

# How to Prioritize Pathologies to Integrate a Value-Based Healthcare Program?

## The Collaborative Value Modelling Approach

Beatriz Lopes

Integrated master's in biomedical engineering, Instituto Superior Técnico (IST), Lisbon, Portugal

**ABSTRACT:** Well defined criteria are critical for making complex decisions such as those to prioritize pathologies to be covered by a Value-Based Healthcare (VBH) program. Nevertheless, a review of the literature shows that criteria selection under this context has not received significant attention. Moreover, the VBH healthcare delivery system is a multi-stakeholder system, where there is the need to consider perspectives and values coming from not only providers' organizations, but also those outside the organizations. José de Mello Saúde (JMS) led the case study, where we aimed to involve and support a potentially large and diverse number of VBH stakeholders from the Portuguese healthcare market to assess the relevancy of a set of criteria for this decision context. In order to achieve this involvement, this work implements the Collaborative Value Modelling (CVM) framework that enhances multicriteria Decision Conferencing (DC) with an ex-ante Web-Delphi participatory process. Stakeholder groups included in the study were healthcare professionals- including doctors, nurses and technicians-, health technology industry, patient associations, hospital managers and administrators, insurance companies, clinical information managers and academics and research. Once concluded the Delphi process, a total of 18 aspects (64%) reached group agreement, one aspect (4%) was rejected, and the remaining 9 aspects (32%) did not reach agreement. Finally, an expert validated the results obtained and narrowed down the list so that a requisite number of criteria can differentiate the VBH pathologies, giving rise to a value tree of 14 criteria.

**KEYWORDS:** Value-Based Healthcare; Prioritization; Pathologies; Stakeholders; Alignment; CVM; Delphi process; Decision conference

## 1. INTRODUCTION

### 1.1 CONTEXT AND MOTIVATION

Apart from the ageing population and increasing incidence of chronic disease, rising demand for healthcare is exacerbated by high levels of clinical waste and unexplained variance in treatment and outcomes. In 2006, Michael Porter and Elizabeth Teisberg first introduced the term Value-Based Healthcare (VBH) in their book *Redefining Health Care*. VBH principles are the foundation for a delivery framework to improve health outcomes at a lower cost, suggesting healthcare to be organized around patients' medical conditions and full care cycles, using measurements of medical outcomes as the base for improving care [1]. Moving to a VBH system means the adoption of a new healthcare delivery model, which should be based on well-defined strategies. In such a complex environment like the healthcare system, many stakeholders are directly or indirectly affected by the adoption of a new model. In such an environment of conflicting perspectives and

objectives, using structured approaches to aid decisions involving multiple criteria can improve the quality of decision making. For this purpose, a set of techniques, known under the collective heading Multiple Criteria Decision Analysis (MCDA), should be considered as a way forward. Additionally, ensuring the participation of a variety of stakeholders by the application of participatory processes enhances the consistency, transparency, and legitimacy of the output decisions. Within such a broader participatory process, the CVM framework [2] come into sight as a tool to build widely informed multicriteria evaluation models in complex evaluation contexts.

### 1.2 JOSÉ DE MELLO SAÚDE CASE-STUDY

José de Mello Saúde (JMS) is a group of healthcare provision founded in 1945. JMS launched the VBH program in 2015, presenting it as one of the group differentiating clinical projects [3]. During its first phase, the program was designed in collaboration with the International Consortium for Health Outcomes Measurement

(ICHOM) and identified 13 medical conditions with high potential to be integrated in the VBH program over the next three to five years. However, the group have now identified the need of developing a standardized implementation approach for VBH model, one that includes a tool to prioritize pathologies to be included in VBH model within their hospitals. There is currently no literature regarding relevant evaluation aspects that one should follow during this prioritizing- JMS has conducted a previous study [4] which aimed to construct a multicriteria model to prioritize pathologies, but the group found it necessary to develop a more inclusive approach in the evaluation selection process.

### **1.3 OBJECTIVES AND METHODOLOGY**

The overall objective of this work is to involve and support healthcare stakeholders to identify a set of evaluation aspects that will later allow to build a requisite multicriteria model to guide a prioritization process of pathologies to be covered by a VBH plan in a hospital context. In order to accomplish the overall objective, five specific objectives were set: 1) identification and selection of the stakeholders that have an essential role in the healthcare context in Portugal; 2) generation of an initial list of aspects (and respective descriptions), by performing a literature review and by consulting with a restrict group of experts; 3) design and implementation of a participatory process to complement the initial list of aspects and to collect the views and perspectives of a large number of participants (the stakeholders identified in objective 1) regarding their relevance; 4) evaluation of the set of proprieties (e.g. completeness, comprehensiveness, redundancy) of the previously generated list of aspects, narrowing down the list of aspects so that a requisite number of criteria can differentiate the VBH pathologies; 5) design and implementation of a DC process with a strategic group of experts to validate 4) and conclude model structuring.

