Multi-Criteria Decision Analysis

Experience and experiment
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Where do we start from

- Under the concept of a Multiple-Criteria Decision Aid (MCDA), the principal aim is not to discover a solution, but to construct or create something which is viewed as liable to help an actor taking part in a decision process either to shape, argue, and/or transform her/his preferences, or to make a decision in conformity with his/her goals.
- This assessment is challenging in the face of trade-offs between the multiple decision criteria
- Helpful when there is a need to combine ‘hard data’ with subjective preferences, to make tradeoffs between desired outcomes, and to involve multiple decision-makers
- Hence an MCDA requires a sociotechnical design, reflecting both the social (who participates, when and how) and technical (which MCDA methods, which software) decisions that need to be made when designing an MCDA
Therefore it helps 3 types of decision making

• Choice problems (identification of the best alternative).
• Ranking problems (identification of the rank ordering of alternatives from best to worst).
• Sorting problems (assignment of the alternatives to pre-defined ordered categories)

Methods

- Determination of alternatives
- Establishing the decision criteria
- Measurement of target achievement levels
- Scoring the target achievement levels
- Weighting of target criteria
- Aggregation of measurement results
Several uses of MCDA has been considered so far by HTA agencies

- Incorporate stakeholder preferences in comparative effectiveness research
- Weigh the multiple end points considered in the assessment of quality and efficiency in health care
- Prioritize investment in public health interventions
- Assess new health technologies
- Assess orphan drugs
- Support benefit/risk assessment

...And also in several areas of application

Real world examples of MCDA utilisation to support decisions

<table>
<thead>
<tr>
<th>Country</th>
<th>Example(s) of utilization</th>
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| England/UK  | I. Orphan drugs, AGNIS/NICE  
II. Respiratory, mental, children's health, cardiovascular, and cancer interventions, NHS/Primary Care Trusts  
III. Major capital expenditures, NHS  
| USA         | I. Diagnosis and treatment decisions  
ii. Clinical trial design  
iii. Interventions for chronic non-cancer pain  
| Canada      | I. Healthcare priority-setting  
ii. Budgeting  
| Germany     | Incorporation of patient involvement with MCDA quantitative approaches, IDWG  
| Sweden      | I. Orphan drug coverage, TVL  
ii. High-cost biologics, TVL  
| Denmark     | Orphan drug coverage  
Finland  
| The Netherlands | I. Orphan drug coverage  
ii. Publicly funded healthcare priority-setting  
iii. Ankle-foot repair in stroke  
| Italy       | Screenings  
| France      | Healthcare priority-setting  
| Norway      | Healthcare priority-setting  
| Hungary     | Hospital medical technologies, OEP  
| Scotland    | Orphan drug coverage, NHS  
| New Zealand | Algorithmic approach using 1000Minds software used to analyze coronary artery bypass graft surgery, MoH  
| South Africa| Private health plan used for liquid-based cytology for cervical cancer screening  
| South Africa| Healthcare priority-setting  
| South Africa| Health interventions in the universal health coverage benefit package, NHS  
| Israel      | New healthcare technologies, Health Basket Committee  

Drake et al Utilization of multiple-criteria decision analysis (MCDA) to support healthcare decision-making FIFARMA, 2016
A suggested framework for OMP’s

![Table 2 - Attribute weights (%) from two workshops.]

Sussex et al, A Pilot Study of Multicriteria Decision Analysis for Valuing Orphan Medicines

Rare disease inter-criteria comparisons in CEE countries

- Efficacy
- Safety
- Unmet need/innovation
- Patient preference
- Cost effectiveness
- Budgetary impact
- Disease status/political pressure
- Equity
The primary objective of the exercise is to showcase how different methodologies have different effects on the outcome of an MCDA analysis. In order to do this, the project has been divided into three sections, aligning with the steps necessary for decision making through an MCDA methodology.

1. Criteria definition and selection
2. Criteria weighing
3. Criteria scoring

These steps have been executed in such a way to represent the Japanese market access environment. Step 2 and 3 have been executed in a 3-hour workshop with students and industry representatives of the Tokyo University and pharmaceutical industry.

Criteria definition and selection

The criteria definition and selection has been done through an internal exercise, in which first an extensive list of criteria has been collected after which consensus was reached on all criteria deemed important enough to be included in the model.

