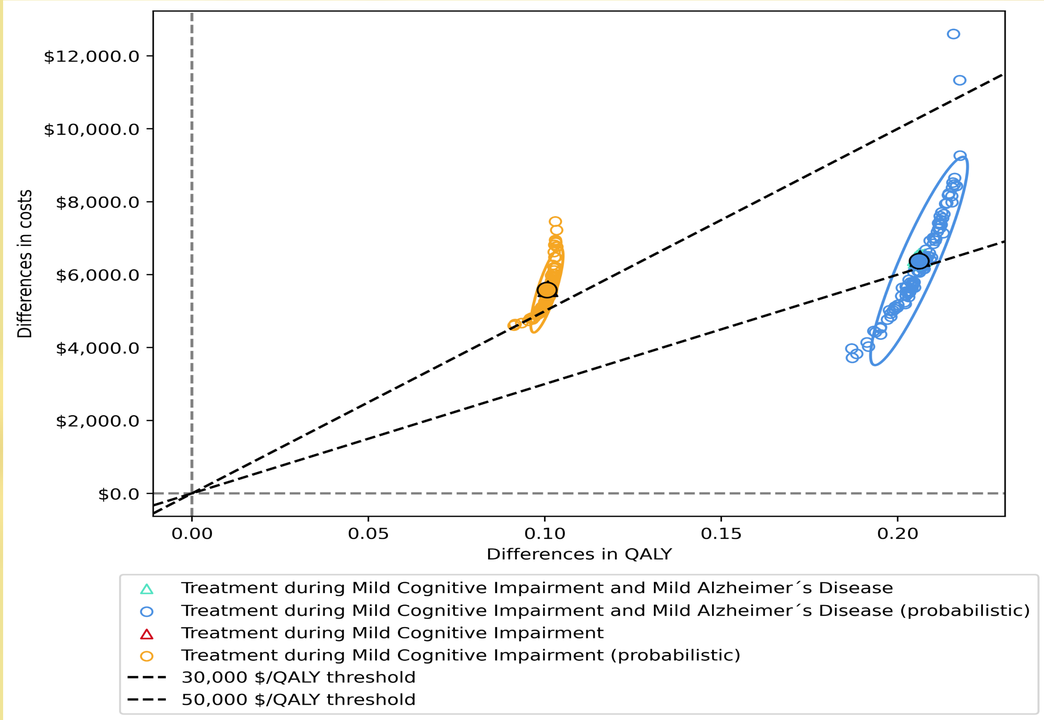
Probabilistic sensitivity analysis (PSA) was performed through 1000 simulations and bootstrapping the synthetic data. As the MMRM coefficients are correlated, this variability was incorporated into the model using Cholesky decomposition.

Uncertainty about treatment effect waning was addressed by scenario analysis (optimistic and pessimistic).

Conceptual model



Results: Cost-effectiveness plane in both scenarios



RESULTS

The incremental cost-effectiveness ratio of a hypothetical treatment was above €30,000/quality-adjusted life year (QALY) in the pessimistic scenario and around that threshold in the optimistic scenario. The cost-effectiveness plane showed more variability in the incremental cost than in the incremental utility in both scenarios. Treatment dominated for thresholds above $40,000/QALY in the optimistic scenario and above $60,000/QALY in the pessimistic scenario

CONCLUSIONS

We describe an innovative approach by applying probabilistic sensitivity analysis to two scenarios and shaping individual cognitive trajectories on a continuous scale. Incorporating long-term effectiveness and multi-sectoral costs of dementia, along with advanced methodologies, will provide a new framework for decision-making in the market access process for new preventive interventions and disease-modifying treatments.