## **2.METHODOLOGICAL APPROACH**

### **2.1 PROCESS DESIGN**

The first phase of the CVM framework is the process design. At this phase, the environment components for the remaining components will be set up. Specifically, it will be performed a characterization of the decision context [5] and a clear definition of the evaluation problem at scope [2]. Once the evaluation problem is clearly defined, the second phase of the process design of the

proposed methodology is the identification and selection of both the enlarged number of stakeholders that participate in the Web-Delphi phase, and the small group of key-players that will take part of the DC phase [2]. In a first instance, the facilitation team should identify the stakeholder groups to be included in the study. Later one, the individual participants of both de Web-Delphi and the decision conference should be identified. Finally, the last phase of the process design phase is the definition of a facilitation team. This team is formed by a set of specialists in decision analysis which works as process consultants [6] "guiding the group through the phases of discussing the issues" ([7], pp.1). At this phase, it will be defined a facilitation team responsible for assist and guiding the whole process, with the proper expertise giving the context and purpose of this study.

### **2.2 WEB-DELPHI**

The model structuring step in a MCDA approach involves the structuring of a value tree that identifies and represents the key evaluation criteria of the decision-maker. In this master thesis the identification of these criteria is performed following the CVM framework, which involves the conduction of a widely participated Web-Delphi that allows for an enlarged and multi-disciplinary decision-maker. The Delphi process conducted in this study has both the overall objective of ensuring that the aspects fulfil some required properties and requirements and also the creation of alignment between stakeholders. Hence, one can divide the overall objectives of the process as follows: technical objectives of ensuring the fulfilment of the technical properties of the aspects that make them suitable criteria for integration in a multicriteria model; and the social objectives of creating alignment between the involved stakeholders, promoting learning and convergence between them and around the structuring activity.

The conduction of the Delphi survey was in a web-based platform designed to implement and monitor the participatory processes. This option highly facilitates the process, as face-to-face participatory methods are usually expensive and time-consuming. Moreover, a web-based method allows experts to answer according to their own time and availability. Hence, the decision support system that will implement the Delphi process is the WELPHI platform (<http://www.welphi.com/>), which will be established for implementing and monitoring the web-based participatory process. In order to avoid high drop-out rates and considering that this Delphi process does not aim

to reach consensus, the total number of three rounds is defined at the beginning of the process: a first, open-ended round, and two following closed-ended rounds. The first round is a divergent and open-ended round that will allow the participants to freely share their knowledge and perspectives, leading to the collection of a wide range of distinct values and perspectives and ensuring the completeness of the list of aspects. Then, two close-ended, convergent rounds take place. These rounds assist the process of ensuring some other necessary technical properties- besides the completeness evaluated in the first round- that the aspects need to fulfil in order to become criteria suitable to integrate a multicriteria model. Specifically, these two rounds will allow to ensure that the aspects are complete, non-redundant, concise, specific, understandable and relevant for the decision problem at scope.

- Web-Delphi round one

The first step in a modelling structuring phase is to identify the aspects considered fundamental to evaluate options [8]. With this purpose, before the application of the Web-Delphi first round, a preliminary task is conducted to generate a list of aspects potentially relevant to be considered in the prioritization process of pathologies to integrate a VBH program, which will be the input of the first round. This generation phase must be done through a systematic literature review in combination with experts' consultation. Given this input, the first round of the Delphi intends to ensure that this list of proposed aspects is as inclusive as possible, and also to guarantee that both the aspects and their descriptions are correctly and rigorously defined.

The first round assumes an explorative, open-ended format, aiming to collect the views and opinions of the participants. Once finished, an aggregation and refinement approach should be performed, ideally by a team of researchers in order to avoid biases resulting from individual judgement. The facilitation team performs this step- whose main tasks are outlined in Figure 1- and the output should be a new list of suitable and clear aspects, each one associated with a straightforward description, that will be the input for the two following Delphi rounds.

