

ABSTRACT

Multi-criteria decision analysis (MCDA) methods are well suited to serve as the basis for new clinical decision support systems to facilitate delivery of high quality health care. However, MCDA methods differ in ways that could affect their ease of implementation into practice. The extent to which it is necessary to sacrifice ease of use to ensure robust decision support when choosing a MCDA method for clinical decision support is currently unknown.

We conducted a five group, cross-sectional study comparing decisions made following use of a tabular balance sheet alone with decisions made after use of MCDA methods with varying levels of procedural simplicity and theoretical development: a repeat balance sheet (which served as a control), a decision dashboard, ordinal MCDA, TOPSIS, and the analytic hierarchy process (AHP). The study sample consisted of members of an Internet survey panel. The decision scenario was a hypothetical choice among four cardiovascular risk reduction options. Study outcomes included preferred option, confidence in choice, ease of use, values clarity, and decision-related uncertainty.

We found statistically significant differences among the MCDA methods with regard to changes decision confidence, preferred option, ease of use, and uncertainty. Rates of change in initially preferred option after MCDA use increased progressively as the intensity of decision support increased ($p < 0.001$). The AHP was associated with statistically higher decision confidence compared to the balance sheet and lower decisional uncertainty compared to the dashboard.

Conclusion: Increasing levels of complexity across the spectrum of MCDA methods used in this study were associated with more frequent changes in preferred option, suggesting choices that are more consistent with personal preferences, but was not associated with consistent decreases in usability. Of the methods studied, the AHP seems uniquely capable of providing both high levels of decision support and ease of use.

Keywords: Analytic Hierarchy Process, clinical decision support, medical decision making

1. Introduction

Clinical decision support systems based on MCDA methods are theoretically well suited to facilitate the provision of evidence-based, patient-centered care. However, the extent to which it is necessary to sacrifice the ease of use needed to facilitate implementation in busy practice settings to ensure robust decision support is currently unknown. The goal of this study was to address this question by comparing the outcomes of patient-level analyses done with a variety of MCDA methods with varying levels of procedural simplicity and theoretical development.

2. Literature Review

There is a small but growing literature demonstrating that MCDA can be used to support clinical decision making. [1, 2] However efforts to routinely implement patient-centered clinical decision support interventions have had disappointing results [3, 4] These findings have focused attention on the importance of ensuring that decision support methods are both trustworthy and easily implemented in busy practice settings.

3. Hypotheses/Objectives

We sought to determine if more complex MCDA methods harder to use than simpler ones. We hypothesized that there would be a negative correlation between ease of use and MCDA complexity.

4. Research Design/Methodology

We conducted a five group, cross-sectional study of members of an Internet survey panel comparing five multi-criteria methods with varying levels of complexity to evaluate four potential options for prevention of cardiovascular disease. Study participants made an initial choice of preferred option after reviewing a tabular summary the alternatives' outcomes with regard to five decision criteria and then a second choice after performing analyzing the decision using one of five MCDA methods: 1) a repeat decision using the same balance sheet (which served as a control), 2) a decision dashboard, 3) ordinal MCDA using MAGIQ, 4) TOPSIS, and 5) the analytic hierarchy process (AHP). Study outcomes included preferred option, confidence in choice, values clarity, decisional uncertainty, and ease of performing the MCDA.

5. Data/Model Analysis

There was a progressively higher frequency of change in preferred option as the level of MCDA decision support increased, $p < 0.001$. There was no difference among methods with regard to ease of use.

6. Limitations

Study limitations include the use of a relatively simple and the limited number of MCDA methods studied.

7. Conclusions

Despite these limitations, our findings demonstrate that there is not necessarily a relationship between ease of use and the quality of decision support provided by MCDA. The AHP, which we considered the most complex method, was rated second highest in terms of ease of use suggesting that it may be exceptionally well suited to serve as the basis for patient-oriented clinical decision support systems.

8. Key References

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