ABSTRACT

Objective: We develop a framework for stratified cost-effectiveness analysis using individual-based discrete-event simulations that allow for the representation of heterogeneous patient populations, and which can be used to evaluate the cost-effectiveness of genetic testing in different patient groups.

Conclusion: In each study, we used a simulation model to identify a subpopulation based on age and clinical risk, for whom we used genetic testing to find intensified prevention measures, which was optimally cost-effective. As more genetic tests become available, this method can be used to identify screening strategies that maximize cost-effectiveness.

BACKGROUND

• Genetic screening identifies candidates for intensified cancer screening and prevention.
• Due to the high cost of genetic testing, it is important to identify patients who are most likely to benefit.
• Doing so using clinical algorithms is prohibitively expensive; thus a mathematical modeling approach is required.

OBJECTIVE

• We develop a framework for stratified cost-effectiveness analysis using individual-based discrete-event simulations that allow for the representation of heterogeneous patient populations, and which can be used to evaluate the cost-effectiveness of genetic testing in different patient groups.

MODELING APPROACH

The Discrete Event Simulation Model consists of two components:

Natural History
• Mutation distributions
• Correlations between mutation and other risk factors (e.g. family history)
• Cancer incidence, progression, and mortality
Healthcare interventions
• Genetic testing
• Screening
• Diagnosis
• Treatment
• Costs

GENERAL APPROACH

The genetic screening strategy consists of three steps:

• Benefit-risk assessment, in which patients are assessed for risk of carrying mutations and potential benefits from genetic testing
• Genetic testing, in which qualified patients within an optimal risk bracket are given the appropriate tests
• Intervention, in which patients are given preventative care based on the results from the genetic tests.