- Web-Delphi round two

In the second round, the role of the panel is to review the previously considered list of aspects- plus the suggestions given by participants in the

first round- and state the level of agreement concerning how relevant each aspect would be for

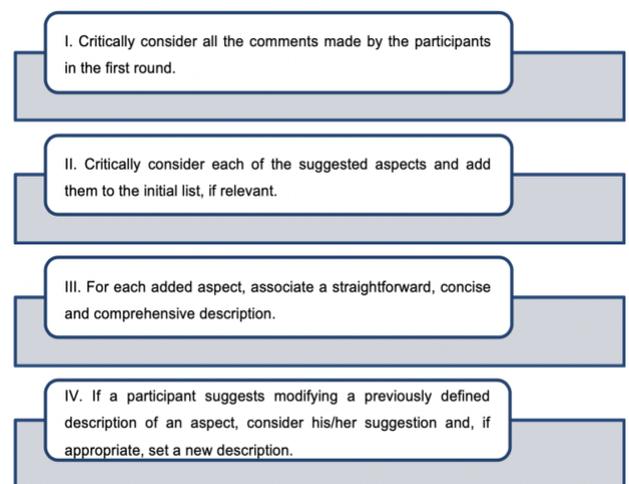


Figure 1: Post- first round analysis flowchart

evaluating different pathologies to integrate a VBH program. This second Delphi round follows a closed-ended response format, where participants express their agreement, or disagreement, with the presented aspects by means of a 6-level Likert scale.

- Web-Delphi round three

In the third and last round, participants will be faced with the same list of aspects of the previous round and will be invited to either keep or change their answers, at the light of the provided group information. This round aims to create alignment between stakeholders, promoting learning and convergence between them, and is important to evaluate the stability of the answers provided by the participants.

At the end of the second round, statistical summaries of the answers should be the core of the feedback provided to the participants at the beginning of the third round. Additionally, complementing this quantitative feedback, in the third-round participants also have access to the full panoply of comments provided by the participants in the second round.

Once finished the Delphi process, a final structuring step is performed with two main objectives: 1) set the final list of criteria by following aspect approval/rejection rules based on the final statistical summary; 2) guarantee that all the aspects obey to a set of structural properties and requirements Once these properties are assured, the aspects may be called criteria and may be included in the structure of a multicriteria model. In

this study, the level of agreement could be either for approval or rejection. The flowchart in Figure 2 illustrates the adopted approval and rejection rules of an aspect. Additionally, the flowchart presented in Figure 3 is a useful guide for the post-assessment step.

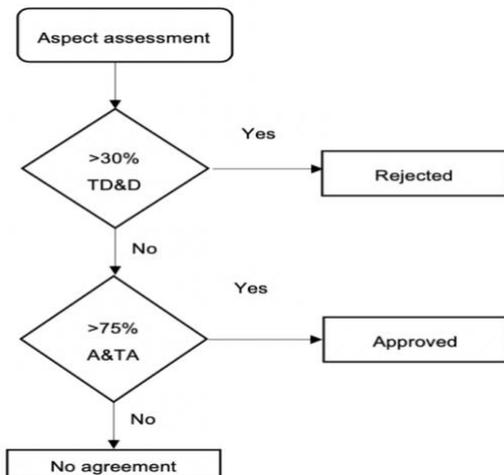


Figure 2: Flowchart of the decision rules adopted for aspect approval and rejection. Adapted from: Freitas et al., 2018. TD: Totally disagree; D: disagree; A: Agree; TA: Totally agree; NAND: Neither agree nor disagree.

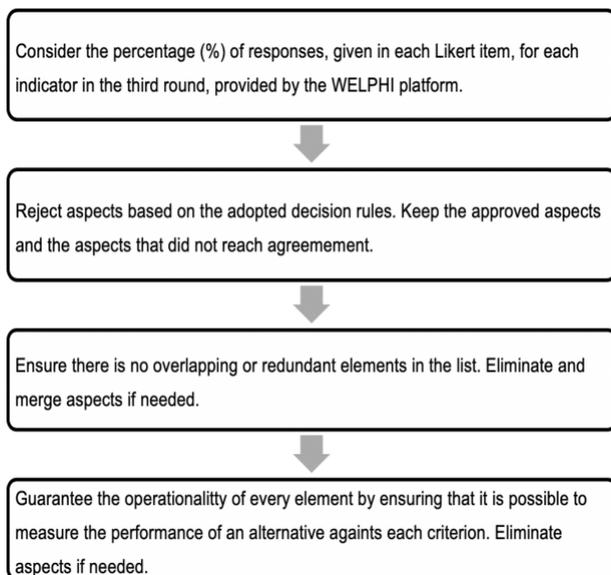


Figure 3: Web-Delphi post-assessment steps

### 2.3 MULTICRITERIA DECISION CONFERENCING

In the CVM framework, the knowledge acquired in the Delphi process is then digested by a small group of key-players in a DC process. The final DC should have a representative from each stakeholder group that have participated in the previous Delphi process and will includes six main steps: summary of the work done; presenting the Delphi process main results; voting on the aspects that did not reach an agreement in the prior Web-

Delphi process; validate the previously undertaken decisions, namely the refinement and structuring steps analysis actions that conducted to the elimination, refinement and/or merging of aspects; refinement of the value tree depending on the results of the previous undertaken voting; validate the results and ascertain its relevancy; and create a sense of commitment to the way forward.

