Development of a Multi Criteria Decision Analysis (MCDA) Tool for Medical Devices National Procurement in Egypt

Ahmad Fasseeh[1,2], Baher Elezbawy[1], Nourhan Ibrahim[3], Mary Kirollos[4], Mariam Eldebeiky[4], Amal Sedrak[4], Randa Eldessouki[5], Miriam Boles[6], Marwa El Agouz[6], Sherif Abaza[7], Zoltán Kaló[8,9]

1. *Syreon Middle East, Alexandria, Egypt*
2. *Eötvös Loránd University, Budapest, Hungary*
3. *Barcelona School of Management, Cairo Egypt*
4. *Unified Procurement Authority, Cairo, Egypt*
5. *Fayoum University, Cairo, Egypt*
6. *Ministry of Health, Cairo, Egypt*
7. *Syreon Middle East, Cairo, Egypt*
8. *Semmelweis University, Budapest, Hungary*
9. *Syreon Research Institute, Budapest, Hungary*

INTRODUCTION

There are usually several alternatives to choose from when procuring medical devices. However, there is a lack of methodological support for assessing and evaluating them. Multi-criteria decision analysis (MCDA) may assist decisionmakers to evaluate the true value of the proposed alternatives. The aim of this study is to develop an MCDA tool for purchasing medical devices by the Unified Procurement Authority (UPA) in Egypt.

METHODS

A systematic literature review was conducted to identify the criteria used in assessing medical devices. A preliminary list of potentially relevant criteria was created. This was followed by an expert interview to refine and group the criteria. Finally, a 2-day workshop involving local experts representing different stakeholders was held to create the tool. Participants voted for ranks, scoring functions and weights for each criterion.

RESULTS

Systematic literature review

PubMed, Scopus and grey literature were searched identifying 378 records. After removing duplicates and screening, 46 studies were included for analysis.

Criteria

The identified criteria were categorized to facilitate the analysis and avoid the redundancy. Nine criteria domains were created. Each domain was subcategorized into topics providing a total of 25 topics. Costs (purchasing price) was the most common domain in the identified medical devices MCDA tools, followed by technical characteristics of the device.

Expert Interview

After discussion with an expert, the criteria extracted were refined to reach ten non-price criteria. Price was not included in the tool, as in Egypt, the pricing committee is independent from the technical committee and comparators are assessed for their price in a separate phase.

Workshop

During the workshop, participants agreed on removing two of the proposed criteria and adding a new one to finally reach nine non-price criteria.

Ranking & Weighing

Criteria were ranked from the most important to the least important according to the experts' anonymous votes. The average weight was calculated based on the aggregated votes using the SMART and Swing weighting method. The final ranks and weights are presented in table 1.

Table 1 : Ranks and weights of the final criteria

Rank	Criteria	Weights
1	Technical characteristics of the medical device	33.0%
2	Use in reference countries*	17.8%
3	Supply reliability	11.3%
4	Country of origin	9.0%
5	Previous use in tenders (for the product)	7.4%
6	Pharmacovigilance system	7.3%
7	Instant replacement within product variety	5.1%
8	Training	4.7%
9	Refund/ replacement	4.2%

* Reference countries are a group of countries defined by the Egyptian Ministry of Health.

Scoring

Each criterion had a score from 0 to 100% depending the device achievement of the criteria requirements. Participants agreed on excluding products that come from companies which have no pharmacovigilance system, products that fulfill less than 70% of the technical specifications requirements and products which have more than 10 supply related issues in the previous 3 years. The final score of each criteria is presented in table 2.

Table 2 : Scoring of criteria

Criteria name	Possible scoring elements	Score (%)
Technical characteristics of the medical device	Fulfils 100% of the technical specifications required	100%
	Fulfils 90%-<100% of the technical specifications required	80%
	Fulfils 80%-<90% of the technical specifications required	60%
	Fulfils 70%-<80% of the technical specifications required	10%
	Fulfils <70% of the technical specifications required	Exclusion
Use in reference countries	CFG certificate from FDA	100%
	Canadian free sale certificate + ((medical device active license + MDSAP certificate) or medical device establishment license)	80%
	European CE certificate + free sale certificate from a reference country	75%
	European CE certificate only (for local products only)	50%
Supply reliability	No previous supply related issues in the previous 3 years	100%
	Less than 5 supply related issues in the previous 3 years	80%
	5-10 supply related issues in the previous 3 years	55%
	Did not supply previously	40%
	More than 10 supply related issues in the previous 3 year	Exclusion
Country of origin	Reference countries for both legal and actual manufacturer	100%
	Reference country of the legal manufacturer or actual manufacturer	80%
	Local product	60%
	Non reference countries for both	40%
Previous use in tenders	Used in 5 or more governmental tenders in the previous 5 years	100%
	Used in 4 previous governmental tenders in the previous 5 years	90%
	Used in 3 previous governmental tenders in the previous 5 years	75%
	Used in 2 previous governmental tenders in the previous 5 years	65%
	More than 5 Purchase orders from governmental institutions	50%
	Used previously in non-governmental tenders	30%
Pharmacovigilance	Supplier has an efficient pharmacovigilance system	100%
	Supplier has a moderate quality pharmacovigilance system	70%
	Supplier has a low-quality pharmacovigilance system	20%
	No pharmacovigilance system	Exclusion
Instant replacement within product variety	Supplier provides instant replacement within product variety (During surgery on shelf stock)	100%
	Supplier does not provide product replacement for different sizes/ types	15%
Training	The supplier provides training for the staff/patients for the product	100%
	The supplier does not offer training for the product	10%
Refund or Replacement	The supplier provides refund or replacement of its products	100%
	The supplier does not offer refund or replacement of its products	10%

Testing the tool

A hypothetical test case for different devices was tried to assess the tool for any needed amendments. Participants also tested the tool on some real cases of devices which revealed the possibility of some minor changes to the weighing and ranking in the future . Experts agreed on conducting a pilot phase. The MCDA tool will be used in parallel with the current tendering tool to examine the need for any further modifications.

CONCLUSION

The development of an MCDA tool enables the comparison of medical device alternatives in an objective way. The developed MCDA tool puts the highest emphasis on the technical characteristics of the medical device, and considerable weight on its use in reference countries, supply reliability and its country of origin.