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Making MCDA 'Shiny' With an Adaptive Support Tool for Healthcare Decision-Making: An Application in Broad Molecular Testing With R Shiny

HTA40

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Abbreviations. MCDA: Multiple-criteria decision analysis; SoC: Standard of Care; WGS: Whole genome sequencing

Introduction

Reimbursement decisions about innovative, incrementally-developing medical technologies are notoriously challenging. These technologies commonly have **limited** and **rapidly evolving evidence**, an **uncertain position** in the care pathway[1], and may impact criteria beyond clinical-, and cost-effectiveness.

Multiple-criteria decision analysis (**MCDA**) helps evaluate these often conflicting criteria. However, its use in current appraisal processes is scarce and needs more transparency[2].

Aim: to develop an adaptive decision support tool that facilitates the use of MCDA in the decision-making process.

Application: Broad molecular testing in oncology in the Netherlands. When can the narrow panel testing (SoC) be better replaced by a broad testing method?

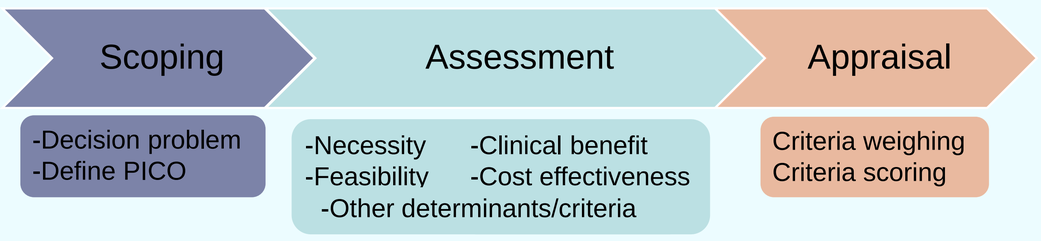
Methods

Software: R studio

Main packages: Shiny, shinydashboard, MCDA, ggplot2, dplyr

Audience: Framework of the Dutch Healthcare Institute

Intended users: Analysts (Scoping, Assessment) and Decision-makers (Appraisal).



Additional criteria: Feasibility, implications of diagnostic results, organization of laboratories, patient journey, and scientific spillover[3]

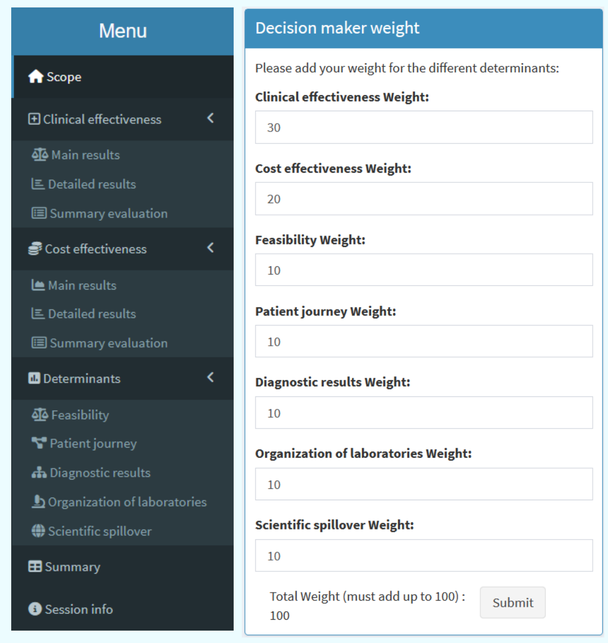
The tool will include:

1) Data set template for users upload their own datasets.
2) Set of defined functions for different MCDA and data visualization techniques.
3) Code template with R markdown to implement the functions based on the analyst needs.
4) Web-browser interface that stores the scoring and weighing of the decision-maker.

Results

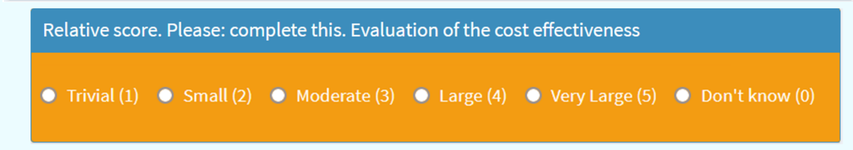
With the web-browser app, decision-makers can weigh and score the decision criteria. The figure (right) shows a possible weight appraisal.