## 3. APPLICATION OF THE METHODOLOGY

### 3.1 PROCESS DESIGN

Gathering a variety of interests and knowledge from a variety of stakeholders is a crucial step in this work. The drawing up of the list of stakeholder groups to be involved in the following phases was based on two main activities:

1. Construction of a visual representation of a VBH implementation model, generalized to any hospital. This representation provided an appealing and organized tool for mapping the involved stakeholders; Stakeholder mapping technique [9] was used as it highly facilitates the identification process, since the visualization of the delivery model path enhances the identification all the relevant stakeholders that may have a role in it.
2. Brainstorming sessions and one-on-one interviews with JMS experts with large experience in the healthcare market and VBH implementation strategies.

This process ended-up with nine groups of stakeholders identified as having an essential role in the decision-making process: Healthcare professionals (Including doctors, nurses and technicians); Policymakers; Health technology industry; Patient associations; Hospital managers and administrators; Insurance companies; Clinical information managers; Academics and researchers; Health law experts. Once defined the stakeholder groups that should participate in the subsequent technical-social steps, a list of individuals was set up, covering all the predefined groups of stakeholders, most of them with more than one representative.

In order to support the process, a facilitation team was established. This team was composed by two members with expertise in decision analysis and two members with expertise in biomedical engineer; furthermore, one of the members of this team was the project manager of the VBH project in JMS group, allowing to get into the team the necessary knowledge and experience in the healthcare market in general and in the VBH

implementation strategies in particular. The facilitation team was in charge of supporting the whole process- including the technical support of the three Web-Delphi rounds and the final multicriteria DC- and was also responsible for carrying out the decision analysis process between rounds and for aggregating and structuring data before the decision conference step.

### 3.2 Web Delphi

The Web-Delphi process took place between 31<sup>st</sup> July 2019 and 7<sup>th</sup> October 2019. At the beginning of each round, experts were personally contacted by means of an e-mail- written in Portuguese, in order to avoid misunderstandings- directly sent from the WELPHI platform itself. Besides stating the objectives of the round, the e-mails also contained the link that redirected the user to the corresponding survey.

- Web-Delphi round one

The facilitation team decided to define a proposed list of evaluation aspects to share with participants in order to avoid an exhaustive post-survey analysis process. From this research, one concluded that almost no literature regarding prioritization of pathologies to be covered by a VBH plan is available to date, particularly on the criteria that should be followed in the prioritization process. According to our findings, a single study [4] was conducted with this purpose. Hence, given the very poor literature within the problem at hands, the generation of the proposed decision aspects was based on two primary sources: consultation of the only study with a similar purpose [4]; consultation of a restrict group of experts with experience in VBH implementation strategies, through brainstorming sessions and interviews.

A total of 17 evaluation aspects were proposed: 7 adopted from Rodrigues [4] work, and the remaining ones generated from experts consulting. These aspects were: National prevalence of the pathology, Prevalence of the pathology in the hospital, Burden of the pathology, Clinical complications associated with the pathology, Readmissions of patients with the medical condition after treatment, Availability of ICHOM standard set for the pathology, Lack of Solid Clinical Guidelines for the pathology, Burden of PROMs instruments associated with the pathology, Burden of CROs instruments associated with the pathology, Clinical team commitment to the program, Availability of new technologies to gather evidence associated,

Human resources requirements, Information systems requirements. Once identified, the facilitation team set descriptions for each of the proposed aspects, allowing participants to understand them as clearly as possible.

The list of proposed aspects alongside with the corresponding descriptions was made available to the participants on the WELPHI platform, together with an open-ended space that allowed participants to freely add any aspects they think were missing in the list; Furthermore, an additional comment space for each aspect already on the list was also provided, allowing participants to insert free-text comments regarding each aspect or about the corresponding description. These features aimed to ensure that the list of proposed evaluation aspects was as inclusive as possible, and also intended to guarantee that both the aspects and their descriptions were correctly and rigorously defined.

