# Multi-criteria drug benefit-risk assessment
using network meta-analysis

Gert van Valkenhoef (1,2), Bert de Brock (2), Hans Hillege (1)

(1) University Medical Center Groningen, NL; (2) University of Groningen, NL

Purpose

Pharmaceutical decision making is based on assessing benefits and risks of alternative drugs, ideally by considering all available clinical evidence. In practice this is not achieved as the assessments are based on meta-analytical methods that allow only single criterion pair-wise comparisons. A more holistic and explicit approach is needed, and software should be developed to enable straight forward application of evidence-based decision models.
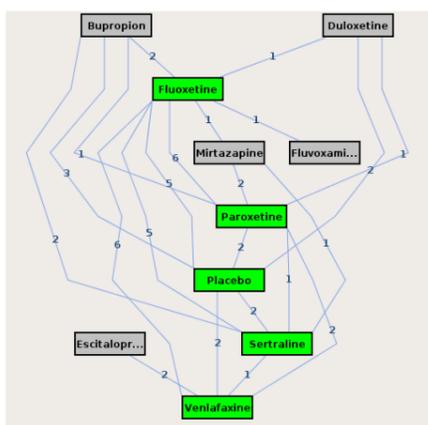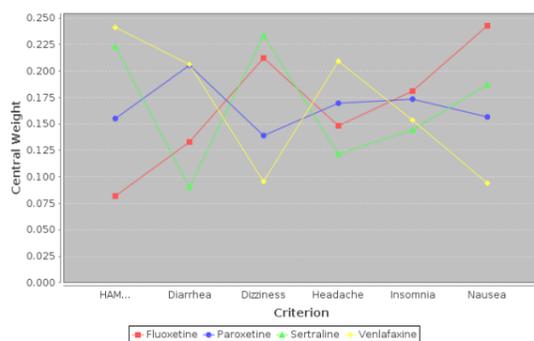
Network meta-analysis

Network meta-analysis enables indirect comparisons within a set of alternative treatments based on a collection of clinical trials. It estimates the difference in performance of any pair of alternatives, regardless of whether they were directly compared in a trial. It also allows to rank the performance of treatments, while quantifying the uncertainty.

MCDA/SMAA multi-criteria models

Multi Criteria Decision Analysis (MCDA) methods help structure and quantify decisions with multiple (possibly conflicting) objectives, and make trade-offs explicit. Stochastic Multi-criteria Acceptability Analysis (SMAA) is an MCDA method that allows uncertainty in the performance measurements and preferences can be fully or partially unspecified. Uncertainty in the decision recommendations is made explicit.

Methods and software

We developed methods for explicit benefit-risk analysis taking into account all available evidence. The models can be based on a single trial, using just SMAA[1], or on a network of trials using network meta-analysis together with SMAA[2].

The methods are supported by ADDIS, an open source system for evidence-based decision making[3].

Try it yourself!

drugis.org

[1] T. Tervonen, G. van Valkenhoef, E. Buskens, H.L. Hillege, D. Postmus, "A stochastic multi-criteria model for evidence-based decision making in drug benefit-risk analysis" (under revision).
[2] G. van Valkenhoef, T. Tervonen, J. Zhao, B. de Brock, H.L. Hillege, D. Postmus, "Multi-criteria benefit-risk assessment using network met-analysis" (manuscript).
[3] G. van Valkenhoef, T. Tervonen, T. Zwinkels, B. de Brock, H.L. Hillege, "ADDIS: a decision support system for evidence-based medicine" (submitted manuscript).