OBJECTIVES: Regulators of medical technologies are facing increasing pressure to make their deliberations concerning the benefits and risks more transparent. Both benefits and risks are often measured via multiple competing outcomes. Hence, MCDA models like the Analytic Hierarchy/Network Process are valuable tools in quantifying decision trade-offs. The objective of this paper is to demonstrate the use of MCDA models for benefit-risk assessment and the use of sensitivity analysis to assess the impact of uncertainty and patient heterogeneity.

Unknown factors in MCDA models:

Structural uncertainty
- Uncertainty about the assumptions made in the design of an MCDA decision structure and the methods for elicitation of responses e.g. which attributes were taken and which decision objective.

Stochastic uncertainty
- Heterogeneity: uncertainty about the treatment preferences in subgroups of the population.
- Imprecision: parameter uncertainty, i.e. the uncertainty around the estimation of an individual parameter.
- Uncertainty “sensu stricto”: uncertainty about the decision makers’ knowledge and confidence about the subject matter.

Approach 1: Deterministic sensitivity analysis of the “impact of decision criteria” and “performance” by manually adjusting priorities

Base-case analysis
Sensitivity analysis on “treatment response”
Sensitivity analysis on drug performance on HRQoL

Approach 2 and 3: Probabilistic Sensitivity Analysis of (1) criteria weights and (2) criteria weights and performance of antidepressants

Probabilistic Sensitivity Analysis for criteria weights: Criteria weights (n=12 patients) were resampled using bootstrapping. Base case ORs on drug performance were obtained from the literature. Drug treatment preferences were calculated.

Probabilistic Sensitivity Analysis for criteria weights and drug performance: Criteria weights (n=12 patients) were resampled using bootstrapping. Drug performance was sampled from OR distributions for the three separate drugs.

Probabilistic Sensitivity Analysis for criteria weights excluding “relapse” and “HRQoL”: These were not given a preference weight because of insufficient data on drug performance. Criteria weights and drug performances were resampled using bootstrapping (see other cases)

CONCLUSION: Deterministic sensitivity analysis by manually adjusting criteria weights is a flexible and easy way to analyze the impact of uncertainty. PSA, however, is more the more rigorous approach incorporating distributions of both criteria weights and drug performances. This example demonstrates that the impact of drug performance uncertainty is larger than uncertainty in the criteria weights.

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