In this first questionnaire, participants were faced with the following statement: “**Please consider the following list of potentially relevant aspects for prioritizing pathologies to integrate a VBH program in a hospital context:**”, which aimed to present the set of aspects proposed by the facilitation team. This statement was followed by the question: “**In your opinion, is (are) there any missing aspect(s) in this list?**”, which aim to encourage participants to add any other aspect(s) they think it was (were) missing from the proposed list. Furthermore, in this initial round, the experts were asked to insert some demographic data, namely: their field of studies, current occupation, and professional experience with VBH design or implementation strategies; finally, a personal opinion regarding VBH possible influence in the healthcare market dynamics was also asked to each individual participant.

A personalized invitation e-mail was sent to a total of 92 experts at the beginning of the first round. The e-mail was sent by the WELPHI platform itself on July 31, 2019, asking for answers until August 16, 2019, allowing participants to complete their answers according to their own availability. Additionally, personal communications were established a priori with a particular group of stakeholders. This approach is suggested by Belton et al. [10] to prevent panelists drop-out, and it was used with the particular insurer’s group as it is expected this group to have a low response rate without a personalized e-mail. In order to increase the number of responses, four reminder e-mails were sent on August 5<sup>th</sup>, 8<sup>th</sup>, 12<sup>th</sup> and 19<sup>th</sup>, and the deadline to answer this first e-mail was extended to August 21<sup>st</sup>, 2019. In this first round, a total of 28 answers were collected, and only the participants that have finished the whole survey

were considered.

The initial panel of 28 participants was perfectly balanced between male and female participants and they most occupied the age range between 40 and 59 years old. Concerning the field of studies, medicine was the most represented one, followed by economics and management, and the majority of the participants were healthcare professionals. Regarding the experience in VBH area, a relative balance is also observed, with 56% of the participants answering that they were previously involved in the design or implementation of VBH strategies. Regarding the influence participants attribute to this new approach in the Portuguese healthcare market dynamics, 46% think the model will have “some influence”, 32% “quite influence” and 18% “extreme influence”.

Once reached the final deadline, 17 new aspects were added. The aggregation of the answers given by the experts was done as carefully as possible and by the facilitating team. Answers that appeared to have no meaning for the purpose, or not sufficiently explicit, were not considered. The added aspects were the following ones: social burden of the pathology; diagnosis age of the pathology; percentage of patients that are considered working population; expected number of years the patient will live with the pathology; predicted health gains associated with the treatments of the pathology; resource preparation for the inclusion of the pathology in the VBH plan; degree of attribution of clinical outcomes to hospital care; variability of costs; national involvement capacity for comparative pathology data collection; outcomes variability; pathology complexity;

Additionally to the analysis of each aspect, at the end of the first round it was also performed the construction of a clear description for each aspect to be presented to the participants in the next rounds. Since it was not asked in the survey, the majority of the participants did not provide additional explanations for the aspects, and for the ones that provided, the explanation sometimes assumed the participants’ point of view. However, it was decided that the description of the aspects could not assume any perspective or position, and it should be as impartial as possible.

Besides new aspects suggestions, some participants also recommended some modifications to the definitions and/or descriptions of the provided aspects. In total there were counted one suggestion to modify the definition of a decision aspect, and three suggestions to modify aspects descriptions. After discussing the suggestions with an expert, all of them were considered appropriate and took into account.

- Web-Delphi rounds two and three

The second round took the form of a structured questionnaire that provided the participants the list of aspects resulted from the previous round, alongside with their descriptions. The list of aspects was preceded by the following statement: **“This aspect is relevant to prioritize pathologies to integrate a VBH program in a hospital context:”**. Then, for each aspect, participants had to select one of the six possible responses, according to the relevancy they attributed to each one. This assignment was based on an ordinal, Likert-like scale, suggested by Belton et al. (2019) as the most appropriate one. The adopted scale had five response categories: Strongly agree (SA) and Agree (A) indicating agreement; and Strongly disagree (SD) and Disagree (D) indicating disagreement, and an additional Neither agree nor disagree (NAND) option. Finally, a “Don’t know/ Don’t want to answer” option was also available.

The invitation e-mail was sent to the 95 participants by the WELPHI platform on September 6, 2019, asking for answers until September 16, 2019. In order to increase the number of responses, seven reminder e-mails were sent to participants that had not yet responded to the survey, and the deadline to answer the survey was extended to September 22th, 2019. Additionally, personal e-mails were sent to the participants in addition to the default reminder e-mail. Once reached the extended deadline, the second-round survey was closed with a total of 22 answers considered, representing approximately 24% of drop out from first to second round.