Criteria weighing

In a workshop with 24 participants divided into 4 groups all selected criteria have been weighted by each group according to 2 different methods, ranking with point allocation and a pair wise testing approach. Different techniques and their computations were derived and used according to the current literature. Any differences between the 2 techniques and group difference were discussed afterwards.

Criteria scoring

Each group was handed a case study of a hypothetical drug launch in Japan. Each group had to assess this drug along the different criteria selected. Immediately afterwards outcomes were given in the tool and outcomes were discussed.
Some of the findings

01 Inclusion of MCDA criteria
Participants experienced that it is impossible to include all criteria potentially desired, since this would lead to overlap and double counting and would put unreasonable resources on the weighing exercise.

02 MCDA as a discussion aid
The MCDA exercise fostered a lot of discussion within groups and helped them reaching consensus, this is helpful when making complex decisions. This means that MCDA can certainly be an aid in complex decision making processes through consensus building.

03 MCDA as a communication tool
Participants, saw the possibilities of using it as a communication tool by making public health choices more transparent.

Issues

- Most studies evaluate the MCDA as having a positive contribution in bridging the HTA with decisions from various stakeholders.
- Even though many studies consider patient/individual-centered values as relevant, only 40.0% of the studies included patients in the decision making process.
- Participation of patients or their representatives in HTA should be further encouraged.
- Also, for MCDA to be feasible in a real-world treatment setting, selecting proper stakeholders’ who can consider the relevant criteria and guarantee their incorporation into the overall decision framework will be essential.

Kim et al, MCDA in Health Technology Assessment: Review of Literature on MCDA Methodology and Decision Criteria
Issues

• Who should be involved (7P’s, payer, patient, physician, pharma, politician, pharmacist, general public)
• Whose preferences are relevant enough to be elicited?
• How could different preferences be taken into account?
• What MCDA model should be selected?

Methodological challenges

1. Double-counting: Studies that used the EVIDEM framework identified that costs and health effects were double counted because they were also included in cost effectiveness.
2. Challenges with scoring: (1) Raters have different levels of understanding of the data and interpret scales differently, and (2) the complexity of scoring scales varies with the number of points on the scale.
3. Appropriateness: The appropriate weighting technique must be determined, as well as the circumstances under which a specific technique should be used.
4. Quantifying the impact of uncertainty: Many studies did not assess the impact of uncertainty.

Opinions differ - Industry

- By structuring the process of selection and evaluation of alternatives, MCDA quantifies evidence to identify best alternatives and helps eliminate contradictions between stakeholders.
- MCDA can help sharpen signals to manufacturers in advance, to focus on providing data that matter most to decision-makers.
- By taking into account and measuring criteria other than cost-effectiveness or budget impact, as for example equity in patient access and local health system priorities, MCDA ensures that social preferences, epidemiological priorities, and ethical values are not neglected in the decision-making process.

Drake et al, Utilization of multiple-criteria decision analysis (MCDA) to support healthcare decision-making, RIFARMA, 2016

Opinions differ - Payer

“Some stakeholders, notably patient groups, often think a particular SMC decision is wrong, but this is exclusively when the decision is not to recommend the therapy concerned. Would they be less unhappy if the “no” resulted from a more explicit MCDA approach? It seems unlikely.”

Andrew Walker, Challenges in Using MCDA for Reimbursement Decisions on New Medicines
Guiding principles to improve value assessment frameworks

1. should define and use inclusive and transparent stakeholder engagement processes
2. should explicitly define their priorities and intended purpose(s)
3. Should include patient perspective
4. Should have a holistic systemwide scope of work that seek to evaluate a range of interventions
5. Should be grounded in established methods
6. Should capture and apply the full range of evidence
7. Should address longer term outcomes
8. Should measure and assess relevant costs and cost effectiveness
9. Should be able to adapt to shifts in science, evidence values and health care system more broadly
10. Should be developed with feasible implementation strategies reflecting practical opportunities to improve value-based care

Sorenson et al Advancing Value Assessment in the United States: A Multistakeholder Perspective
1) Set the aim of the final decision,
2) Set and define evaluation criteria,
3) Set the relative importance of each criterion (i.e., weighting)
4) derive the overall score

- Prioritization of interventions for coverage or reimbursement (investment).
- Selection of intervention (prescription).
- Assessment for licensing (authorization).
- Allocation of research funds (research interest and funding).