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

Fugiera J et al, MCDA state of the art surveys

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

Areas of Application
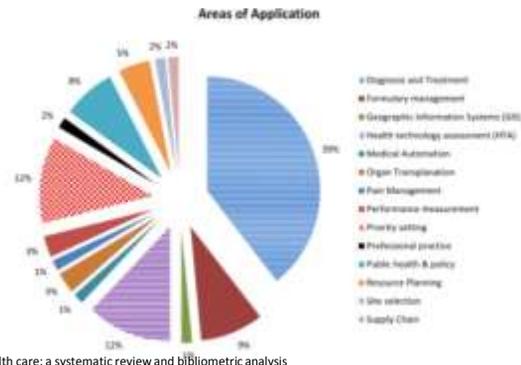
Adunlin et al, Application of multicriteria decision analysis in health care: a systematic review and bibliometric analysis

Real world examples of MCDA utilisation to support decisions

Country	Example(s) of utilization
England/UK	i. Orphan drugs, AGNSS/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
Canada	i. Healthcare priority-setting ii. Budgeting iii. Interventions for chronic non-cancer pain
Germany	Incorporation of patient involvement with MCDA quantitative approaches, IQWIG
Sweden	i. Orphan drug coverage, TLV ii. High-cost biologics, TLV
Denmark	Orphan drug coverage
Finland	Obesity research and prevention
The Netherlands	i. Orphan drug coverage ii. Publicly funded healthcare priority-setting iii. Ankle-foot repair in stroke
Italy	EVIDEM framework used with medical devices, diagnostic assessments, and pharmaceuticals
France	Screenings
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
Ghana	Healthcare priority-setting
Thailand	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.		
Attribute weights (%)	**Experts workshop**	**Patients workshop**
Availability of existing treatments	19.5	11
Disease survival prognosis with current soc	14	11.5
Disease morbidity and patient clinical disability with current soc	12	15
Social impact of disease on patients' and carers' daily lives with current soc	8	15
Subtotal weight for impact of disease/extent of unmet need	53.5	52.5
Treatment innovation: scientific advance + contribution to patient outcome	0	5
Evidence of treatment clinical efficacy and patient clinical outcome	27.5	17.5
Treatment safety	8	7.5
Social impact of treatment on patients' and carers' daily lives	11	17.5
Subtotal weight for impact of new medicine	46.5	47.5
Total	100	100

soc, current standard of care.

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

Physicians on all criteria for RD
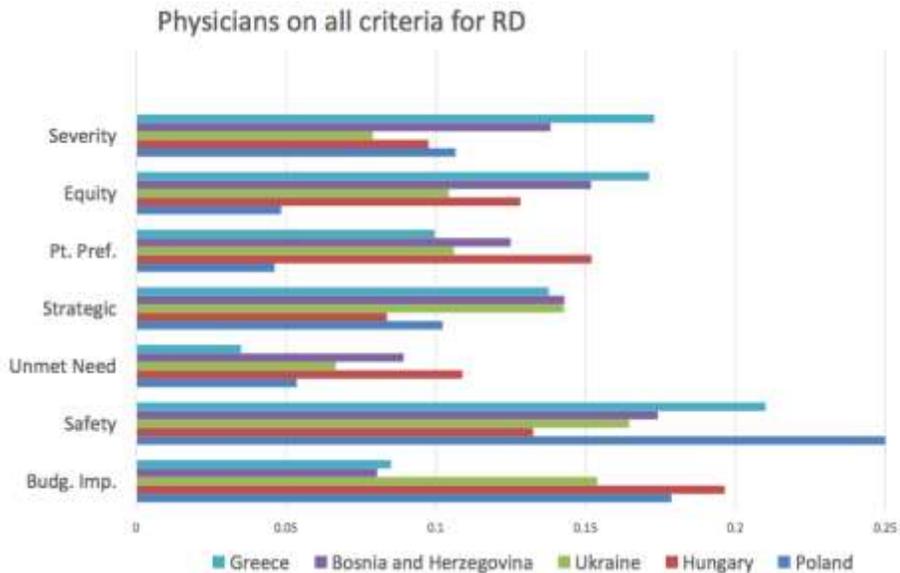
Zah 6th HTA international Symposium in Utokyo Evidence based decision making in Health care policy - MCDA,

MCDA workshop in Japan

On of the objectives 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 in 3 section, 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 in 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.1 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 stake- holders' 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?

Kaczynski and Muhlcbaher, Making Good Decisions in Healthcare with Multi-Criteria Decision Analysis: The Use, Current Research and Future Development of MCDA

Methodological challanges

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.

Marsh K, et al. Assessing the value of healthcare interventions using multi-criteria decision analysis: a review of the literature. PharmacoEconomics. 2014;32(4):345–65.

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 stake- holders.
- 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 exam- ple equity in patient access and local health system priorities, MCDA ensures that social preferences, epide- miological 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 FIFARMA, 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).

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