In the beginning of the third round, an invitation e-mail was sent to these 22 participants on September 22rd, 2019, asking for answers until September 30th, 2019. A statistic summary of the results of the second round was provided to the participants. The screen contained all the percentages of anonymous answers provided in the second round, summarized in a table, with participant own individual answers pre-selected in a dark-grey cell. Faced with this feedback, participants were invited to re-reflect on their options. After revising them, they could choose between either keeping previous round’s answers-concluding the round- or change them, based on the same response categories scale. Three reminders were sent, and the third round ended-up with 20 answers considered, representing a drop-out 9% regarding the previous round. Round-to-

round dropout rates decreased as the Delphi process progressed, as Table 1 illustrates.

Table 1: Web-Delphi participation and drop-out rates

	Round one	Round Two	Round Three
Total Invited	92	29	22
Total participants	29	22	20
% drop-out rate	70%	24%	9%

Regarding the participants of the third round, the majority of the 20 participants (65%) has experience in VBH design or implementation. Additionally, one also concluded that healthcare professionals' group (which includes doctors, nurses and technicians) was the most represented stakeholder group in the third round (with a total of eight participants), followed by insurance companies' members and academics/researchers, with three participants each.

It is also possible to analyze the evolution of responses by aspect from round two to round three. One can conclude that two aspects presented the biggest change of opinions between rounds: Complexity of the pathology and Percentage of patients considered active population. These changes were mostly towards an agreement: participants mainly change from Neither agree nor disagree or Disagree to Agree. Another useful information that one can retrieve once concluded the Web-Delphi is the comments per aspects. The Complexity of the pathology and the Diagnostic age of the pathology are the more commented aspects, each one with a total of four comments. These comments consisted mostly on a justification for the response, even though in the case of comments that regards the Diagnostic age of the pathology, some comments have also demonstrated the personal point of view.

#### • Web-Delphi summary report

Based on the presented values, the following conclusions can be drawn:

- I. A total of 18 aspects (64%) reached group agreement and were considered as relevant for the prioritization of pathologies to integrate a VBH program. As such, they proceeded to the structuring analysis that preceded the construction of the value tree. These aspects were: *National prevalence of the pathology, Prevalence of the pathology in the hospital, Burden of the pathology, Social burden of the pathology, Readmissions associated to the pathology, Clinical complications associated to the*

*pathology, Pathology complexity, Human resources requirements, Commitment of the clinical team involved in the cycle of treatments of the pathology, Human resources preparation for VBH implementation, Costs associated to the normal cycle of care of the pathology, Variability in costs associated with the cycle of treatments of the pathology, Degree of attribution of outcomes to clinical care, Degree of attribution of outcomes to clinical care, Burden of CROs Instruments associated with the pathology, Implementation and monitorization costs, Lack of solid clinical guidelines for the pathology, Health impact associated with the pathology treatments, Expected number of years the patient will live with the condition.*

- II. One aspect (4%) was rejected: *Availability of state-of-the-art technologies to gather evidence associated with the pathology.*
- III. The remaining nine aspects (32%) did not reach group agreement. These aspects were not eliminated as it was decided to rather re-evaluate them in the following DC. As such, similarly to the approved aspects, these aspects proceeded to the structuring analysis that preceded the construction of the value tree. These aspects were: *Diagnosis age of the pathology, Percentage of patients considered working population, National involvement capacity for comparative pathology data collection, Availability of ICHOM standard set for the pathology, Outcomes variability, Burden of PROMs Instruments associated with the pathology, Existence of risk-sharing agreements, Information systems requirements, Possibility to face legal barriers.*

Following the proposed methodology, the step further to the application of the approval/rejection rules is a deep analysis to guarantee the necessary requirements and properties of the aspects in order to be possible to become criteria suitable for application in a multicriteria model. This analysis also considered the points of view expressed in the comments provided by the participants.

At this phase, a total of nine modifications were performed:

- The aspect *Pathology complexity* was eliminated, as it was considered to exist redundancy with two other aspects: *Burden of PROMs instruments associated*

with the pathology and Burden of CROs instruments associated with the pathology.

These aspects were considered to concern the value measurements complexity associated with a pathology, which has strong relation with the number of cycles associated with the pathology.