Analyst can upload their data so that decision-makers can navigate all available evidence. For our application, we show cost-effectiveness results[4] (Figure below) and the scoring board in orange.

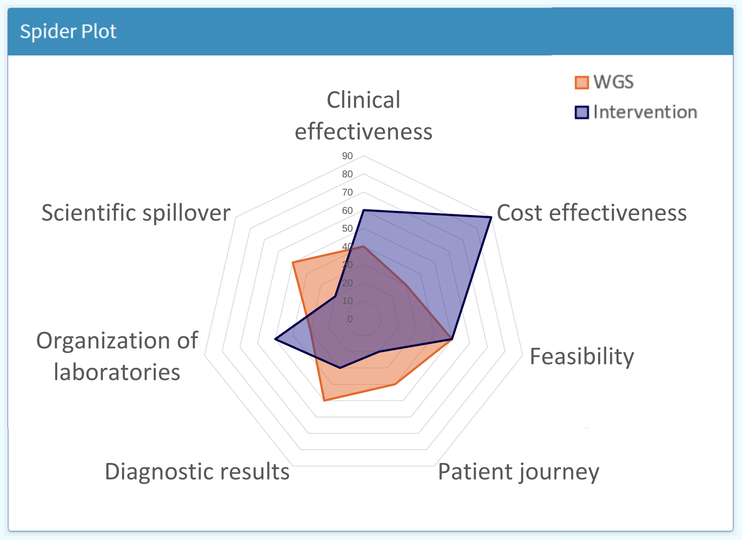


Summary of main results

Strategy	LYs	QALYs	Total costs	vs	ΔQALYs	ΔCosts	ICER	iNMB
SoC	1.878	1.234	149,703€					
SoC followed by WGS	1.878	1.232	150,777€	vs SoC	-0.002	1,059€	Dominated	-1194
WGS	1.882	1.236	151,237€	vs SoC	0.002	1,534€	657,572	-1349



The tool will include different ways to show the appraisal results. For our application, we show the results of the appraisal in a spider web (Figure below). The score and the weight of each determinant was multiplied (weight × score) to compare the interventions.



Conclusion

The R Shiny MCDA tool facilitates **systematic synthesis** and **transparent communication** of information and **preferences** from different stakeholders; while fostering evidence-informed decision-making. The tool is intended to be user-friendly for both analysts and decision-makers. The systematic approach for including additional determinants besides health benefits and costs is an **innovative** approach to decision-making in broad molecular testing.

References

(1) Bouttell, J., Briggs, A., & Hawkins, N. (2021). A toolkit of methods of development-focused health technology assessment. International Journal of Technology Assessment in Health Care, 37(1), E84. doi:10.1017/S0266462321000507

(2) Gongora-Salazar P, Rocks S, Fahr P, Rivero-Arias O, Tsiachristas A. The Use of Multicriteria Decision Analysis to Support Decision Making in Healthcare: An Updated Systematic Literature Review. Value Health. 2023 May;26(5):780-790. doi: 10.1016/j.jval.2022.11.007. Epub 2022 Nov 25. PMID: 36436791.

(3) LF van Schaik, E.E., EA Wilthagen, WH van Harten, Valesca Retèl, [Unpublished] The identification of determinants influencing the choice for narrow or broad molecular diagnostics, a scoping review

(4) Simons MJHG, Retèl VP, Ramaekers BLT, Butter R, Mankor JM, Paats MS, Aerts JGJV, Mfumbilwa ZA, Roepman P, Coupé VMH, Uyl-de Groot CA, van Harten WH, Joore MA. Early Cost Effectiveness of Whole-Genome Sequencing as a Clinical Diagnostic Test for Patients with Inoperable Stage IIIB,C/IV Non-squamous Non-small-Cell Lung Cancer. Pharmacoeconomics. 2021 Dec;39(12):1429-1442. doi: 10.1007/s40273-021-01073-y.

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