- The aspect *Diagnosis age of the pathology* and *Percentage of patients considered working population* were considered to present redundancies with the aspect *Social burden of the pathology*. Indeed, it was considered by the facilitation team that these aspects intended to highlight the idea that some pathologies have more burden to the society than another, since they can possibly affect different age groups, which in turn have different impact on the overall economic growth of the country (in principle, older people are retired and do not contribute to the economic growth of the country). Since this impact is already considered in the *Social burden of the pathology*, these aspects were both eliminated.
- The aspect *Human resources requirements* was eliminated as it was considered to be a screening criterion. It was considered by the facilitation team that a VBH program was not approved whenever it was not available minimum human resources required.
- The aspect *Possibility to face legal barriers* was also eliminated. After some discussion, it was considered by the facilitation team that this criterion would be very difficult to predict and thus hardly measurable to be included in the model.
- The aspect *Lack of solid clinical guidelines for the pathology* was also eliminated. Taking into account a comment provided by a participant, the facilitation team considered that, indeed, without specific clinical guidelines a VBH program is hardly implementable. As such, this aspect could be considered an exclusion aspect: if one pathology does not have solid clinical guidelines, it should not be considered to be evaluated by this multicriteria model, and not selected for the implementation of a VBH plan.
- As *Possibility to face legal barriers*, the aspect *Health impact associated with the pathology treatment and National involvement capacity for comparative pathology data collection* were eliminated

from the final list as it is an aspect very difficult to predict.

- The aspect *Predicted number of years that the patient will live with the condition* was eliminated as it was considered to exist redundancy with the aspect *Burden of the pathology*. Indeed, for the calculation of DALYs, it is considered the number of years of life a person lives with disability caused by the disease (YLD)

The final DC should include a representative of each one of the stakeholder groups that have participated in the Web-Delphi process. However, due to the difficulty of combining the availability of several experts to arrange a meeting, it was not possible to schedule it on time.

Since one of the objectives of this DC was to decide about the aspects that did not reached agreement once concluded the Delphi process, this decision was up to one expert of the facilitation team with deep vision and experience on VBH strategies. The expert was interviewed and asked to decide about the inclusion of five aspects that both did not reached group agreement and have passed the previous analysis step: availability of ICHOM standard set for the pathology; outcomes variability; burden of PROMs instruments associated with the pathology; existence of risk-sharing agreements and information systems requirements. From these five aspects, the expert only considered the aspect Information system requirements as being fundamental at this stage, arguing that there is no way to analyze costs of the clinical pathway without the support of IT tools. As a result, a value tree with the selected criteria divided by areas of concern and clusters was created and is illustrated in Figure 4.

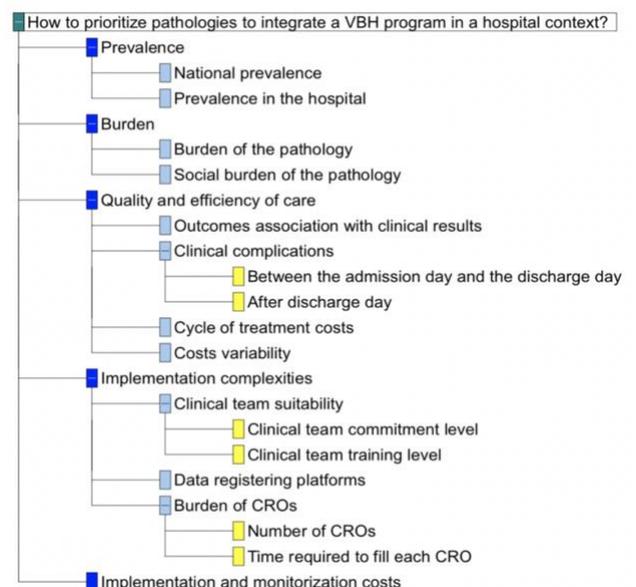


Figure 4: Value-tree constructed in the M-MACBETH software

## 4.DISCUSSION

- **The multidisciplinary of the participatory process**

One of the specific objectives of this master thesis was to involve a large and multidisciplinary set of stakeholders, to represent as accurately as possible the different visions and perspectives of the wide variety of stakeholders of the healthcare sector in Portugal. From the nine stakeholder groups identified, seven groups were represented in the whole Web-Delphi process. This is a very satisfactory and valuable result, since only two of the stakeholder groups were initially identified and invited to participate- health law experts and policy makers- were not represented in this study.

- **Level of agreement achieved and trends by stakeholder group**

Overall, 19 (68%) of 28 aspects reached an agreement- 18 for approval and one for rejection- by the end of the Delphi process, with 9 (32%) remaining with lack of agreement. Even though it was not a substantial majority that have reached agreement, this was not considered a drawback of the study, since the most important objective defined was to achieve a consistent group of final aspects, not necessarily a large one. We consider that it is more important to reach a set of requisite criteria that have reached a certain level of agreement among stakeholders than to reach an extensive list, also because the greater the extent of the set of final evaluation criteria, the greater the implementation complexity of the future model. Despite in this study it has not been possible, conducting a final DC is also an important and valuable step in order to accomplish the objective of achieving a set of requisite criteria.

One also verified that, even inside a specific stakeholder group, the opinions varied a lot between individuals. No pattern of response was found per aspect according to the stakeholder group, which may illustrate the considerable variety of opinion on this thematic even among people with similar interests. However, regardless the level of agreement achieve, it is worth to mention once again the responses of the participants regarding the influence that VBH delivery model can potentially have in the current healthcare market: 46% of the respondents answered that the model will have some influence, 32% answered that it will be quite influence, and

18% answered that the influence will be extreme. These results illustrated the importance that such a recent model already has to the healthcare stakeholders, reinforcing the need for more studies on this field.

- **Stakeholders opinion change**

it is important to analyze the variance of the opinions along the process. From round 2 to round 3, 21 from the 28 aspects (75%) had at least one participant changing his/her opinion. This revision of answers from round 2 to round 3 led to an increase in agreement percentages regarding the indicators approved. Additionally, there were three aspects that in round 2 did not reach an agreement, and in round 3, due to an increase in the percentage of 'Agree' and 'Totally Agree' answers, have reached agreement. However, we cannot find a very significant relationship between the number of comments and the degree of opinion change. Even though the aspect that had the more significative percentage change from round 2 to round 3 (Pathology Complexity) - was also one of the two aspects with more comments- four comments in total- we cannot find a significant correlation when analyzing the remaining aspects. One can thus conclude that this Delphi process was successful as it enabled the change of opinions of participants between rounds, but there was no significant indication that the existence of an open space to justify the responses was an efficient method to improve agreement.

- **Final set of criteria**

The final set of evaluation criteria is considered concise but complete at the same time. It covers different areas of concern and has a feasible number of criteria to implement in a future model, as 14 criteria does not seem to imply a very complex implementation.

- **Strengths and Limitations**

Across the Web Delphi process, the response rate achieved over three rounds exceeded our expectations. The use of a web-based Delphi process increased the efficiency of the procedures, both on the delivery of the survey and also on the follow-up. Performing a first opened round was quite complex, as there were many aspects added sometimes with any type of explanation. The facilitation team, with no extra information, had to perform its own interpretation of the aspect, and it may have occurred that the description of the aspect- constructed by the facilitation team- did not correspond exactly to the initial idea of the participant that suggested the new aspect. This can be pointed out as one limitation of this study,

and a workshop or individual interviews could have been done in order to overcome this limitation. However, despite these difficulties, the open round added a lot of new and valuable perspectives to this study. Finally, the analysis of the aspects that did not reach agreement should ideally have been done by a group of experts in the DC rather by a single expert, which can be pointed out as another limitation of this study.

## 5. CONCLUSIONS AND FUTURE WORK

This work was successful in providing a set of suitable criteria to be applied in a future multicriteria model, being able to align providers' strategy with the interests of the remaining players of the VBH market. From a methodological perspective, it has reinforced the advantages of the use of participatory methods in the healthcare context, as it allows for the construction of very inclusive models. Additionally, this study has also reinforced the importance of stakeholder involvement in studies within the healthcare context, as it has shown the different views and perspectives that exist in such a complex environment.

The findings of this study reinforce the usefulness of the continuity of this work. Specifically, the DC should be held in the future in order to consolidate and validate the present work by a group of experts. Furthermore, the remaining activities of a MCDA approach besides structuring should be conducted, and, ideally, integrated with the MACBETH approach in order to apply the model to specific options (in this case, pathologies), allowing its use by different hospitals in our country, both in the public and private sector.

## 6. ACKNOWLEDGMENTS

To professor Ana Vieira, thank you for your unlimited support, for being such an unwavering supervisor during all these months, and for giving me the motivation I needed during the most challenging times. To professor Carlos Bana e Costa, thank you for sharing with me all your knowledge and experience. To João Leal, thank you for your unconditional and warm support; for the opportunity to learn so much with you, and for the chance to have my internship in such a big company like José de Mello Saúde and to meet such incredible people during those months. To Cristina Valente, Mariana Raposo and Bruno Valente, thank you for making my daily routine in JMS so much funnier and homely. To all the experts that have participated in my surveys, thank you all for your time and knowledge. To my boyfriend Francisco, thank you for always believe

in me, for being the most serene person I know and the only one that always calms me down in the hardest and stressful times. To my parents, thank you for providing me the best education I could ask for, for always having my back and always be my safe place.

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